

Home Is Where the Earth Is

Exploring the Adoption of Vernacular Architecture in Urban Housing in India

Neha Satheesan

Master Thesis Series in Environmental Studies and Sustainability Science,
No 2017:028

A thesis submitted in partial fulfillment of the requirements of Lund University
International Master's Programme in Environmental Studies and Sustainability Science
(30hp/credits)



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Sustainability Studies



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Words: 13,992

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Submitted May 16, 2017

Supervisor: Wim Carton, LUCSUS, Lund University

Susan Maxman has suggested that “sustainable architecture isn’t a prescription. It’s an approach, an attitude. It shouldn’t really even have a label. It should just be architecture.”

Abstract:

India has yet to build 70% of the buildings that will exist in 2030. The housing industry in India has been growing rapidly in an effort to keep up with increasing urbanization, population growth and aspirational consumption. Its growth is accompanied by a large ecological footprint, given the resource intensive processes involved and the large amount of greenhouse gas emissions (GHG) produced. Statistics indicate that construction industries in India are responsible for 35% of carbon dioxide emissions. This is compounded by urbanization giving way to rapidly growing cities and new ways of living, with urban areas having the highest built environment expansion rates. As a major contributor to climate change, building sustainability in the construction industry, is of utmost importance and relevant to further the course of sustainable development.

The architecture practice is a crucial step in the building process as it predetermines all the steps in the value chain of the entire process. With modernization, traditional techniques and methods are often abandoned. Today, Indian buildings stand largely influenced in their disposition, unfit for the landscape, climate or regional cultures; the very principles that traditional vernacular architecture abides by. This thesis proposes that vernacular architecture, given its inherent environmental, social and economic sustainability should be streamlined to the urban residential context, and how this can be achieved. In doing so, we can design better buildings, reduce consumption and emission of greenhouse gases.

This thesis conceives architecture as a social practice to study the elemental links that make up a practice in conjunction with the levels of the operational space (niche, regime, landscape) it is practiced in. In doing so, it uncovers the “unmaking of unsustainability” to find the path to incorporating sustainability at the core of Indian architecture. Using practitioners of the practice to inform the research. The findings reveal that vernacular architecture can be applied to the urban context of housing in India through the active engagement and interaction of the social practices of policy-making, education and architecture. The paper highlights the real challenge posed by sustainability in the application of traditional vernacular architecture to the changing social, cultural, economic and political context. It discusses the points of intervention, reinforcement, and establishment of the practice to enable a macro-level change; thus, demonstrating how adoption of vernacular architecture shows promise of serving as a compass for progressive sustainable architecture while contributing to fulfilling the OECD objectives for sustainable building in a more holistic manner.

Keywords: Traditional, Vernacular Architecture, Urban housing, Social practice, Sustainable Transition

Word count: 13 992

Acknowledgements

“I want to be the change I want to see”. I look back at my statement of purpose in my application to the LUMES programme. I am not sure if I can take the onus of radical change in its entirety. But I have met some of the most incredible people during my time in LUMES, and I am assured that together we can be the change we want to see.

This thesis was a process laced with laughter, consolation, serious pondering, procrastination, sheer hysteria, sometimes more food and less thought and very little but much appreciated sunshine. Firstly, I am ever so grateful to my supervisor, Wim Carton, for his wise words, gentle reprimands and blatant pointers. Your constructive feedback on *‘agriculture’* always helped getting a fresh perspective on things. I hope this piece of work does you proud. I can finally renounce any etiquette and join Henner in thinking up of fun names for you.

Gregor and Madhuri – it was wonderful to have two people that I could reach out for anything and everything at anytime. Thank you for your constant encouragement and fruitful feedback sessions.

No amount of gratitude will be enough to express my appreciation to Mum who has always gone above and beyond; thank you for your valuable input, for letting me pick your thesaurus brain when mine was on the verge of a verbal strike. Thank you for your never-ending patience and finding ways to keep me tickled, lending your ears to my screaming frustrations, hyperventilated paranoia and dark silences.

I could always count on my LUMES family – be it serious discussions, goofing around or just a hug. Thank you. All those fikas, movie nights and dinners kept me going especially in the past few months. Special thank you to my study dates that kept me focused and indulged me in my days of procrastination.

Christine – we have come a long way and I love you for more than just for your coffees, gourmet cooking skills and for being tech-savvy. While that made my life easier, having me as a roommate meant dealing with my moments of panic, excitement, restlessness and over-zealous fervent narrative tone that I take to, on a regular basis. You took it like a champ – thank you.

My grandparents have been there for me every step of my life. And they saw no reason to take a backseat when it came to my thesis. Thank you for believing that I can do this, being involved in my thesis process, never failing to update me on the latest architectural happenings in town and adding your thoughts to the discussion.

Henner, you have been available to many of us until the very end and for being your quirky helpful self, always there to lend an ear, offer advice or a smile. Thank you.

The research would not have been possible if not for Ruchie Kothari’s resourcefulness and timely help. Thank you for taking time out for the insightful discussions and working out different permutations and combinations with me. I am much obliged for all the information and confidence you gave me.

Last, but not the least, I would like to thank Peter Šeremet for bringing me to my mystery.

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1 Introduction

The United Nations states that in three decades around 80% of the global population will live in cities (C-USE, 2017). Subsequently, increased demand in urban infrastructures has led to construction industries around the world having a large ecological footprint (Kucukvar & Tatari, 2013). Cement, a common building material, is alone responsible for 14% of global carbon dioxide emissions (Heede, 2014).

“India is yet to build 70% of the buildings that will exist in 2030” (“Building Energy Modeling & Advisory Project (BEMAP) Fairconditioning”, 2017, para. 1) . The onset of industrialization in India led to private sectors like the construction industry to rapidly grow (Nayyar, 1978), making it the country’s second largest growing sector (Laskar & Murty, 2004), with estimates pointing towards India becoming the third largest in the construction business across the world (Kataria & Pathak, 2013). Additionally, urbanization in India contributes to rapidly growing cities and new ways of living, with urban areas having the highest built environment expansion rates (commercial and residential). 2050 looks at an urban fabric that is expected to shelter 497 million people in India (C-USE Centre for Urban Science and Engineering, 2017). Thus, I explore the role of architecture in enabling more sustainable building practice.

The building industry’s impact on the environment is undeniable. The unsustainable mobilization and consumption of resources and energy-intensive practices within the housing construction industry is straining the environment and contributing to climate change through various GHG emissions (Kataria & Pathak, 2013; Kulkarni & Ramachandra, 2015). Currently, construction industries in India are responsible for 35% of carbon dioxide emissions (Kulkarni & Ramachandra, 2015). Over 2 million residential buildings are built every year in India (Gopalakrishnan Nair, 2006); this number has been estimated to increase drastically by 2050 (OECD/IEA, 2013). This causes increased GHG emissions due to the consequent surge in building material used (Gopalakrishnan Nair, 2006). Increased material and energy demands of building new houses further contributes to GHG emissions, aggravating climate change. Subsequent requirement for space heating and cooling, has led to high levels of energy consumption and GHG emissions in India (OECD/IEA, 2013). The potential of architecture to combat this vicious cycle of consumption and emission is being explored as building designs today are often energy and resource intensive, both during and post construction (UNEP & TERI, n.d.), making it economically and environmentally unsustainable.

1.1 Background Context and Problem Statement

The plethora of cultures in India manifests itself in the country's art, literature, music, dance and its architecture as well (Lopez & Collaco, 2003). The backdrop of the Indian architectural narrative demonstrates the architectural legacy that is a result of multiple reigns (lack of a proper centralized government prior colonization), the varied topography and climate across the country (Lopez & Collaco, 2003). Building design has represented the changing spatial and temporal dimensions bringing art, science, environment and people on the same plane (Lopez & Collaco, 2003). Presence of many religions, rulers and a rich history contributed to this architectural collage (Lopez & Collaco, 2003). The technological advancements over time fused with the various religious expressions, bringing aesthetic appeal to functionality (Lopez & Collaco, 2003). The colonial rule under the British, largely influenced the Indian architecture to cater to the needs of the new hosts (Lopez & Collaco, 2003). Post-independence, the western influence on the architectural style was furthered by renowned French architect, Le Corbusier and foreign-trained Indian architects who tried to replicate the European/American architecture reconstructing the imagery of Indian buildings (Lopez & Collaco, 2003).

Today, Indian buildings stand largely influenced in their disposition, not always fit for the landscape, climate or regional cultures (John, Clements-Croome & Jeronimidis, 2005; Thapar, 2012; Elworthy & Holder, 1997). The trend of building to imitate the West has become unsustainable in that it poses a threat to the environment, people and architectural culture (Thapar, 2012; Elworthy & Holder, 1997). The OECD project identified five objectives for sustainable buildings (John, Clements-Croome & Jeronimidis, 2005);

1. Resource efficiency
2. Energy efficiency (including greenhouse gas emissions reduction)
3. Pollution prevention (including indoor air quality and noise abatement)
4. Harmonization with environment
5. Integrated and systemic approaches.

To reduce impact on climate and environment, sustainable construction is essential. Before the term "sustainability" came into existence, traditional builders incorporated sustainability at the core of their architectural practice (Curtis, 2008). Recent studies have shown that modern architecture does not incorporate sustainability at their core (John, Clements-Croome & Jeronimidis, 2005; Kataria & Pathak, 2013). There has been an increasing focus on 'greening' buildings recently (Curtis, 2008),

which has undeniably improved building performance and resource efficiency in many ways, introducing renewable energy sources and eco-friendly construction materials (Nelson, Rakau & Dörrenberg, 2010). It addresses the first two OECD sustainable building objectives to an extent through technology fixes (Nelson, Rakau & Dörrenberg, 2010). While many efforts have been taken to practice wise resource use, focusing on material and energy efficiency (John, Clements-Croome & Jeronimidis, 2005), this alone is not enough; as GHG emissions continue to rise, energy-intensive consumption and construction practices continue to prevail (Kataria & Pathak, 2013). Moving away from energy efficiency and towards preservation through thoughtful architecture could go a long way into creating buildings that integrate functionality and productive use of space in the first place (John, Clements-Croome & Jeronimidis, 2005). This would also address OECD's 4th objective, ensuring a more holistic building architecture practice allowing the incorporation of the other objectives (John, Clements-Croome & Jeronimidis, 2005). This calls for a change in or development of, an architectural practice that is ecologically conscious (Kibert, 2007).

Potential Solution: Vernacular Architecture

For these reasons, the rationale for sustaining traditional architectural practices that were sustainable in their era, is worthy of research. I would like to introduce the concept of vernacular architecture as a potential solution to reduce construction industry's environmental impact. Vernacular architecture can be defined as "architecture based on localized requirements and building materials, and reflecting local traditions" (Niroumand, Zain & Jamil, 2013, p.131; Foroughi, 2016). Vernacular architecture uses knowledge that a native builder derives from his local space, incorporating principles and methods based on local "know-how" of the terrain, climate and local resources (Foroughi, 2016). The major advantage of vernacular architecture is that the context-specific local knowledge of builders facilitates use of climate appropriate, energy efficient building strategies that aid cost effective and efficient resource use during housing construction (Zhai & Previtali, 2010). These characteristics make it a sustainable practice as it is conscious of the local environment and uses building designs that were energy-efficient post construction as well (Curtis, 2008). It is undeniable that the architecture was practiced when circumstances in terms of population, land use, resource availability and accessibility were more manageable. It was easier to build houses that were in harmony with nature and optimized the use of natural energies (Dili, Naseer & Varghese, 2010a) to provide a healthy indoor environment.

Yet, in appropriate application to the urban setting, the practice shows potential to be sustainable in present-day scenario (Fernandes, Mateus & Bragança, 2014), which is what I test in my thesis. In India, reviving this sustainable architectural practice could offer an opportunity to (Kataria & Pathak, 2013) combat increasing GHG emissions of the housing construction industry, reduce resource consumption, ensure healthy indoor environments (Gray, 2017).

1.2 Aim and Research Questions

Aim: To determine the feasibility and extent to which traditional Indian vernacular architecture can be incorporated into mainstream construction practices within the housing sector in urban India.

Research Questions (RQs)

R.Q. 1: To what extent is vernacular architecture a sustainable practice for urban residential housing, according to practitioners?

R.Q. 2: What factors encourage and hinder the adoption of vernacular architecture within the housing construction in urban India?

R.Q. 3: If found sustainable, what strategies can enable vernacular architecture to be adopted in India?

To answer my RQs, I focused on practitioners of architecture to serve as my key informants. Despite many improved long-term energy, economic and environmental benefits of vernacular architecture, modern architecture is less than ideal in terms of (economic, social and environmental) sustainability. To explore the research gap as to why this is the case (Curtis, 2008; Singh, Mahapatra & Atreya, 2009), this paper aims to address this by determining factors influential to the (re)adoption of vernacular architecture in the urban Indian context; a potential solution to advance the sustainability discourse in mainstream construction.

Vernacular Architecture in India: Past and Present

There have been many cases, wherein the use of vernacular architecture has come with numerous benefits. Use of earth architecture that employs traditional methods has been widely acknowledged in developing countries as a sustainable form of architecture that is cost-effective, environmental friendly and energy-saving (Niroumand, Zain & Jamil, 2013). For instance, the traditional technology

of mud construction in Kerala (The Hindu, 2005) is predominant especially since mud is still easily accessible in many regions of the state.

