

# Transitions in traditional dwellings

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**A dwelling, while providing shelter, reflects the identity and individuality of its occupant(s). Traditional architecture evolved with time, catering to the needs of the inhabitants, adopting local materials and in harmony with the prevalent climate and environment. Growing aspirations and global pressures drive transitions in this traditional fabric, pushing towards modern construction practices. For traditional societies in Asia and Africa with a large rural population, transitions have serious local and global impact, including loss of traditions, increased material and energy demand, and contribution towards climate change. This article reviews transition in dwellings in rural settlements and makes an effort to comprehend its nature, drivers and consequences. Understanding transitions helps appreciate traditional building practices and design for a sustainable future.**

**Keywords:** Built environment, modernization, rural settlements, transitions, vernacular dwellings.

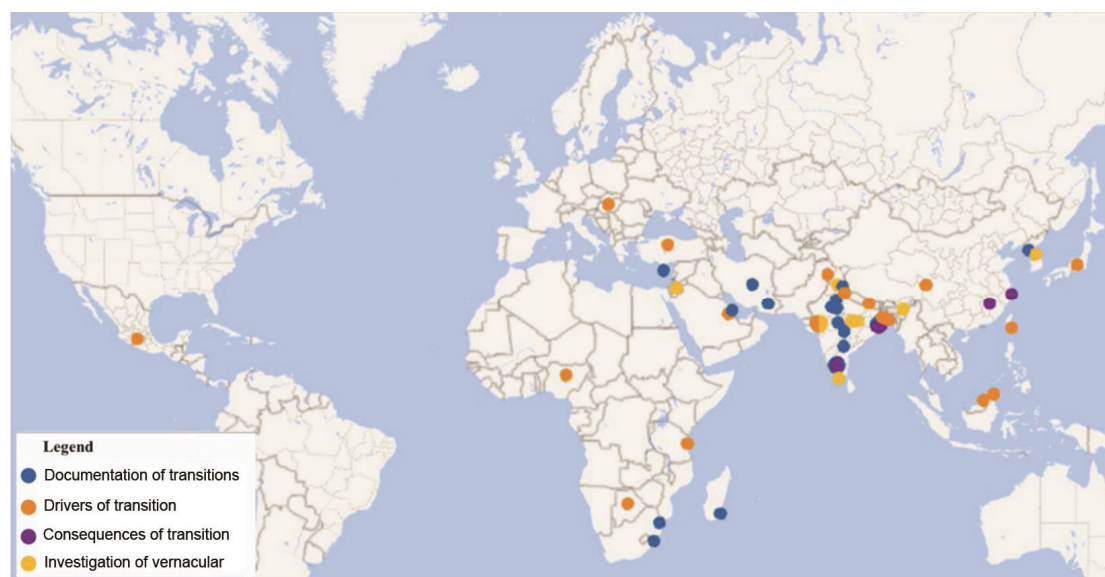
DWELLINGS, while providing shelter and safety, also give an individual the sense of identity, ownership and a feeling of being ‘at home’, derived from nostalgia and emotional connect with the space, people and quality of life in that space. Dwellings reveal the current state of a society, its values, advancement in science and technology, and preparedness to the prevalent climate and environment<sup>1</sup>. Vernacular dwelling, considered as an extension of its occupants, reflects unique personalities of the individuals as physical manifestations in the houses. It is regarded as a cultural artefact evolved through centuries, embodying local needs, values<sup>2</sup> and knowledge and skill to adapt to local environment and climate. A traditional settlement, a cluster of such dwellings, possesses a unique collective identity<sup>3</sup>. The houses mirror the needs and aspirations of the people, changes in the society, cultural and regional context in which they exist and climate<sup>4</sup>. The construction of dwellings progressed through collective and shared labour, ensuring social interaction and camaraderie in the community<sup>5</sup>, using materials that are durable, sustainable and followed a closed-loop, cradle-to-cradle resource cycle, generating little waste<sup>6</sup>. The traditional dwellings housed open spaces like courtyards and verandahs for outdoor activities and social interaction<sup>7</sup>. Influence of climate is fundamental and evident in the form,

site planning, design and material selection, ensuring comfortable indoors achieved passively based on design configurations finely attuned to the prevalent diurnal and seasonal weather patterns<sup>8</sup>.