Several studies conducted in India found that residents living in traditional houses acknowledged having greater degree of thermal comfort compared to those living in present day modern housing (Singh, Mahapatra & Atreya, 2009; Dili, Naseer & Varghese, 2010b). Sathiaran (2010) points to traditional South Indian vernacular architecture which uses enclosed open spaces and positions doors in a line alignment to enable natural ventilation. Traditional Indian vernacular buildings used architectural principles such as natural ventilation design techniques, reflection principle and designs such as perforated stone, latticed mesh-like patterns on windows, symmetrical corridors; these unique sustainable building designs were passive methods that maximized use of air-flow and natural energies (Singh, Mahapatra & Atreya, 2009; Chaurasia & Sharma, 2017). This helps lighten up the entire room, reduce energy consumption and naturally regulate indoor thermal comfort (Zhai & Previtali, 2010; Chaurasia & Sharma, 2017). Additionally, “locally available, energy efficient materials having low thermal conductance, high specific heat capacity and high resistance value” were used, e.g. red sand stone, timber, traditional lime mortar, reflective materials (emerald, mirrors) and natural colours used according to building orientation (Chaurasia & Sharma, 2017, p.3). Vernacular architecture used designs and materials to build climate responsive, energy efficient (during and post-construction) houses that provided healthy indoor environment with low environmental footprint (Zhai & Previtali, 2010; Chaurasia & Sharma, 2017).

The examples stated reflect use of local resources/methods using *natural materials* which are not easily implemented in today’s urban housing, e.g. local timber or cow dung. However, elements of vernacular architecture such as building design (such as in examples stated above) and principles (utilizing natural energies: sun, wind, air) could still be incorporated into present day practices (Curtis, 2008). Every stage of building lifecycle, i.e. raw material procurement, the building process, the final product: built form of house/housing complex, its occupancy and post-occupancy consumption patterns, is defined by the architecture of the building (Curtis, 2008; Singh, Mahapatra & Atreya, 2009). The process of building is as important as the building itself. The architecture predetermines all the steps in the value chain of the entire building process. Therefore, the focus on architectural practice and the building designs it advocates, makes for a viable leverage point in the pursuit of sustainability within the construction industry.

1.3 Relevance in and Contribution to Sustainability Science

Sustainability science (SSc) is instrumental in gauging the complexities that lie within sustainability challenges which entail “dynamic nature-society systems” (Kates et al., 2001). The research adopts a problem-driven approach (Miller, 2012), stemming from its characteristic of being motivated and defined by the problems rather than the disciplines it employs (Clark, 2007, p.1783).

The thesis departs from this standpoint, considering the temporal-infrastructure inertia across multiple spatial scales (Swart et al., 2004; Kates et al., 2001) of transferring use of vernacular architecture in its historic context to the present-day urban context in housing. Sustainability of the construction sector involves and depends on social, economic and environmental factors (Ortiz, Castells & Sonnemann, 2009; Ball, 2002; Kataria & Pathak, 2013), the three pillars of sustainability that SS draws from in its problem-solving agenda (Miller, 2013).

As a major contributor to climate change, building sustainability in the construction industry, is of utmost importance and relevant to further the course of sustainable development (Hill & Bowen, 1997; Kataria & Pathak, 2013) of India. Thus, the sector calls for the holistic approach that SSc offers to address factors that influence it, interweaving and amplifying within the layers of system complexity; building sustainability has been known to use the concept of sustainable development in order to address its multiple dimensions (Ball, 2002). In addressing the core dimensions of sustainability problems “ecological, social, economic, ethical and institutional” (Swart et al., 2004, p. 139), it is imperative that the building construction industry is not viewed in isolation from its local settings as it would strip the SSc scheme from analyzing the very factors/systems that influence the industry’s sustainability trajectory; negatively impacting human and ecological welfare (Ball, 2002).

One of the core questions SSc asks is the kind of systems that incentivize sustainable transitions (Kates et al., 2001), which I ask in my thesis. Loorbach (2007, p. 18) defines a transition “as a continuous process of societal change whereby the structure of society changes fundamentally” and one has to account for “rapid, simultaneous changes in the social and environmental systems” that result in multiple pressures (Kates et al., 2001, p.642). As discussed by Geels (2011), “sustainability transitions are necessarily about interactions between technology, policy/power/politics, economics/business/markets, and culture/discourse/public opinion” that co-evolve together. The introduction of novel solution strategies, in this case vernacular architecture, to facilitate a sustainable transition, should heed the continuously evolving nature of sustainability in its definition

and who defines it. By employing this approach in my thesis, I acknowledge the prevailing dynamism and attempt to link incongruent natural and social science perspectives (Swart et al., 2004).

2 Theory

My thesis draws on the Multi-Level Perspective (MLP) from transition theory, using the Social Practice Theory (SPT) to complement it. Taking elements from both approaches, I adopt an analytical lens that serves as a suitable heuristic framework for use in my thesis. I use the MLP to lay out the sustainable transition across multiple scales (Figure 1), that vernacular architecture will journey through to be fully adopted into the mainstream architectural practice. I apply SPT to understand how the existing architectural practice came into being and persists. It helps to position the motivations, desires, capacities and role of social groups (individual and collective) in this transition juxtaposed with the three levels in MLP.

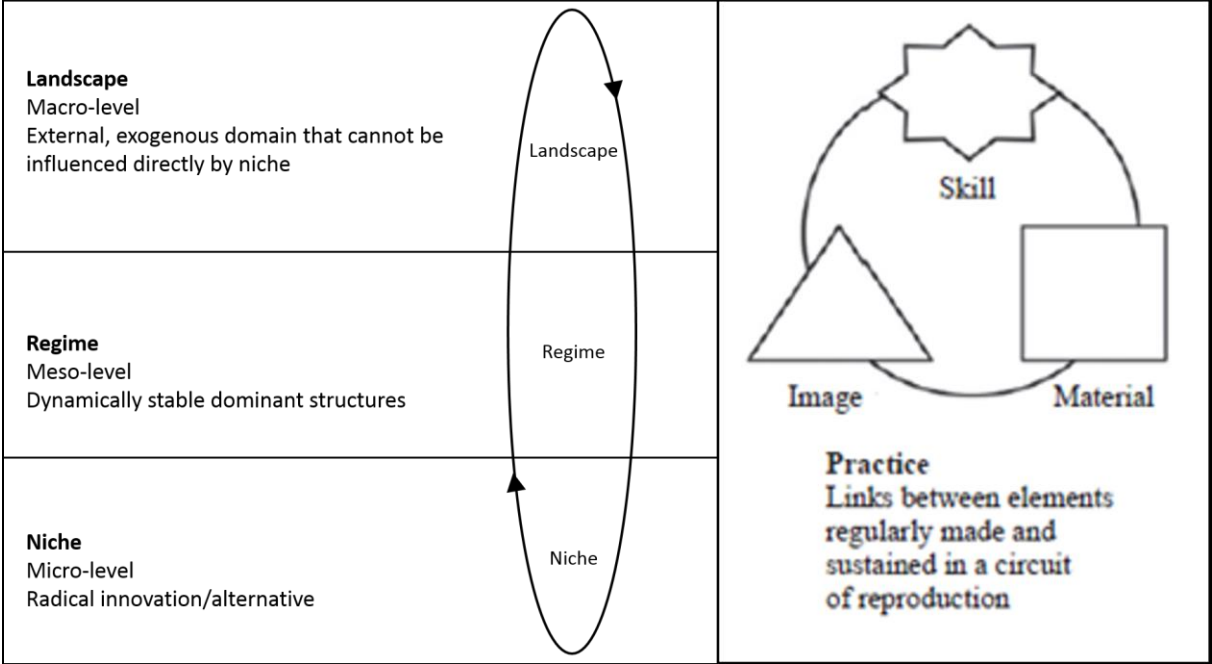


Figure 1. Multi-Level Perspective (left) and Social Practice Theory (right) illustrated. Adapted from (Hargreaves, Longhurst & Seyfang, 2013).

Before I elaborate on the use of the combined theory, I explain each of the theories and how I came about bringing them together to form a single unit of analysis.

2.1 Transition Theory: The Multi-Level Perspective

Transitions in practice

With sustainable development on the agenda of almost every sector, the need for deep rooted structural changes through transitions is necessary (Loorbach & Rotmans, 2006). Resolving persistent “contemporary environmental problems” like climate change and diminishing natural assets often involves significant systemic changes that bring in various factors into picture (Geels, 2011), that in themselves and with each other, impact the system(s). Factors could be “technology, policy, markets, consumer practices, infrastructure, cultural meaning and scientific knowledge (Elzen et al., 2004; Geels, 2004). The factors interact and co-evolve which is why systemic changes are referred to as socio-technical transitions (Geels, 2011) as they help recognize relationships between social and technical aspects. These systems are sustained by actors (firms, industries, policy-makers, engineers, consumers etc.) that influence different structural elements that make up these systems (Geels, 2011).

Multi-Level Perspective (MLP)

The MLP is a “middle range theory” used to gain insight into how such a transition occurs (Geels, 2011). The framework proposes three levels (Figure 2) that, when a transition percolates through, creates the macro-level change required to sustain the transition successfully. The three levels: niche, regime and landscape take on increasing levels of stability and complexity (Geels, 2011; Smith, 2007).

Landscape is the overarching socio-technical setting encompassing the tangible and the intangible: market, economy, institutions, social and political values and beliefs (Geels, 2011). It serves as a material backdrop in which various established systems called *regimes* exist. These established or ‘incumbent’ systems consist of regime rules, lifestyles, mainstream practices, regulations that strengthen and stabilize the socio-technical systems (Geels, 2011; Smith, 2007). *Niche* is the ‘radical innovation’ introduced into the existing established systems (regime) as a result of landscape pressures like environmental degradation and climate change (Geels, 2011). When the niche interacts with the regime, introducing or reshaping its foundational structures, it translates into a new regime, establishing itself in and (positively) impacting the landscape (Geels, 2011; Smith, 2007).

MLP has traditionally been used in the past to understand historical transitions, however, it has been successfully used for goal-oriented transitions such as sustainability in cases of biogas and co-combustion (Verbong & Geels, 2007,2010; Hofman & Elzen, 2010; Raven, 2004). Other theoretical approaches have been applied for use as prescriptive policy-making tools that would facilitate the transition e.g. strategic niche management (Kemp et al, 1998) and transition management (Kemp and Loorbach, 2006).

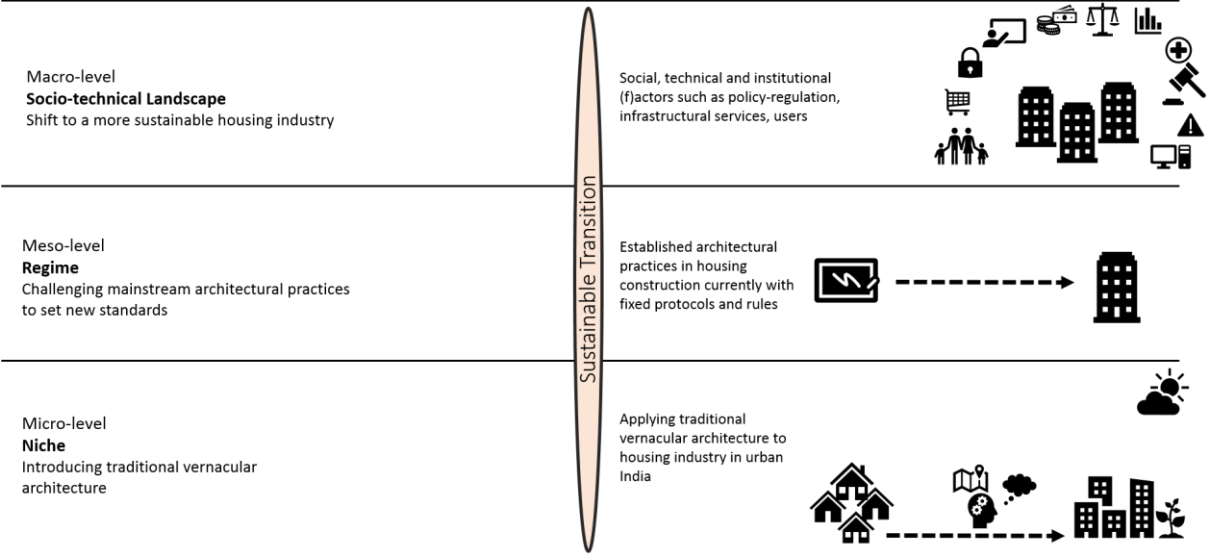


Figure2. The Multi-Level Perspective in context of this thesis focus. Adapted from (Geels, 2011; Hargreaves, Longhurst & Seyfang, 2013).

These ideas were developed to guide current unsustainable regimes towards becoming more sustainable. The growing concern of the construction industry’s contribution to climate change in India has raised interest in proactive measures to tackle the problem of inefficient use of building materials, resources and building design (Kataria & Pathak, 2013). I explore the role of architecture in enabling a more sustainable building practice. The MLP framework allows me to investigate how the “niche innovation”, vernacular architecture can be taken up and established as mainstream architectural practice. I visualize, explore and explain the “dynamic interactions between niche and regime” (Geels, 2011) and look at how this emerging practice can then be propagated to become a standard construction practice imbining sustainability at its core and scaling it up within urban India.

Hargreaves, Longhurst & Seyfang (2013) MLP rightly point out that to develop the niche, it is essential for facilitators to provide means to buffer the infrastructural, economic and market

pressures to reduce the struggle for the emerging niche (Geels, 2011). In my research, I look for means of 'protection' and MLP provides a starting point by illustrating influence of elements/systems within the landscape and regime domains on the niche and vice versa, to know how the niche can reconfigure the regime to get the desired sustainable transition (Geels, 2011; Hargreaves, Longhurst & Seyfang, 2013; Smith, 2012).

However, MLP falls short as it has a proclivity to concentrate on the technological sans considering 'social innovation' and the social implications of the niche on society (Seyfang and Smith, 2007; Shove and Walker, 2010). Geels (2011) argues that social agents are instrumental to the "increasing structuration of activities in local practices" (Appendix I) and that the social groups guide the regime reconfiguration. However, the focus is mainly on market and political actors (Seyfang & Smith, 2007). Inclusion of civil society in the 'social' innovation would be essential especially if the innovation will be used largely by and affect them (Shove & Walker, 2010; Hargreaves, Longhurst & Seyfang, 2013). Also, as much as innovation is considered "a social process shaped by broader societal contexts", the impact of the innovation on society and their everyday routine is not accounted for (Shove, 2003; Geels, 2011).

I believe to revive vernacular architecture, it must come from social consciousness that is informed, rational and cognizant of the impacts that architecture has on the building and interconnected factors. This sort of "innovation" of a social practice can be cultivated if the underlying motivations, culture, structure and practices, which explain adoption and persistency of the practice, are understood. This brings me to SPT.

2.2 Social Practice Theory: "Understanding the unmaking of unsustainability"

Social practice theory (SPT) emerged to direct the focus to practice, an action or 'doing'; away from macro and micro-social phenomena (Mayntz, 2004) such as regime transformation and individual action (Shove, Pantzar, & Watson, 2012). It investigates the dynamic relationship between social structures (political, market, normative behavior) and human action (Shove, Pantzar, & Watson, 2012). Thus, one learns about the "processes of fracture and dissolution" of a practice (Shove, 2010). This is essential when looking for factors that enable and hinder transitions in a society with issues of scaling-up and path dependency (infrastructural lock-in) (Shove, 2010; Geels, 2011). This can be uncovered by observing motivations, attitudes and trends around a practice in addition to the

infrastructures, technical innovation and individual agencies that aid it (Spurling, McMeekin, Shove, Souherton & Welch, 2013, Geels, 2011).

This is a definite shift from innovation studies, that celebrate the birth of social and technical transitions, conveniently neglecting what makes and breaks a practice (Shove, 2010). It critically analyses why something is practiced, its impact (on sustainability), where the power lies thereby, facilitating the “unmaking of unsustainability”. This is relevant in this thesis, if one aims to displace the mainstream architecture (breaking dominant unsustainable practice) with an alternative: vernacular architecture (making a new sustainable practice). Numerous approaches of what a practice embodies are alike in that, they conceptualize a practice as comprising of (1) images (2) materials (3) skills (Reckwitz, 2001, Schatzki, 2001; Shove and Pantzar, 2005; Hargreaves, Longhurst & Seyfang, 2013). This is explained as:

- Meanings: symbols or images associated with the social practice (e.g. cleanliness, freshness is associated with the practice of showering)
- Materials: the objects necessary to carry out the practice (things required to shower: soap, water and a showering space)
- Skill: competence to perform the action (the ability to wash and clean oneself)

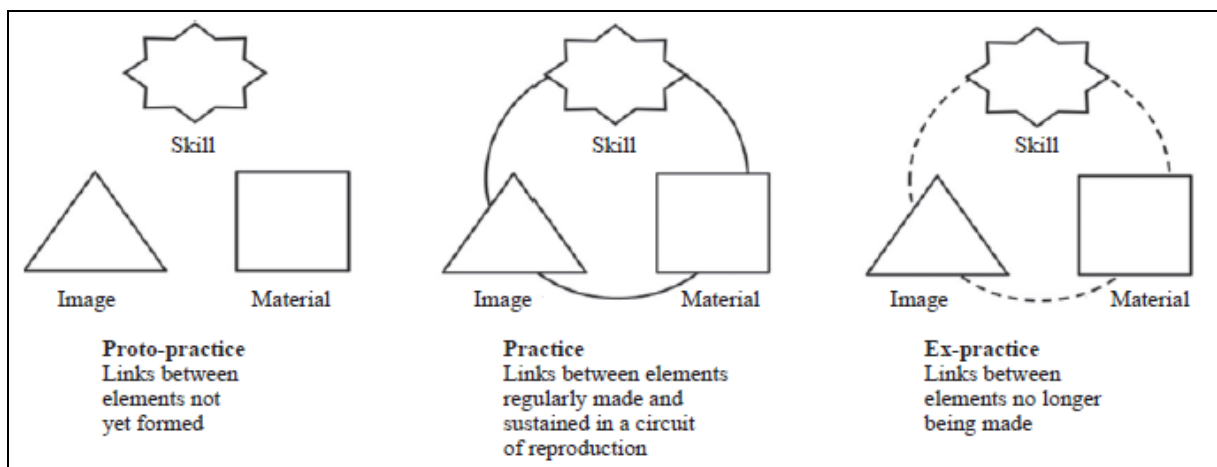


Figure3. Formation of the image-material-skill link in a practice. Adapted from Pantzar and Shove, page 450 (2010).

Practices are produced, reinforced and established by practitioners through the formations and co-evolution of these three key elements (Figure 3) (Shove & Pantzar, 2005). In questioning how practices came into being, the integration between the image, material and skill are understood;

thereby, serving as a means to determine intervention points to introduce the desired change in (or adoption of a new) practice.

It has been often used to study everyday routinized behaviour such as showering, shopping or commuting (Hargreaves, Longhurst & Seyfang, 2013). Building on Bourdieu and Giddens' work, recent developments and various approaches in SPT have been seen within the academic sphere, predominantly by Warde, Reckwitz, Southerton and Chatterton. More recently, SPT has seen application in the context of sustainability and innovation in practice (Pantzar and Shove, 2010; Shove and Pantzar, 2005; Spurling, McMeekin, Shove, Southerton & Welch, 2013).

SPT acknowledges the three elements in their context are inherent to the carrying out of such routinized behaviours and in defining the norms (Hargreaves, 2011; Spotswood *et al.*, 2015). "Understanding the dynamics of practices offers us a window into transitions towards sustainability" (Spurling, McMeekin, Shove, Southerton & Welch, 2013, p.1). In asking questions like: how current architectural practices recruit carriers (practitioner/actor); what influences practitioners to continue or discontinue the practice – one adopts new ways of micro, meso and macro levels of enquiry; pursuing the social relations in the process of building a building (Shove, 2010; Southerton *et al.*, 2004).

2.3 Analytical Framework

"Architecture affects human kind through the built environment more directly than any other discipline" (Salingaros & Mehaffy, 2006). It plays an important role in providing a healthy indoor environment, shaping the consumption patterns in terms of energy-material use and how it subsequently impacts the outdoor environment (Marsh, 2011). In understanding the 'triangular relationship of society, architecture and the physical context' (Desai, 2010), and as an important feature of human life, vernacular architecture of housing must be understood as a form of social practice (SPT) in conjunction with the levels of the operational space (niche, regime, landscape) it is practiced in (MLP).

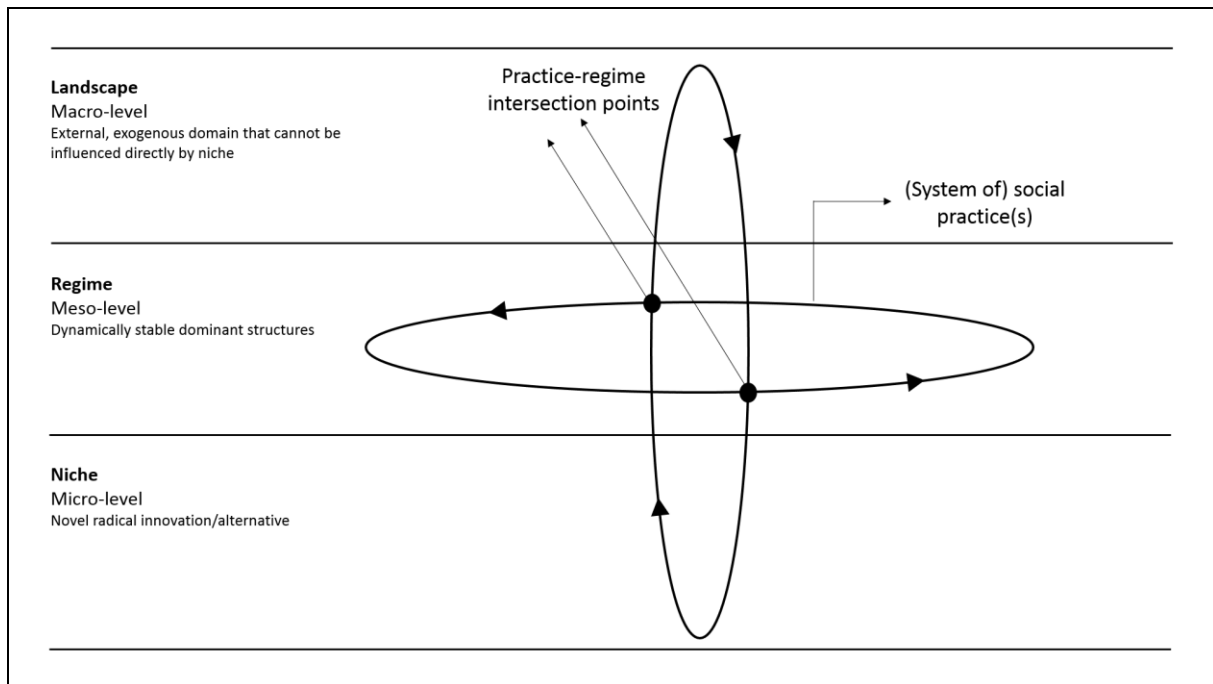


Figure 4. Combining Multi-Level Perspective and Social Practice Theory. Adapted from Shove, page 193 (2003).

Combining MLP with SPT (Figure 4), I conceive vernacular architecture as a social practice entering the vertical analytical levels of the MLP (niche, regime, landscape). As a practice, architecture would essentially constitute of activities organized by multiple people (Higgs, Barnett, Billett, Hutchings & Trede, 2013) in the material-infrastructure context that it is set in. This forms the horizontal circle (Figure 4). Some of the important actors identified within the construction industry are building developers/contractors, architects, masons, consultants, the clients, designers, end-users and policy-makers (Ametepey, Aigbavboa & Ansah, 2015). The interaction between these actors based on individual conceptions of symbols/images, knowledge and skills and subsequent actions performed establishes the architectural practice.

While Geels (2011) suggests that a system could entail “technology, policy, markets, consumer practices, infrastructure, cultural meaning and scientific knowledge” (Elzen et al., 2004; Geels, 2004), I determine ad hoc, through my research design method, what factors come up as most influential in the nature of the architectural practice adopted.

SPT, as an additional unit of analysis, helps exploring links and intersections between regimes and practices. I study the different social relations created in the architectural practice, their capacities, power and how they impact the practice, while simultaneously drawing on the overlap between them to truly apply the useful contributions the two theories have to offer. This helps bridging the gap between innovation and implementation (Hargreaves, Longhurst & Seyfang, 2013). Thus, consistent with sustainability science, this integrative framework sees the world in terms of coupled human-environment systems (Kates, 2012), which are founded on the idea that “human action and social structures are integral to nature and hence any distinction between social and natural systems is arbitrary” (Adger, 2006, p. 268).

This flexible heuristic framework helps putting together easily pieces of information I collect through research/fieldwork and examine the operating interface and intersecting points between architecture as a social practice and its regime setting in the housing construction sector.

3 Methodology

3.1 Methodological Approach

The thesis methodology uses critical realism as its ontological stance. Critical realism combines the objective reality while still acknowledging the social constructions around it formed by the interactions between, formulations by and interpretations of the human minds. (Sayer, 2000; Archer, Bhaskar, Collier, Lawson, & Norrie, 1998; Maxwell, 2012). One can never truly grasp objective reality, one can however, epistemologically, through exhaustive in-depth critical examination, apprehend it as closely as possible (Benton & Craib, 2010, p. 120; Guba & Lincoln, 1994).

The GHG emissions and environmental degradation (through climate change) by the construction industry form the empirical reality, while the social practice of architecture, its practitioners and users form the constructed social reality. My thesis views the environmental unsustainability of mainstream architectural practices as influenced by its practitioners, other actors and the structural material context they are set in (social, political, economic and market factors: constructed reality). Its ontological stance dictates the epistemology in that, I examine human agency and social structures influenced by it to find agents of change and points of intervention (Collier, 1994). I pay attention to the contextual setting in which the reality is formed, taking into account the perceptions, actions of the actors involved. Thus, a critical realist perspective helps “guide

appropriate action in practice development and realistic evaluation for understanding the consequences of those actions” (Wilson & McCormack, 2006).