From the time man built permanent shelters, dwellings have evolved in response to the needs of their occupants, social structures, climate and materials available. The history of architecture is often the documentation of transitions in the use of materials and adoption of changing technology. The dwelling, its form, space use and integration with the community have witnessed several changes over the years. These changes were gradual, internal, organic and in harmony with the environment and the community. However, the worldwide transition towards modern architecture started in the mid-1800s owing to the Industrial Revolution with advances in technology, engineering and development of materials like concrete, steel and glass, that helped in the construction of sturdier but lighter buildings. This accompanied by colonialization, followed by the post-independence era of nation-building and the present era of globalization forced transitions in the built environment by a combination of global and local factors<sup>9</sup>. The debut of a nation and its people to the world economy through globalization, global and local influences on the people, personal and aspirational influences accelerated modern transitions in the early 20th century. Modernization in the pretext of development was an imitation of the West, a shift from agricultural to industrial society and focused on economic growth<sup>10</sup>. The state policies ensured all inhabitants surrendered to be part of this modern economy. The meaning of a dwelling also evolved to become a symbol of recognition and accomplishment<sup>3</sup>, revealing a deliberate shift from contentment to a progressively aspirational way of life synchronized with an economy driven by consumerism<sup>11</sup>. Urbanization, predominantly westernization, reflects aspiration of people to modernize<sup>12</sup>. Increased disposable income, improved transport and communication, access to cities and televised media has contributed to these transitions. The dwellings today are modelled to adhere to industrially standardized trends around the world, than the cultural or ethnic identity. Such transitions to modern dwellings tend to be out of place in the local context, require materials foreign to the neighbourhood, fail to sustainably meet the needs of the individual or community, and are unable to respond to the prevalent<sup>13</sup> or changing climate<sup>14</sup>.

This transformation of dwellings from vernacular to modern or conventional typology is termed as ‘transitions’

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**Figure 1.** Case studies reviewed in this article.

in this article. Although these transitions meet modern aspirations, increase convenience associated with modern lifestyle, allow separation of functional spaces, and increase privacy, they have multiple consequences, including reduced thermal comfort, overdependence on electric controls, loss of traditions, increased urban heat, depletion of natural resources and increased emissions. Understanding transitions in built environment is crucial as its impact on environment, material and energy consumption and climate change is immense. This paper defines, characterizes and reviews transitions in human settlements. An attempt has been made to discern factors underlying transitions in traditional settlements and the consequent impacts.