3.2 Research Design

I adopt a qualitative research method relying mainly on primary data retrieved from explorative semi-structured interviews. To answer my RQs, my research is designed to understand from participants their stance about use of vernacular architecture in urban India, its feasibility, enabling and hindering factors to facilitate this. In keeping with the critical and emancipatory tradition of social science (Sayer, 2000) and using the analytical lens of my framework, I used this thesis to uncover the conditions and suggest strategies that would overcome the causal mechanisms of mainstream architectural practice, stimulating the adoption of the more sustainable vernacular architecture. I use secondary sources to complement data collected through interviews. This enabled me to converge my findings to my RQs.

I examined the social practice of architecture through its practitioners. I conducted 9 online interviews (Appendix II) which formed the backbone of the data collection in my research process. The participants were architects/had an architectural background and served as key informants to the research. An email interview was used in the case of one informant (unavailable for online interview), wherein questions were sent to the person and answers were received via email. I also interviewed participants whose input I considered valuable to answering my RQs. E.g.

- Environmental designer
- Environmental sustainability consultant in building design
- Urban designer involved in city planning and built environment of an area

Their previous experience and background in architectural practice and new yet connected domains of expertise, helped add new dimensions to the research. The list of questions for the interview (Appendix III) were created based on the MLP-SPT analytical framework with the intent of determining:

- factors such as “technology, policy, markets, consumer practices, infrastructure, cultural meaning and scientific knowledge” (Geels, 2011) and
- social relations created in the architectural practice, how and why mainstream architecture is practiced, its impact (on sustainability), where the power lies thereby makes and breaks a practice (Shove, 2010).

The interview guide was subjected to peer review to eliminate any bias and presence of leading questions. The interviews were conducted in English and lasted for approximately an hour. I conducted the interviews with participants in India via Skype, which was the next closest option to a face-to-face interview. Semi-structured interviews proved to be useful as they allowed for flexibility within basic frame of the interview guide, yet ensured qualitative data obtained was “reliable and comparable” (Cohen & Crabtree, 2006). Use of open-ended questions allowed me as the interviewer to direct the conversational path to pursue underlying motivations and delve into the new angles to the issue that are brought up (Cohen & Crabtree, 2006). The interviews were transcribed using the ExpressScribe software which allowed for the track’s speed to be increased/decreased. This eased transcription and helped pick up on indecipherable words. Transcribing was done using smooth selective verbatim (Mayring, 2014), leaving out parts of conversation irrelevant to the data collection (but crucial to sustain a conversational flow) and fillers/crutch words (uhms, aahs).

Ethical issues

The prospective participants were informed of the research aim, purpose and the kind of information I was looking for (Bryman, 2016). A letter of consent (Appendix III) was created to ensure voluntary participation was obtained from the participants. At the start of each interview, participants were asked if they agree to giving a verbal consent, as the interviews were online. The terms and conditions on the form were read out; participants were emailed a copy for reference. The main terms stated that participants will not be identifiable (anonymous if wished for) and information provided by them will be strictly confidential and will be used for research purposes alone. For the one interview via email, the consent form was sent to the participant who filled it out and emailed the scanned document back to me.

The interviews were recorded with permission using the CallNote software which allows for Skype calls to be recorded. The thesis and interview transcript were sent to the participants for review and comment.

3.3 Qualitative Data Analysis

The qualitative data collection method and analysis was an iterative and reflexive process (Bryman, 2016), wherein I used the information gained in each interview to further develop the interview questions within my analytical framework. This helped me explore, draw out new angles and perspectives to help answer my RQs.

I used the MAXQDA (MAX Qualitative Data Analysis) software to analyse the interview transcripts. General category codes were formed inductively based on previously read literature of research done in the field and MLP-SPT framework (e.g. sustainable architectural principles, vernacular architectural principles, enablers, inhibitors). The information from the interview transcripts were reviewed individually and relevant texts were coded using different colours for each category. I used deductive coding to form new codes within and outside the preconceived category codes, when new factors emerged in the transcript. Coded texts of two or more transcripts could be retrieved, viewed and compared at once using the software. I drew out major themes from coded text to be analysed by the analytical framework.

While coding, I would play the track in the background to better understand any non-verbal cues in their tone/intonation, for e.g. hesitation, laughs, feelings of confidence, dissatisfaction, discomfort, to complement their verbal responses (Robson, 2011).

4 Results and Analysis

“... it's just a question of - just common sense. I mean why would anybody do anything but that.” (GDC) on sustainable architecture.

The aim of the thesis is to determine the feasibility and extent to which traditional Indian vernacular architecture can be incorporated into mainstream construction practices within the housing sector in urban India. This was answered through three RQs. RQ1 was answered by the participants to inform the context base of how sustainability in architecture is perceived (Section 4.1). Using this as a departure point, RQ2 used the data collected from the interviews to form the body of knowledge that I viewed through the MLP-SPT lens. This helped me to reinterpret the information to draw out factors within the framework in order to answer my RQs using the ‘image-material-skill’ horizontal lens juxtaposed with the three levels of MLP vertical lens (Section 4.2). RQ3 used the answer to RQ2 to draw out key intervention point and explains how to facilitate the adoption of VA in urban housing in India.

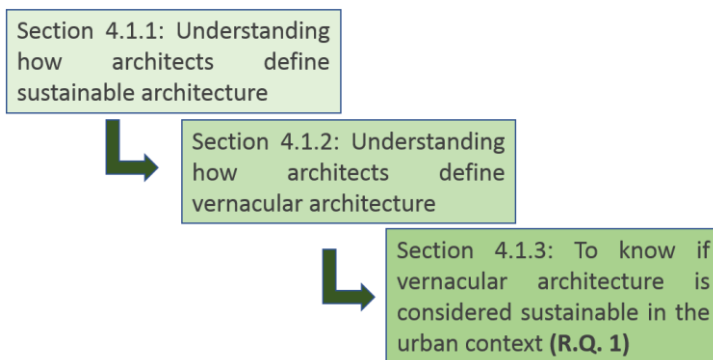
All participant names are coded. Based on participant requirement for anonymity, the anonymous are coded with numbers (e.g. Interviewee (5) is coded as (5)). The rest have been coded with acronyms of their full names (e.g. Vinu Daniel is coded as VD) (Check [Appendix II](#) for detailed list).

4.1 R.Q 1: To what extent is vernacular architecture a sustainable practice for urban residential housing, according to practitioners?

To answer my first RQ, I first sought to define sustainability in the architectural context to set base. The variety of meanings the term sustainable architecture could encompass, can take many definitions based on the different logics of sustainability: eco-centric, eco-technic, eco-cultural etc (Guy & Farmer, 2001). The dynamism comes from the kind of sustainability focus and context. (Guy & Farmer, 2001). Thus, I used the interviews to find out how participants define:

(1) sustainable architecture

(2) vernacular architecture and whether these principles are in line with (1) to make for sound sustainable architectural practices for houses in urban India.



Roadmap 1: Design of R.Q.1.

This helped get the practitioners (interviewees) to set the context in which the analytical framework was applied to answer the next RQ.

4.1.1 Sustainable architecture defined

There are three gods when building a building according to VD: the site, the design, the material. Generally, the terms or principles used by participants to define sustainable architecture, followed the same line of thought, in agreement with the definitions cited in the literature.

Understanding the climate, keeping in mind the local context, correct building orientation (direction of sun and wind), ensuring wise resource-material management, proper placement of windows (fenestration), consuming least amount of energy to construct/operate a building, using minimal mechanical/electrical systems while optimizing natural energies including light and ventilation to

regulate indoor temperature thereby providing a healthy environment are some of the common principles brought up by all participants. It is essential that in the process of building, one respects the space being utilized and prioritizes least environmental damage. Therefore, aspects such as retaining the landscape (not damaging it unless you could help it), letting the building to blend into/fit the site in a manner that allows one to build around or using the nature of the site – it could be “the tree, maybe the slope, maybe the buildings next to it” (VD).

Each principle has an underlying motivation or rationale behind it. For example, understanding the climate will tell the number of openings a building needs and the amount of slope to be provided to the roof. In Kerala, because of heavy rainfall, sloped roofs are used to allow water to drain off (5). In arid climates such as in Kutch, flat roofs made using materials effective for thermal insulation are used (5). Considering the orientation of the building and its fenestration with respect to the sun and wind direction will allow intelligent use of light and air ventilation to bring about a healthy indoor environment (7).

Retaining trees, slopes and water bodies are important (VD, 5, 9). It is not easy to bring back old trees; natural slopes and water have a lot to do with one another and flattening a slope or changing the flow of water goes against the natural terrain which might serve a purpose in the environment. In short, sustainable architecture is architecture which make sense in terms of the local climate, culture and energy requirements.

These findings indicate that OECD’s 4th objective of harmonization with nature (John, Clements-Croome & Jeronimidis, 2005) is crucial in constructing sustainable buildings and architecture can help achieve this to a large extent.

4.1.2 Vernacular Architecture defined

Reiterating the literature (Section 1.1.), the participants defined vernacular architecture (VA) to have the same principles as sustainable architecture. To eliminate any bias, some participants were asked to define SA before they were asked to define VA, others vice versa. One participant defined VA as:

“...vernacular architecture is architecture which is put together using local practices and local materials... buildings built by people of the place are vernacular buildings. All they have at their disposal is the material that is lying around them and their own ways of putting it together. Any building that is put together by this local kind of knowledge is a vernacular building.” (7)

Traditional Indian vernacular principles imbibed key principles of environmental design. JJA, an architect and environmental designer, explained how, using the example of a traditional architectural style of housing in Kerala, *Naalukettu*. Its architectural principles align perfectly to the main elements that make up the criterion of proper environmental design. Firstly, for an environmental design, the building plan should account for low-energy, low-carbon design, placement and orientation, which is strictly followed in the *Naalukettu*. Secondly, the principle of using local materials and resources is something *Naalukettu* abides by. Finally, the appropriate use of daylight and shade that ensures no part of the house receives sunlight except the roof, thereby not heating up the building. This has been mastered in *Naalukettu*.

Participants described vernacular architecture as architecture practiced by local communities, using the local materials at their disposal to build houses comfortable for the local climate. The practice evolved instinctively based on local knowledge that catered for functionality, local traditions and was aesthetically beautiful. Traditional vernacular architectural principles were heralded as sustainable in their historic context, by all participants because they followed all the principles of sustainable architecture stated earlier by them.

4.1.3 To what extent is vernacular architecture a sustainable practice for urban residential housing?

The key elements of local knowledge that account for sustainability in the environmental, economic and cultural context, make traditional vernacular architecture (TVA) applicable in the urban context.

One example of how traditional vernacular *principle* of using local re-usable material is applied to present day architectural practice (in terms of material use) was given by JNT. He used fly ash deposits from thermal power plants to design and manufacture concrete hollow building blocks, for a National level competition under the Ministry of Housing and Urban Poverty Alleviation. The technologies to implement this were locally available and used local labour.

The replication of TVA in the urban context is not necessarily sustainable in its entirety. Yet vernacular architecture, in its principles and philosophy is still sustainable and it can and should be applied in the urban context.

“...what used to be vernacular traditional is *sometimes* not even feasible anymore” (GDC), this seems to be mostly to do with materials or material-based-designs. For instance, a popular

architectural design used fire bricks made from clay from fields to build houses a couple of decades ago in Kerala (Radhakrishnan, 2017). Participants mentioned that this was indeed sustainable at that point in time, but today it does not make sense as they are no longer a sustainable option. The fields are unable to grow rice with the depleted levels of clay and laws are in place to ban extraction of clay from fields (GDC, VD). More examples are mentioned in the following sections, including other causal factors.

Thus, to answer the first RQ, vernacular architecture is synonymous with sustainable architecture in *principle*, rather than the entire practice.

4.2 Use of vernacular architecture in urban housing in India: revisiting the thresholds of vernacular architecture

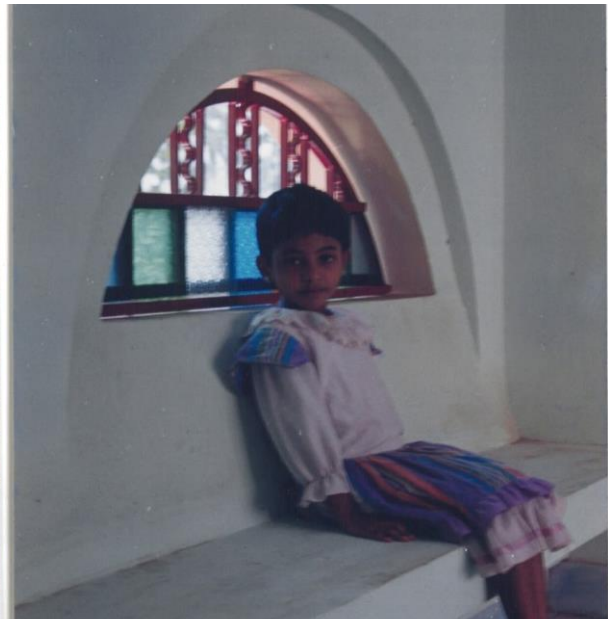
“I believe it is important for the building industry anywhere to adapt and adopt vernacular architecture to meet their needs as much as possible I mean taking - replicating it is not going help, you will have to understand why they did it and recreate in a more interesting manner because we can't have old buildings again” (JJA).

TVA practices have inspired the use of techniques and traditions in present day architecture (JNT, JJA, GDC). Below are example cases of VA applied in urban housing today. JJA talked about the use of jaalis (perforated stone/latticed screens) to allow diffused lighting and ventilation of cooler air; orientations from local traditional designs to effectively minimize heat gains; courtyards to ensure partially shaded spaces which also encouraged ventilation. Internal courtyards act as suction zones that make use of airflow patterns from around the house to ventilate, maintaining indoor environmental conditions (Rajapaksha, Nagai & Okumiya, 2003).



Left: dining hall arch with built-in brick diwan (rest platform by a pool) which cools the courtyard and house interior. Vent openings near ceiling above arch which allows warm air to escape as ventilation
 Right: rectangular courtyard in east-west direction. The rooms are built in north and south direction to minimise direct sunrays.

Figure 5. Photographs of passive techniques inspired from traditional vernacular architecture. (Shared by architect Joseph N Thomas, 2017).



Left: The kitchen used recycled ventilators (openings above doors in a dismantled traditional house found at scrap shop) kept horizontally to give maximum natural light and ventilation for the working platform, with a view to pool. This is passively cooled and lit the kitchen throughout the day.
 Right: Wherever possible, wood and steel furniture was minimised using built-in brick furniture.

Figure 6. Photographs of passive techniques inspired from traditional vernacular architecture. (Shared by architect Joseph N Thomas, 2017).

Architect JNT is currently involved in a remodeling project wherein he strives to provide utility value to redundant spaces in the house. For this purpose, he is using passive methods inspired from traditional VA: maximizing natural energies (sun, air) to achieve the desired indoor environment. The photographs below (Figure 5; Figure 6) show examples where JNT incorporated passive techniques, in a house in south India.

Some designs he mentioned included the planning of a courtyard to trap cold air, opening for natural light and air-vent in the roof of internal stair hall to improve air flows, thicker arched walls to tackle radiation from outdoor street areas, evaporative cooling from a built water court and recycling all the existing wood of internal areas for newer openings.

Many participants bring up examples where *elements* of traditional VA have been successfully incorporated in urban housing. While feasibility of VA use in urban context is evident, this is practiced by few architects in very pocketed regions of India. Mainstream architectural practices that persist often disregard principles of sustainable architecture. For instance, use of natural energies as mentioned above is often disregarded as indoor environment is more than often conditioned artificially. So, buildings are designed taking artificial indoor environment regulation as a given, rather than considering if the local climate can be utilized for the same purpose. This brings me to my second research question.

4.3 R.Q. 2: Factors influencing the Adoption of Vernacular Architecture in the Urban Context

This section uses the MLP-SPT analytical lens to discuss factors that participants stated as influencing the adoption of VA in the urban context of housing construction in India. The interviews were guided by the MLP-SPT framework which served to organize and identify patterns in the interview data. As mentioned in [Section 2.1](#), MLP looks at the role of factors such as “technology, policy, markets, consumer practices, cultural meaning and scientific knowledge...” in systemic changes that drive sustainable transitions. Role of actors (firms, industries, policy-makers, engineers etc) that sustain these systems are also explored in the overarching socio-technical landscape (Geels, 2011).

Using the additional lens of SPT allowed me to relate to broader sociological understanding of the meanings (images) and understandings around architectural practices in India. Rather than focusing on technologies/materials that could enhance sustainability in architectural practice, I looked at the architectural practice to understand practitioners’ roles in the architectural practice (Section 4.3.1)

and their skills in knowing how to contextualise VA in an urban residential building (Section 4.3.3). Social understandings around the practice like, what is perceived as a status symbol by society (house) and how it influences what a house symbolizes for a house-owner (Section 4.3.1), were uncovered. Additionally, normative behaviour and social pressures that surfaced in the architectural process such as the architect-client dynamic (Section 4.3.1) were determined. This was essential to derive the reasoning and agency in what and why actors of the architectural practice do what they do.

On analyzing the interviews, I distilled four broad factors. On further interpretation of the interviewees' responses through MLP-SPT, I linked the factors thus identified to the MLP-SPT lens, such as actors would play a role at the niche level highlighting the limited nevertheless, sustained SPT links. The factors are:

- actors involved in the building process (architect, client, building developer, consultant)
- education and values
- knowledge on how to contextualise VA in the urban context
- policy

The underlying drivers and motivations behind the kind of architectural practices employed are explored. In elaborating each of the above factors, I identified image/material/link and/or 'image-material-skill', links in them (if any) using the horizontal SPT lens, in addition to the factors' roles within the vertical lens of MLP, through the sustainable urban transition of VA adoption in urban housing in India.

4.3.1 Actors

Incorporating the idea of VA in the urban context requires the collective effort of several actors in the building process. In smaller projects, it is often the home-owner, the architect and the mason who influence the extent to which VA might be adopted. In larger projects, contractors, developers, various consultants (structural, plumbing, HVAC (Heating, Ventilation, Air Conditioning) etc) also come into the picture. The most prominent actors that were considered influential in the kind of architecture used were architects, clients and building developer/contractor. I shall individually take up how each of these actors influence the extent to which VA is adopted using examples.

Architects and clients:

Irrefutably, architects were said to have considerable influence when it came to implementing and facilitating this sustainable transition to adopting VA, but not without help. An architects' architectural liberty is largely dependent on and aided by their clients' awareness, strong enforcement of laws and active participation of the different stakeholders (building developer, residents, contractors, environmental designers, consultants) (JJA, JNT, NG, MS).

Often the best way one makes believers out of people is by example. In his ten years of practice, VD and his firm put to rest any doubts about using mud architecture in a tropical state like Kerala that was subject to a lot of rain. The Karan Grover Associates over three decades established themselves as a company that values sustainability above all and followed VA principles strictly.

“I try and do interesting work, each of my buildings are personal. I try and make them personal” (GDC).

GDC strongly looked at local materials (including waste and recycled material) and local construction methods in his architectural practice in Goa. He believes this can “... handle all the waste which is generated, and secondly, obviously to make it cheaper because those recycle materials is practically free...”. Use of local recycled materials reflects the principle of using raw construction materials from around the site/locale, a traditional VA principle. JNT also actively follows traditional VA *in principle* and uses passive techniques and recycled materials.

In each of these cases, they often had environmentally conscious clients who knew what they wanted and had seen previous projects/work that led them to approach the architect. As faithful practitioners of sustainable architecture, the architects use their work to inspire, create and establish an image that would bring about a shift in normative meanings that clients associated with the practice and its' product: house. Trust in architect and his value systems vis-à-vis sustainable architecture are crucial for the client to be open and amenable to different architectural designs. When values of architect and client are in sync, the meanings and symbols associated to the architectural process are the same. Therefore, the application of material and skill (e.g. use of mud and recycled material) is in tandem with the 'image'.

However, participants mentioned the client's veto power and lack of awareness and/or sensitivity to sustainability leaves the architect with little leverage in keeping with the VA principles. On the other hand, it was said that the client cannot be blamed for wanting to invest in his 'dream house' image

within his budget and timeframe (VD). While costs and aesthetic appeal are often the two things clients value the most, architects have the onus of pushing forward the sustainability agenda combining functionality, aesthetic appeal within client budget (9). Low budget clients generally look for pocket-friendly options and incrementality i.e. ability to add on spaces for the future according to need and available finance. Often stringent on space use, verandahs, balconies etc are minimized if not avoided. High budget clients desire lot of semi-outdoor areas like verandahs, private terraces, a pantry to the kitchen, some utility space, a car-porch. So, when building for the affluent, he/she is not interested in the sustainability aspect; rather the architect's style is what interests him. Lack of sync in the concept of functionality and aesthetics due to priority differences, lead to clash in 'images' between the architect and client, affecting the 'material' and 'skill' used in the deciding space use. For instance, the client's desire to imitate Singapore's glass structures, would overshadow the architect's knowledge that it makes for an unhealthy indoor environment. Clients, regardless of their monetary capacity, view the house as a status-symbol (*image* and *meaning* they relate to house) and want the best out of their time and money. This is what defines the mainstream architecture (regime level) that does not prioritise sustainability in the environmental context.

Often a lot of good architecture "has to do with good clients". By "good clients", participants brought up aspects of general awareness, principles and values (economic benefit and speedy construction unhelpful in the long run), demystifying preconceived notions about what a sustainable building is, e.g. it is not 'green' if solar panels are used instead of designing the building to use natural sunlight to provide light in your room. Having 'good' clients makes it easier for architect-client relationship to collaborate over image-material-skill to use VA without having to validate the choice and convince the client, given they both are on the same page. This is valuable to allow for the niche to gain traction in the regime level.

There is a disconnect between architects who practice VA and those following conventional mainstream practices.

"That disconnect is born out of a major part of our society still not realizing the need and the positive long-term impacts of sustainable architecture. Immediate requirements put forward by clients have overshadowed long term green benefits." (JNT).

This is where architects lose ground and give into client demands. But architects and architectural firms that imbibe sustainability at the core of their practice, create and establish a name for themselves in the industry through their projects. Most architects I interviewed showed a deep sense of responsibility in keeping with the tradition of sustainability. Having avoided mainstream

construction and trends, the few architects practicing VA isolate themselves and their practices to few clients, understandably not expanding beyond their career requirements. However, in doing this they restrict themselves to a select, often environment conscious, clientele who are inspired by the architect's style. This way, VA practice does not transcend to a larger scale (regime), self-limiting itself to the niche level. While this is a sign that the niche flourishes in a 'buffered' zone (Section 2.1), measures have to be taken to accelerate and deepen the practice adoption and recruit new and convert present practitioners of it.

An important aspect of architects' alienating their designs from the materials that would be used in their building design, was brought up (VD). This disconnect between what is happening on the drawing board and what is happening on the site, separates the building process into two and with that, architects lost the power they held over the actual building design. Thus, the 'image' that the architect has in his design of a building, is not translated into appropriate 'material' use, thereby breaking the image-material link. Occupational division of labour in India emanating from the "hallmarks of modern society", led to the separation of design of a product from its making (Lang, 2002; Nair, 2006; Daniel, 2017). For this very reason, a greater degree of responsiveness from other stakeholders to sustainable architectural input is essential in making things easier for architects wanting to implement VA (7).

Building Developer

In big projects like high-rise residential complexes, the building developer is influential in deciding the trajectory of the building process. Largely conservative, building developers often look for a common denominator, not wanting to change or try new things (GDC). This inertia to change, impacts the image-material-skill link, deterring adoption of the niche by a potential practitioner thus delaying the transition into regime. Should they try something along the lines of VA, they sometimes overcharge for low-cost sustainable building in the name of creativity (GDC). For building developers, purpose, time, cost and profit define their motivations, actions and thus the social norm of the architectural practice. Often skeptical of new techniques and materials, developers push architects to use architectural methods that are fast and cheap (GDC).

Other actors

In bigger projects, numerous consultants specialized in environmental, structural, energy, electrical and plumbing elements of the building come into play (6). The architect is pivotal to integrating client

requirements and inputs from the various consultants with his own architectural principles (JA). The interaction between these three actors are crucial in ensuring a more holistic building process.

Since VA is still something of a rarity in practice today, hesitation or aversion to build a residential complex or one's house using VA, leaves masons to look for other opportunities. It is often difficult to find skilled labour as there is not as much demand of such practices.

However, GDC found that most of the masons were more than happy to be working in a creative building using alternative methods. It was a welcome change from their usual job of doing "thousands of cubic meters of brick work which is then plastered over. He also believed that people were easily trained and often fast to pick up. It was merely a matter of inspiring.

This reinforces VD's point that "beauty has to be respected at all times – especially at a time when resources are so less." To get the licence to marry science and art in architecture, one has to inspire the client and builder. "Inspire by the virtue of acting - of doing it; not inspire by words – it doesn't mean anything" (VD). I recognize this as a *skill* that architects through their practice can use to change the *image* and *associated meanings* that clients have with respect to architecture and its role in a building, thereby defining the kind of architecture they choose to have for their homes.

Another means of influence was to empirically illustrate benefits of VA. I interviewed a sustainability consultant, whose job entails quantifying sustainability by analysing buildings for architects and builders with the focus on giving design principles or guiding projects through sustainable design.

"There are architects...doing good designs and their good designs are sensible, but they never knew how to measure it or how to quantify... in terms of measuring sustainability" (9).

To address this issue, the consultant provides support during construction and operation period. Furthermore, post-occupancy evaluations are carried out to calculate building performance in terms of the resource consumption, indoor health and well-being. "Talking about energy and efficiency, you may design building which is green or sustainable, but if it is not operated in that manner, it may be highly resource intensive (during operations)".