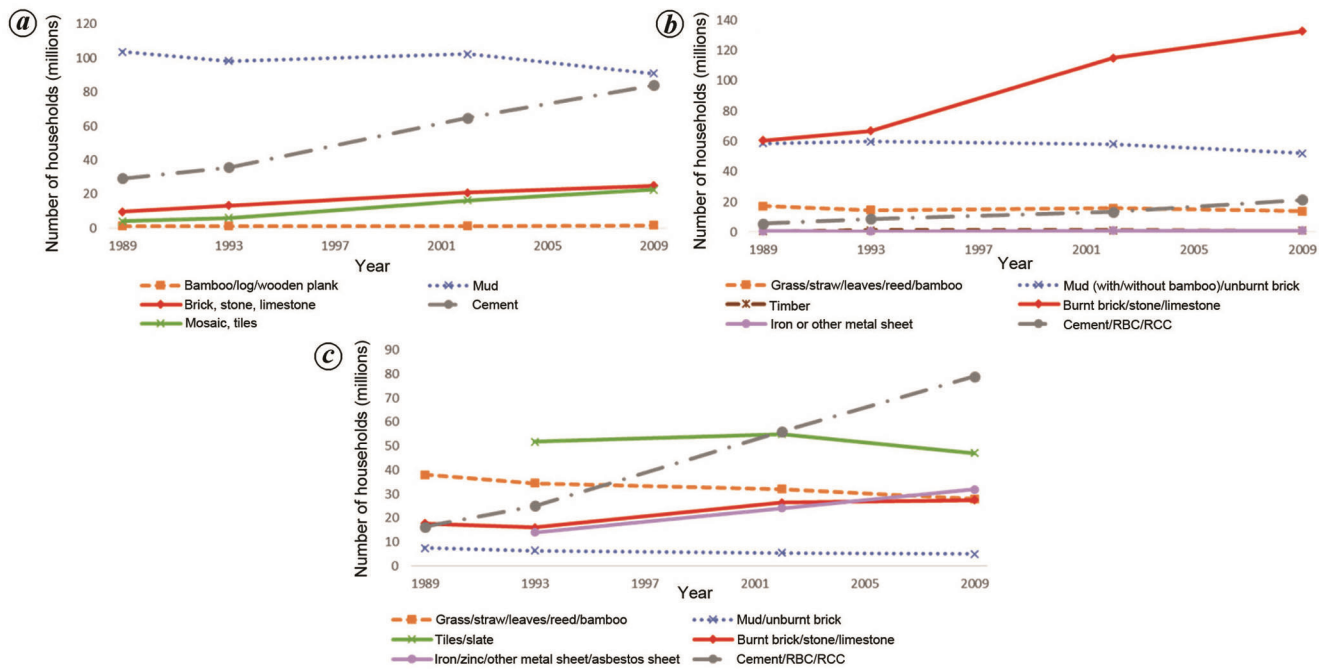
## Transitions

The term ‘transitions’ has been used in the literature to indicate changes/alterations in the built environment from traditional to contemporary<sup>15</sup>, vernacular to modern<sup>9</sup> or Western<sup>16</sup>, or rural to urban<sup>17</sup> typologies. This transition is a shift from ‘selectionism’, an unwritten, choice-based, evolutionary process, to ‘instructionism’, embodied with codes, standards and byelaws<sup>18</sup>. The former led to unique settlements representing collective values, cultures and traditions that varied from place to place and suited the needs of the local people. This promoted diversity across and within geographies, varying in shape (circular, oval, square, rectangular in plan), roof structure (gabled, conical, dome-shaped) and materials used (mud, stone, timber, straw). On the contrary, the latter developed a unified set of mandatory instructions for constructing houses leading to a uniform style across the world, that adhered to the Western school of architecture. This restricts scope for

creativity in the local context, which is fundamental to evolution, adaptation and sustainability<sup>19</sup>.

This article defines transition(s) in the built environment as a combination of changes in practice, design, form and/or materials used for construction from the prevalent traditional style, replacing them with modern or conventional styles, owing to various internal and external stimuli. As habitations respond to various global and socio-cultural drivers, the once familiar/characteristic traditional passive building configurations transform to an exotic, modern and increasingly energy-intensive (both embodied and operational energy) configuration. Many studies have documented vernacular dwellings and their transitions across the world. Figure 1 summarizes relevant studies involving transitions in human settlements, the underlying drivers and resulting consequences. Interestingly, transitions are predominantly documented across Asia and Africa which share a similar history of rich native culture, colonization followed by post-independence urbanization<sup>20</sup>. Starting with public buildings, the colonial period witnessed the construction of structures completely alien to the traditional settlements, but familiar to the colonizer<sup>21</sup>. Post-independence, these nations charted a linear model of development founded on the inherited colonial practices, progressed by following the West, completely overlooking native traditions and heritage<sup>11</sup>. Originating in the urban areas, this transition eventually spread to peri-urban and rural areas. On the other hand, transitions in many of the modern societies in cities and developed countries are often individual houses being replaced by multi-storied apartment buildings, in order to cater to the increasing housing demand due to rural–urban migration and limited availability of land<sup>22</sup>.

This article focuses on understanding transitions in emerging economies like those in Asia and Africa, with a



**Figure 2.** Type of material used for (a) floor, (b) wall and (c) roof in households developed based on National Sample Surveys 1990, 1993, 2002 and 2009 (ref. 27).

focus on India, where it is more prominent. The rate and nature of transitions coupled with the volume of rural habitations in these geographies demand serious attention considering the impact of transitions on energy and material demand, and greenhouse gas emissions. If the transition and consumption patterns in these geographies were to match those in developed countries, the contribution to climate change will be much higher, posing serious hurdles in mitigating the same.