The consultant thus broke the silos in which architects and engineers tend to work providing a means to measure sustainability. This has enhanced awareness of the rationale and environmental-health benefits of using sustainable architectural design amongst clients, architects and developers. Thus, by creating an image that actors in the housing industry associate with vernacular architecture

through empirical evidence, presents potential to recruit more practitioners into the practice. However, this ties into conversion of buildings into a formula discussed in [Section 4.3.4](#).

The above findings reflect the role of actors in and their influence on image-material-skill elemental links. It is evident how individual values, principles and norms and relationships between actors define SPT elements (image, material, skill) and their links. If the knowledge and value systems of the practitioners and clientele support the application of VA, it would facilitate its adoption by the regime.

4.3.2 Education and Values

Education and values came up several times (mentioned earlier as well) in that it was important in informing people's actions that are defined by the *images* they have and meanings they associate to building, architecture and sustainability.

(7) exhorts two main institutions that fundamentally frame our school of thought and cultivate values: family and school. Instructional teaching in architectural schools do not encourage innovation and curiosity (7), something essential for a domestic profession such as architecture which is constantly evolving both temporally and spatially. Participants in general said that there was never any special focus on sustainability during their time as a student, as architectural principles in their logic and rationale are sustainable by default. They do admit that one's personal philosophy and proclivity decides the kind of architecture one adopts and whether sustainability then becomes an add-on. Many architects like VD, GDC have gone one to establish architectural firms where they work strictly on projects that allow them to design local, sustainable, climate responsive buildings to the extent possible and avoid clients who are insensitive to sustainability.

It was interesting to note that most participants did not feel the need to incorporate sustainability in architectural syllabi, because it forces a distinction where there should not be one. However, the need to instill the spirit was recommended to have a positive, long-lasting impact, without differentiating between sustainable architecture separate from architectural practices. "...getting sustainability as an integrated part of design right from the beginning" (8)

Companies and institutions striving to bring about major curriculum interventions were mentioned:

- smart room design-studio exchanges with universities abroad in the field of climate change and sustainable architecture.

- students given the opportunity to work on design questions based on live scenarios abroad, coupled with design discussions with sustainability and climate change experts.
- including evolution and study of traditional vernacular architecture and its planning principles in syllabi to better comprehend the motivation of change in principle and practice; instilling importance of productive means of engaging with the dynamism in the field by accounting for changes (in lifestyles, outlooks, technology and moral values) that emerge and impact the kind of houses/residential complexes designed (7). This ties into Section 4.3.3, where grasping this dynamism gives cues in how one can contextualise VA to urban housing.

Values

A skewed notion of sustainability is prevalent in today's architecture and construction industry tarnishing the image of VA's potential in sustainable urban housing (6,7). There is a drive for making things energy efficient and "green" whilst using energy intensive resources or incorporating efficiency after the building is built; when one can employ certain principles, techniques and strategies during the design stage that will ensure this in the first place. This is where VA steps in. Most architects stated that there is a lot to learn from VA in terms of material-skill that be incorporated in urban housing in India; such as prioritizing good design over normative consumption and unprecedented resource use.

"There is a need not only from architectural point of view, but also to be sustainable in the way of life...entire lifestyle because in the end, it's about a mindset change, which also affects the kind of architecture that you will be built" (7).

However, the use of this knowledge on material-skill is restrained by the prevailing images. Foreign imagery brought in through social media, travel and the internet has mobilized new lifestyles and aspirations influenced by western culture (7, 5). "These aspirations easily leave behind any sustainable design criteria, lapping up to the imagery without questioning whether it is apt for the culture, climate and environment" (7).

"Lot of money is actually pumped into creating an image through which you can assert that your identity is as contemporary as that of the developed countries. So...you have an appropriation of an image which belongs to those developed countries...you can't dissociate what things people do from what their desires or aspirations are" (7).

E.g. With this need to have a standardized managed indoor environment, HVAC was born and today HVAC industries have created an entire market industry for a specified 'indoor global climate' (Elworthy & Holder). Most buildings in Kerala today incorporate air-conditioning systems as part of their base plan design rather than as an add-on feature (JJA), despite the fact that architectural design can be used to maintain indoor temperature.

Thus, structures and buildings housing exuberant lifestyles thrived on consumption intensive practices were constructed disregarding existing natural topography, climate and the socio-cultural past or present. With this, sustainability was no longer a priority (VD).

Thus, mainstream architectural practice is formed through image appropriation brought about by extrinsic factors. This also defines the practice motivation that is aided by the landscape's infrastructural backdrop (construction market and economy, social and political values and beliefs) which is reinforced by the incumbent systems (mainstream architecture practices, regulations reinforcing the regime practices). This hinders the VA adoption.

Dialogue

A consolidative conversation has in the past, helped establish the what, how and why of the architectural practice to be adopted including the specific building designs, materials used and benefits of using them (GDC, 5). Often, architects use this time to understand client requirements, the building footprint and what can be done to minimize it (5). In many cases, they were able to convince or urge clients to opt for choices/designs that are more sensible. It is possible to retain the purpose of a client requirement and at the same time reduce energy and resource use by opting for suggestions conducive to being environment friendly.

One architect mentioned how a client wanted a media room in their house and it was then suggested that they have an open outdoor space that could be converted into a media room by setting up the projector. This way, they maximized the use of space while still using the open space to ventilate the indoor environment. Such interventions in design decisions go a long way in reducing the footprint (5), while still retaining the *image* of the space the client had in mind.

(7) recommends the client and architect engage in a productive discussion to create the "cultural unit", the building. It is up to the architect to balance the 'power dynamic' and dissolve any hierarchical differences to engage the client into a two-way conversation rather than opposition of instruction. This in turn will help reason out, influence and negotiate with the client's understanding,

perceptions and thus choices (7, 5, JNT); illustrating how image formed through conversation defines the kind of material-skill practice implemented.

4.3.3 Knowledge on how to contextualise traditional vernacular architecture in the urban context

Participants cited the importance of incorporating elements of TVA correctly in context of the specific project in terms of building design, materials and techniques. As application of TVA in the urban context is often by trial and error, replication of it without accounting for the change in context is common.

The principle of using replenish-able and locally available materials in traditional architecture is something VD advocates. He actively practices mud architecture in Kerala where mud is easily accessible. However, one must not confuse local with natural. Use of local building materials in TVA meant natural materials because it was at a time where natural resources such as clay, earth, etc were locally available and easily accessible. One cannot expect the same in a city today. Taking cognizance of this, VD's firm has constantly been changing the materials and techniques used in their architectural practice.

“techniques have to change...In the span of 8 years of my work, our techniques are changing. Now we are using waste materials – because there is a lot of construction waste lying around.”

(7) takes an example of TVA gone wrong in urban setting due to its replication rather than contextualisation. Traditional residential form of Maratha architecture in India, Wada, predominantly used wood logs in their building practice. Today, Wada architecture is reproduced in its concrete archetype using too many energy and building resources.

The competence to translate knowledge of local TVA into the present-day context comes with a certain commitment from the actors in the building process to retain the principles of sustainability in the practice. The climatic and cultural conditions that gave rise to the specific strategies of orientation, built form and material use, must be apprehended to distill and adopt the principles applicable to current day urban setting – the ‘why’ and not just the ‘how’ (JJA, 7). Studying the local VA gives cues to the kind of building design and materials that could and should be adopted in the present-day context (JJA, 7). In addition, it will help better comprehend the architectural features and building elements which facilitate the kind of social interactions and lifestyles people follow (5,

JNT). This will ensure the cultural specificity of the architectural designing is retained, a crucial aspect of architectural sustainability especially in housing (7, JNT). Focusing on technical requirements alone and rejecting sociological factors weakens socio-technical sustainability (Chappells & Shove,2005; Herring & Roy,2000) that trickles into the landscape level. Architecture is instrumental in sustaining the social interactions and ‘associated ways of life’ within and in between houses (Chappells & Shove, 2005).

However, often there is no critical engagement with what will be the logical transformation of a building type for the contemporary kind of architectural situations (7). Lack of research in the field also contributes to reduced knowledge on how to go about the practice. This goes on to show how competence and skill (SPT elements) are essential to facilitate the effective translation of TVA in the urban context. The uncertainty, lack of information exchange and dialogue, misinform or create ignorance thus impacting the *image* associated with VA. This must be overcome if VA is to break the conventional architectural practice by creating a new *image-skill* link.

One aspect of knowledge and skill also comes from studying societal changes to be able to appropriately modify and incorporate elements of TVA while simultaneously catering to the changing cultural practices of people in terms of their lifestyles and different standards of living.



Figure 7. Neighbourhood duplex incorporating internal courtyard inspired from TVA. Reprinted from <http://adhiraj.co.in/samyama/project-status/> (2015).

E.g: Traditional Muslim architecture built majalis (big internal courtyards) for the women of the house, as they were not allowed to go out. The courtyards served as leisure grounds where they could have social interaction. Today, this TVA design serves a different purpose and is being used as a place for recreation and social interaction in apartment systems. In a high-rise residential project, a 'neighborhood duplex' was incorporated wherein every five-storeys, the building was turned around (Figure 7) so that courtyards get formed (6). Instead of having one tall building of 55 storeys, they broke it into five-storey clusters, so people of five clusters could come and interact with each other in the internal courtyard. This is an example of TVA being incorporated in high rise structures.

This, undeniably, does not come without trade-offs. Several aspects came up that are worthy of discussion:

Building townships projects or residential complexes, especially in high-density cities have reduced flexibility in terms of availability and access to resources, how much you can build on an area/floor space, maximum utilitarian value in limited space and amenability of developers to the kind of architectural design being adopted.

Choice of building materials in such a dense urban city is restricted to steel (requires greater workmanship) and concrete which is cheaper and easier to procure. One has more leeway in the design elements e.g. number of openings, use of double glazed windows to reduce the impact of heat. Hence, introduction of novel idea of internal courtyard. This project (Figure 7) demanded a large number of consultants (for every field: energy, environmental regulation fulfillment, landscape, elevators and traffic) and overshot the estimated time and costs (with increased labour, material costs, each slab taking three weeks rather than one). With developers no longer supportive of the design, it was demanded the rest of the project buildings be made using a cheaper design.

However, it was stated that regulation and government aid could encourage certain building design principles of VA which would give scope to accelerate the transition from niche to regime.

4.3.4 Policy

Rules and regulations

There is a reasonably wide berth in the regulatory policies within the construction industry. At the same time, urban cities need policies that will enable directorial reconfiguration of mainstream

construction practices, to adapt to the burgeoning population growth and needs in a sustainable manner.

“I think the policy and structure has a huge role to play for sustainable designing. Because at the end of the day, everyone can have the will to change but unless there is a policy in place, no one is actually doing it...without the political will, we are finding it very hard to kind of push for things that we know are sustainable.” (9).

Some regulatory measures mentioned could be imposed more stringently to achieve desired results and participants gave examples. The Development Control Regulation (DCR), a legal mandate produced during the city developmental planning, can state guidelines to enforce sustainable building process but it is not strictly followed despite the requirement (9). Some cities also have an urban design guideline, which not everyone has but was highly recommended. However, “not all city governments make them mandatory and is something that the government kind of chooses to do” (9).

Political support and strict enforcement of sustainable architecture was considered an imperative by most participants to enable this sustainable transition of adoption of TVA in principle. This would also mandate the demand of the knowledge and skill essential to promote and reinforce the VA practice.

Green Building Certifications

In an effort to promote environmentally conscious buildings, green building schemes promote environmentally conscious buildings assigning criteria for good building design and performance; e.g. water efficiency, energy and atmosphere, materials resources, indoor environmental quality are parameters the international LEED (Leadership in Energy and Environmental Design) certification uses (Potbhare, Syal, Arif, Khalfan & Egbu, 2009). However, these often stem from foreign certifications and strive to ‘learn from the experience of leading countries’.

In asking participants’ take on its role in bring in sustainability to the forefront of architectural practice, most were quite skeptical and felt that there are too many certifications today (LEED, GRIHA, BREEAM). While some acknowledge it as a means to induce the ‘sustainability line of thought’ in housing construction, others reject it as a checklist for brownie points that are sought for reasons of economic gain or branding.

“if I know that if I make a green building and I will earn brownie points and then I can sell my building in the larger kind of market through those brownie points, I start making a building which is actually unsustainable.” (7).

Participants argue that clients today are bombarded with numerous certifications of varying levels. With no proper knowledge or guidance, clients often do not know what is most appropriate. Additionally, the economic gains of a green rated system, incentivizes the practice for the wrong reasons. However, (8) points out that second time clients do it for the environmental benefits and the added value they personally experience of having such building design. E.g. corporates building residential buildings for their employees ensure sustainability is integrated with the architectural design process. Additionally, in running and operating the building, the benefit is further realized, increasing the incentive to use VA. This contributes to the reinforcement of the SPT image-material-skill link, wherein the practice is repeated due to the benefits experienced which in turn associates the image of healthy living to a house designed using VA.

“the pursuit of (building) codes is that to streamline processes and so these codes are framed in a language, which is a highly abstract and this abstraction causes or leads to a lot of generic interpretation and that generic interpretation leads to...often incorrectly using the material in different contexts, which does not have cultural specificity and that way the culture is erased and it is not logically carried forward into the building. People...make blank façade and then plant trees on it ...that’s not green, that’s not sustainable.” (7)

Most of the funding comes from large corporations that are aware of where raw materials come from. This nexus they thrive on, is reason for which, they dare not disrupt it. In controlling the whole machinery of green building, attitudes and consumption behaviours stem from the intricate interlink in which religious, social, cultural values are embedded in the ideas of sustainability (7). Thus, the green building regimes hijack the niche deviating from true concept of sustainability.

“Laws and codes often take the life out of this living organism called building...green building principles often dissociate the green building practices from their cultural and social counterparts...a very downgraded idea of green buildings. There is a cultural specificity of sustainability, which is at the risk of being lost out in the obsessive indulgence in the making of these codes.” (7)

The question is whether we need such certifications. Branding environmental sustainability as a separate field creates a false image of sustainability that serves to widen the gap of between

sustainability and architecture, when in fact sustainability should be an inherent feature of architecture. It is noteworthy that architects actively practicing sustainable architecture were uninterested in such certifications and did not feel the need to get certified as their practice was inherently sustainable.

A summary of this section, factors that enable and inhibit the adoption of vernacular architecture in the urban housing context in India are tabulated on the next page.

Table 1: Enablers and inhibitors – factors that influence adoption of VA in the urban housing context in India (Created by author, 2017).

R.Q. 2: Factors Influencing the Adoption of TVA in the Urban Context			
Key Factors		Enablers	Inhibitors
Actors (to gain skill)	Architect	Architect's ability to inspire clients through his/her work	Reduced flexibility due to lack of space and availability and access to resources in high density cities
		Deep sense of responsibility towards sustainability	Disconnect between VA practitioners and mainstream architects
		Knowledge and creativity to contextualise TVA in the urban context	Alienation of building design from building materials
		Architect's work and sustainability values gains client trust	
	Client	Sensitivity to sustainability	Veto power from lack of awareness or sensitivity
		Client awareness of positive long term impacts of VA	Monetary capacity
		Client willingness towards adoption of VA	Time constraints
	Building Developer		Desire for home as status symbol for wealth matching prevalent societal norms
			Skepticism to new techniques and materials
			Inertia to experiment with new materials and techniques
Consultant (structural, HVAC (Heating Ventilation Air-Conditioning), electrical etc)		Profit motivated	
	Quantifying sustainability of a building		
	Empirically illustrating VA benefits		
Education and Values (to create image)		Instilling environmental values through family and school	Foreign imagery influences the meanings and symbols that are associated with architecture in housing; thus impacting images formed → architecture
		Exchanges in the fields of CC in the context of sustainable architecture with architectural universities abroad	
Knowledge on how to contextualise TVA in the urban context (to facilitate skill)		Contextualise TVA appropriately in urban context accounting for new purposes of building elements and social values	No predefined standards (Application of TVA in urban context is by trial and error)
			Lack of requisite knowledge to tailor TVA to new circumstances e.g. Confusing local with natural materials
			Lack of research, information exchange impacting image of VA
Policy (to aid and reinforce image-material-skill link)		Mandate the current voluntary regulatory guidelines for sustainable building process	Lack of clarity and standardisation in regulatory policies
		Green Building Certifications encourages focus on environmental friendly architecture	Lack of awareness of policies amongst client
			Green Building Certifications convert building sustainability into a formula that leads to arbitrary application of 'sustainable architecture'

Important inferences:

The findings to R.Q. 2, gave rise to the following inferences:

Firstly, architecture is as much of an evolving concept, as is sustainability. With time and changing definition of sustainability, architecture must evolve, catering to the new and emerging circumstances and context. VA is synonymous with sustainable architectural in *principle* in that they retain environmental, economic and cultural sustainability (Participants, 2017; Chappells & Shove, 2005). Therefore, one cannot blindly replicate TVA in present-day urban housing in India, but apply it in principle to the urban context.

Secondly, the underlying tone in the interviews pointed to the need to look beyond architecture and design efficiency. Architecture alone cannot imbibe sustainability; inculcating the sustainable philosophy in one's lifestyles will go a long in reducing consumption, distinguishing want (desire: aspirational consumption) from need (basic necessities) as that affects the built form in the architecture used. More than often, people tend to make a building and then bring in the sustainability lens, trying to incorporate features of it such as energy efficiency and high building performance, when in truth, that should be taken into consideration in the first place. Putting an air-conditioner and then making it energy efficient is validating something that is not required; the purpose of which, could have been facilitated through design (6).

4.4 R.Q. 3: Strategies to enable adoption of VA in urban housing in India

Having identified influential factors and their role in *the image-material-skill* link of a practice that aids/hinders the adoption of VA in the vertical levels of its establishment, I suggest strategies which when brought to practice, will enable conditions that correspond with the causal mechanisms that could and should be activated to adopt VA in urban housing.

To strengthen the link between meaning, material, skill that SPT advocates to establish a practice and mainstream to the regime level, images (associated meanings informed from education, values, awareness) and skill (competence to translate TVA into VA in the urban context) were the two most prominent factors that surfaced in the findings of R.Q.2 (Table 1).

Based on the two prominent factors from R.Q. 2 findings, images and skill (Table 1), I identified key intervention points as seen at the regime-practice intersection of the MLP-SPT framework (Figure 8), and thereafter I drew inferences.

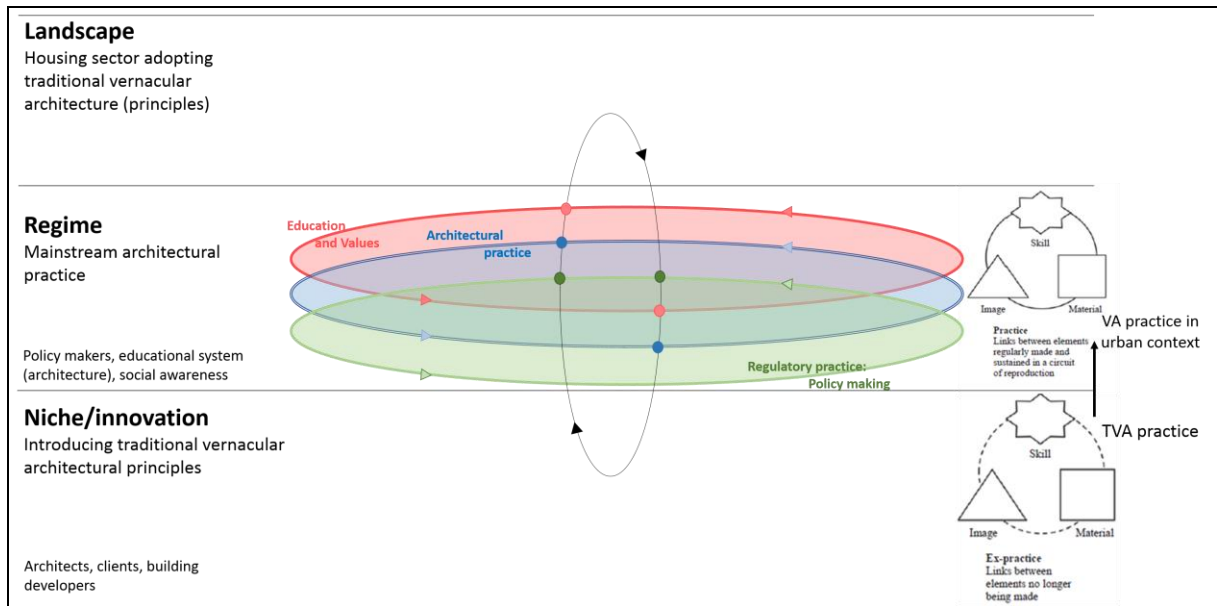


Figure 8: Intersecting regimes and practices in sustainable architecture. Adapted from Hargreaves, Longhurst & Seyfang (2013).

- (1) Education and Values: to create *images* (view sustainability as intrinsic to architecture)
- (2) Architectural practice: to gain *skill* (through knowledge creation and information sharing)
- (3) Regulatory policy making: to reinforce the image-skill-material link (support the above two aspects and push the social practice of VA to the regime level)

- ❖ The focus on *material* in VA practice, comes from knowledge, openness and creativity on the part of the architect and client e.g. using recycling building material
- ❖ Education and policy-making are the most influential social practices within and independent of the social practice of architecture. The three interact and influence one another.

Following, are some initiatives that would facilitate VA to percolate through the system (and the three MLP levels) to bring in deeper structural changes through change in value system and mindset in the architectural context:

- (1) Education and Values

Future architects must imbibe sustainability in their practice without treating it as an add-on feature. Giving students of architecture an opportunity to talk to architects practicing VA will help instill the

spirit of sustainability and expose students to real-life examples of TVA translated to contemporary practices and techniques of the design within the urban context. This will help them acknowledge that the building is a living thing in a changing environment and the building process should be one which is fluid, with a context in transition. Sustainability should be incorporated accounting for changing conditions. Architectural firms could facilitate this by encouraging their employees to take training workshops and teach in schools.

Educating the sales team for builders and architectural firms about sustainable architecture on what sustainable building (materials, design and associated lifestyle) is about and its benefits: operational costs, health, productivity and happiness, would facilitate channelizing a client into sustainable thought process right at the initial stage. Additionally, prospective clients could be given the feel of a sustainably built house using elements of TVA through sample housing, where come in and they experience a TVA-built house in urban setting (to incentivize pro-sustainable architecture behaviour). They could also be acquainted with similar projects done in and outside the country to show how the practice of TVA is implemented and its benefits.

(2) Architectural practice

Social media such as bloggers talking about green buildings would perhaps give sustainable architecture an 'in' flavor.

Additionally, an online one-stop shop for architects, engineers and designers who have a sustainability portfolio would foster a network amongst the likeminded. Fairconditioning, a non-profit programme, Mumbai aims to launch such an online platform to enable information and idea exchange (Personal communication, 2017). It would build collaboration thus enhancing sustained sustainability. This would also encourage mainstream architects to engage and interact with people in the field of TVA and stimulate adoption of the practice. Practices recruit practitioners, when practices are reproduced – it influences more carriers transcending into a regime level (Spurling, McMeekin, Shove, Southerton, Welch, 2013).

(3) Policy

In line with Spurling, McMeekin, Shove, Southerton & Welch's (2013), using practices as a tool for policy intervention will aid VA adoption in urban housing. Our choice is not free from a certain degree of tokenism. Freedom in performing a practice is governed by factors such as our capacity and access to economic, social, cultural resources, normative social behaviour and interaction,

workings of associated establishments and institutions in place (Spurling, McMeekin, Shove, Southerton & Welch, 2013). Thus, in attempting to shift away from unsustainable practices, one must incentivize pro-environmental behavior through policy to complement the understanding of why people do what they do (Table 1).

Building on the strategies mentioned above in practice of education and architecture, some policy interventions that could endorse VA use are mentioned.

To provide the niche (VA) protection during its development within existing regime of architectural practices (Rotmans & Loorbach, 2009), I propose:

Strong political will to reframe the problem of sustainable architecture. Current policies advocate and emphasise on energy efficiency and eco-friendly material post construction (Kataria & Pathak, 2013). Instead of focusing on turning everything built and manufactured energy-efficient and eco-friendly, steps must be taken to do things right in the first place: use sensible designs, practice wise-resource management and make use of the local natural and social context: in essence adopting vernacular architectural principles (RQ 1).

Dominant industries (construction and building industry) possess assets (resources, competence, network, technology and experience) that reinforce their power and position in the regime, leaving no room for new opportunities (niche:VA) to develop. Instead of restricting these incumbent industries with regulatory power which they might get around, policy makers and the government must aid, incentivize and encourage their involvement in 'breaking the practice norm' and making a new one. Their assets will allow increased support to the new practice, accelerating the sustainable transition. To propose concrete measures, calls for further research opportunities wherein comprehensive documentation and exhaustive study of the laws and standards of building industry in place are conducted.

The government should create a database for architects and clients that rates contractors and vendors who employ sustainable architecture, enabling greater transparency in the kind of architectural practices adopted.

5 Discussion and Reflection

The thesis situates itself in the sustainability debate by identifying what would influence and facilitate the adoption of vernacular architecture into the urban context of housing in India, thereby advancing the course of sustainability within the construction industry. Rather than looking at ways to reduce the construction industry's footprint, I picked up an established practice that holds the construction industry together: architectural practice; to serve as leverage in steering the desired sustainability transition.

Taking a step further from the analysis of the findings (Section 4), I discuss here how MLP-SPT analytical framework proved useful and relevant in answering my RQs. I used my interviews to walk me through influential factors, actors, their social relations, implications and the processes that form a part of the architectural practice. Following this, the interview data was organized within the image-material-skill context (SPT) identifying its intersection within the three vertical analytical levels of MLP. Creation process of an architectural practice, its reinforcement and establishment links were recognized and positioned in the MLP (niche, regime, landscape). Therefore, the different practices within the architectural process: client-architect discussion, design process and implementation of the design, overlap and impact one another as seen in the examples of [Section 4.3](#). In apprehending how the practices form, change and engage with one another, the SPT lens of the MLP-SPT framework gave an additional insight into the sustainability challenge at hand. In reflection, this reframing of the problem, from a direct problem-solving approach to one that identifies the root cause(s) within the practice creation, reinforcement and establishment has allowed me to understand what makes or breaks a practice in the architectural context. This was useful in formulating solution strategies to fasten this slow, almost stagnant transition.

My thesis contributes to sustainability science, in taking a strong sustainability approach, to address the root cause within the construction industry that aggravates climate change rather than resorting to technological quick-fixes (Robinson, 2004). Recognizing the role of sustainable architectural practice in reducing construction industry's footprint, the integrative approach in sustainability science helped guide my thesis to acknowledge the social constructions around architecture; that are instrumental in bringing the required systemic-institutional changes (Robinson, 2004). The heuristic MLP-SPT framework explained how solution strategies through social practices of education and policy regulation, intersect and interact with one another within the larger social practice of architecture. Thus, in the capacities of the social relations within the architectural practice together

with institutional drivers of education and policy, lie the potential to bring in the required change in *image-material-skill* elemental to turn a niche practice (VA) to a regime one.

Some reflective thoughts that surfaced:

VA maybe misinterpreted as a discourse similar to that of a green building certification (Section 4.3.4) and the thesis may be challenged for advocating another 'going green' scheme. This is not the intention. In reviving TVA, I strive to highlight its potential to be applied in the current urban context, retaining the principles of sustainability it held in the era it was practiced in, translated appropriately to present day context. I also restate that this thesis clearly points to the environmental, social, economic imperative of imbuing sustainability at the core of the architectural practice. This is not without acknowledging that one cannot reject present day material and technology, e.g. concrete/air-conditioning: in certain circumstances, it is impossible to build without concrete in an urban setting. Rather, it makes more sense to find a way to build sustainably *with* concrete. This validates the thesis focus on architectural principles rather than building design or materials which are circumstantial.

6 Conclusion

As explained in the thesis introduction, architecture plays an important role in defining the extent of resource and energy intensive practices throughout the building process. Considering the sustainability imperative of the housing construction industry to reduce its environmental footprint, I explored the adoption of vernacular architecture in urban housing in India. Residential buildings are the physical illustration of the evolving relationships between the interior and exterior environments of the building. By recognizing and realizing these “complex interrelations among the different environmental spaces we inhabit”, significant factors and practices that revolve around it, we address how the building impacts the environment (Elworthy & Holder, 1997). Thus, I used the lens of the MLP-SPT framework, the thesis used interviews to inform the research of the feasibility (RQ1), influential factors (RQ2) and potential points of intervention to aid the adoption of TVA in the urban housing context in India (RQ3).

My findings illustrate through examples that traditional vernacular architecture *principles*, in its application to the current-day context, present the potential to reduce the construction industry’s footprint (R.Q.1). This is because VA requires architecture to account for local climate, use local resources and cater to changing social and cultural needs of a building; following the basic principles of sustainable architecture ([Section 4.1.1](#)).

Having established that sustainable buildings can be built through application of VA principles, I gleaned the factors that influence VA adoption in urban housing (R.Q. 2) to draw out the main points of intervention. These factors included different elements of the architectural practice (actors, their knowledge, awareness, social interactions/relationship dynamics) and the knowledge to contextualise VA. Additionally, fundamental institutions of education and policy were brought up as instrumental in facilitating and aiding the adoption of VA.

R.Q.3 findings indicate that vernacular architecture can be applied to urban housing in India by reconfiguring the architectural practice to imbibe sustainability at its core, inculcating sustainability values through fundamental institution of education and strong political will to support the sustainable urban transition. Education will help inform the sustainability rationale behind the kind of architecture practice (VA vs mainstream) adopted, while political support will facilitate the dissolution of the incumbent regime to allow the niche VA to develop. Strategies within the social practice of education, architecture and policy-making ([Section 4.3](#)) were proposed. These were

recommended based on my understanding of the architectural practice through its practitioners (R.Q.2), that would enable the sustainable transition of VA adoption into mainstream architectural practices.

Vernacular architectural *principles* offer a strong foundation to bring in and mainstream sustainability into the construction industry, achieving OECD's objectives for a sustainable building to a large extent if not fully (John, Clements-Croome & Jeronimidis, 2005). The regional variety of vernacular architecture stems from the same principles of sustainable architecture which can then be contextualised in the urban context. In understanding the 'triangular relationship of society, architecture and the physical context' (Desai, 2010), vernacular architecture has established its inherent sustainable quality which, as this thesis exhorts can and should be imbibed in the urban Indian context (Crespo, Barrera & Ramos, 2015).

Future Research and Opportunities

This thesis helped identify intervention points at large, showing examples from different parts of India. However, the regional variability of VA would bring variations and new aspects depending on the social, economic, physical context. Future research would benefit from more comprehensive and exhaustive analysis of a wider research sample and incorporating the regional variability of TVA of the many states with varied culture, traditions, socio-economic influences and state-government agendas. I would recommend an in-depth regional study to ensure a holistic understanding of the nuances to enable a useful contribution to region-specific building industries.

As my thesis provides validation and reiteration of the feasibility, viability and benefits of returning to the roots of man's creation of home, it serves as an information tank for architectural firms to draw on the different points of intervention to facilitate TVA adoption.

During the research analysis, I identified the scope of a non-profit organization, to utilize my thesis findings that overlap with their objectives. They seek to understand the norms of the building practice, motivational behaviour and capacities of different social groups to reduce artificial technological solutions in indoor temperature regulation. They intend to draw content from this thesis for their training programmes and roundtable sessions with engineers and architects as well as upcoming media of influence, such as interactive platforms and blogs - of the people - by the people - for the people involved in the world of buildings.

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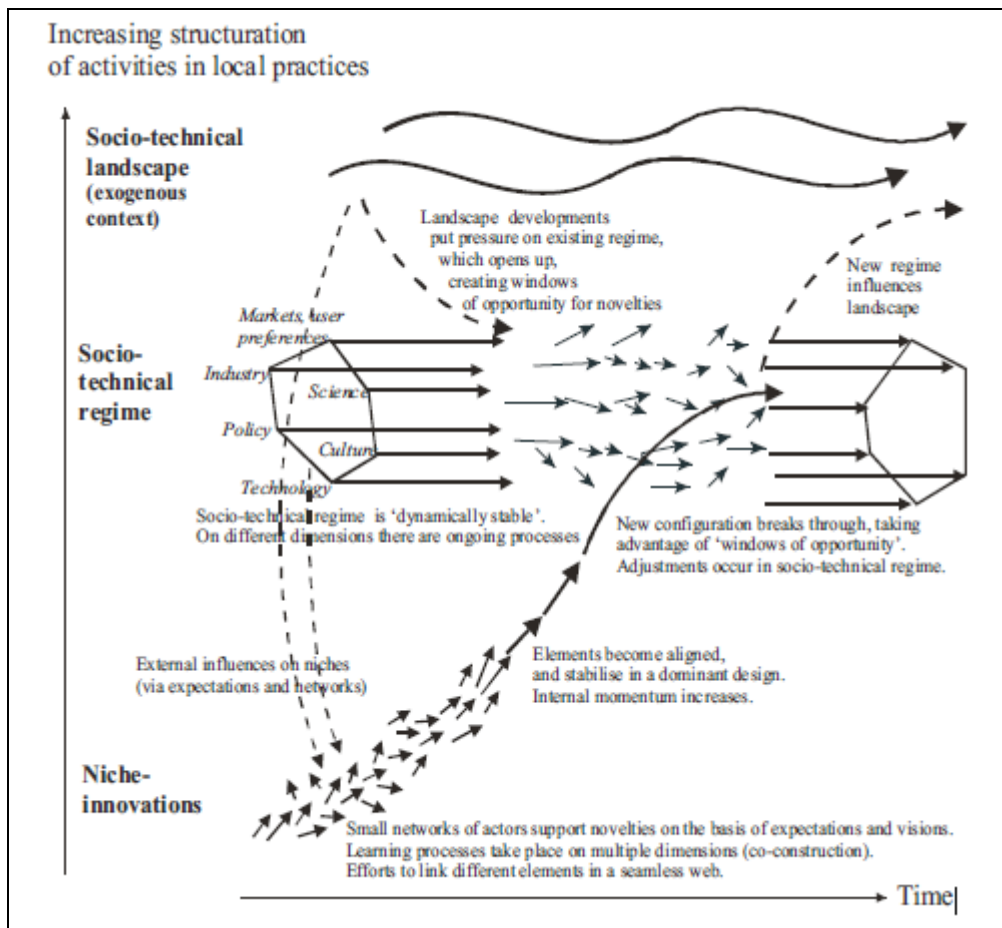
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8 Appendices

Appendix I: Alignment of ongoing processes in a socio-technical regime.



Appendix I. Alignment of ongoing processes in a socio-technical regime (transition theory using MLP framework). Adapted from Geels (2004:912).

Appendix II: List of interviewees (referred to as participants in the thesis)

No.	Participant (Code)	Job Profile
1.	Joseph James Alenchery (JJA)	Architect and environmental designer
2.	Vinu Daniel (VD)	Architect,
3.	Gerard De Cunha (GDC)	Architect
4.	Joseph N Thomas (JNT)	Architect and professor
5.	Interviewee (5)	Architect
6.	Interviewee (6)	Architect – works with high rise residential complexes
7.	Interviewee (7)	Architect
8.	Interviewee (8)	Environmental/Sustainability consultant and former architect
9.	Interviewee (9)	Urban Designer and former architect

Appendix III: Interview guide

The architect

1. What is your opinion of current day architectural practices?
 - a. Have they changed over the years?
2. What are the most important factors for you, in an architectural practice when building a building?
3. What is the nature of the practices you employ in your line of work? (what kind of techniques and building design strategies do you adopt/work with?)
 - a. Have they changed over the years?
 - b. Why do you think this change has come about?
4. How are decisions made in the building design and architectural process?
5. To what extent would you say you are involved in the decision-making regarding the architecture, building design and materials used?
 - a. Who else is involved?
 - b. Who has the most influence?
6. Do you choose/suggest techniques/materials apt for the local climate and/or local terrain?
7. Are there common architectural styles/designs that clients demand?

8. Do clients want to know the what and how?
9. Is it essential for residents to know about the architecture, building design and materials?
10. Do you feel having knowledge on this, influences the kind of the choice made?
11. How do you define sustainable architecture?
12. What are the benefits of sustainable architecture?
13. How would you define vernacular architecture?
 - a. What is your take on traditional vernacular architectural practices?
 - b. Do you regard vernacular architecture as sustainable? Why?
14. Do you think it is important for the building industry in India to adopt vernacular architecture?
15. Who is/should be the main driver for sustainable architecture?
16. Would you say you try to incorporate/prioritise sustainable/traditional architectural design?
17. What is your motivation to study/use/design/build sustainable architecture?

Architect working for an architectural firm that focuses on

18. Could you describe your company's practice and architectural principles?
19. Who is the target customer base?
20. What are people's underlying motivations to opt for sustainable architecture?
21. How can sustainable architecture be incentivized? Are there company strategies to do so?
22. How do you compete with conventional mainstream construction techniques and materials?
23. What measures do you think will help facilitate the use of sustainable architecture?
 - a. Are there any challenges or barriers currently?
24. What do you think will help facilitate the use of sustainable architecture?
25. Do you think more architects are moving towards using sustainable architecture? Why?

Architectural syllabus

26. Do architecture syllabi include the concept of sustainability/ incorporate sustainability at its core?
27. Do you think this is important?
28. What do you think motivates architects to (not) adopt sustainable architectural practice?

Appendix IV: Consent form

Letter of Consent for Master Thesis Research at Lund University



LUNDS
UNIVERSITET

LUCSUS
Lund University Centre for
Sustainability Studies

Informed Consent Form

I am Neha Satheesan, a Master's student of Environmental Studies and Sustainability Science at Lund University. You are invited to participate in my Master thesis research. The research aims to determine factors influencing the adoption of vernacular architecture in urban India through expert interviews with participants. The interview will last around 50-60 minutes.

By agreeing to terms and conditions on this form, you are agreeing to participate in this interview as an informant. At any point of the interview, you are welcome to ask questions or decide against taking part in the interview. Furthermore, you can request that certain statements are not published.

As the interview is conducted online and not in person, the consent form will be read out before the interview and your verbal consent will be recorded and transcribed as proof of voluntary participation. I assure you that the information you provide will be strictly confidential and will be accessible only to Neha Satheesan (researcher), her thesis supervisor and selected peers at Lund University. Your contact details will not be shared and your anonymity will be ensured during the entire research process if wished for.

Do you agree to being recorded? Yes / No

Would you like to remain anonymous? Yes / No

The consent form will be emailed to you for your perusal. If you have any questions regarding the research process, email me at neha.satheesan@gmail.com. The results of my research can be shared with you if you are interested.

Thank you very much for your time.

Date :

Signature :

Appendix V: Limitations

Acknowledging the limitations is an essential self-reflection that aids the understanding and interpretation one draws from one's research context. The data collected was strictly based on the availability and participant responsiveness. I identified and reached out to 40 key informants both individuals and organisations, working in the field of sustainable architecture or having experience in the field. However, I got only 9 responses. The participants were mostly from South India and though many of them had worked all over India, the sample is not particularly representative. However, they came from different professional and academic backgrounds and having worked in numerous projects in and around the country, their knowledge and experience proved to be of substantial significance.