### Stages of transition

Transitions in dwellings materialize in the use of construction materials, replacing traditional with modern materials<sup>23</sup>, in form<sup>24</sup>, or both<sup>25</sup>, or its use like converting rooms to shops<sup>26</sup>. Figure 2 illustrates change in material use for floor, wall and roof in the Indian housing sector from 1989 to 2009 developed based on the National Sample Survey reports providing strong evidence on transitions<sup>27</sup>. The figure shows a declining trend in the use of traditional materials like thatch, wood, mud and unburnt bricks, and increase in the use of conventional materials like burnt bricks, metal sheets, asbestos and concrete. This transition in material also reflects transitions in form; for example, shift from tile or slate roof to reinforced cement concrete (RCC) is often accompanied by change in roof form, from sloping to flat.

Transitions involve intermediate stages of transformation and products of successive hybridizations, starting

from partial refurbishment to demolition of existing houses and construction of modern homes<sup>7</sup>. These intermediate stages are a mix of both vernacular and modern styles<sup>28</sup>, developing from the vernacular, taking inspiration from the modern, representing ‘both a continuation and a change, breaking away from the past but not deviating too much’<sup>7</sup>.

The characteristics of vernacular settlements like adaptability, innovation potential to meet the aspirational requirements of the occupants and resilience to a wide range of adversities like climate have a major influence in creating a hybrid dwelling<sup>28</sup>. Based on the literature, five stages of transitions have been identified in this article (Figure 3). The indigenous ‘vernacular’ house untouched by the industrialized world; the ‘hybrid’ house, an amalgamation of vernacular and conventional, often retaining the form and orientation but replacing traditional materials in part with modern materials, mostly taken up as a maintenance/renovation step; the ‘conventional’ house introduced by rapid industrialization, modifying the form to suit modern materials; the ‘mock-traditional’, the conventional house that imitates elements of the vernacular as a result of the dilemma between the loyalty for vernacular and aspiration for modernity, and the ‘new vernacular’, an emerging method of constructing houses taking inspiration from the vernacular, incorporating the modern aspirations and demands of the people<sup>29</sup>. Recent efforts by architects and planners to revive traditional forms and practices for heritage preservation while meeting modern aspirations are proof of such development<sup>22</sup>. Through

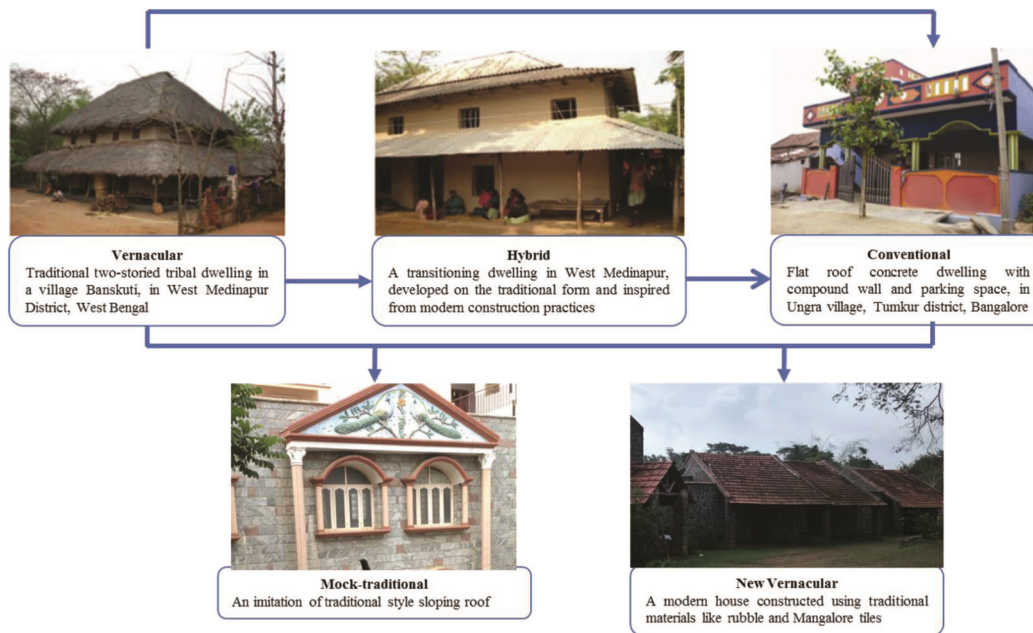


Figure 3. Stages of transitions illustrated with examples.

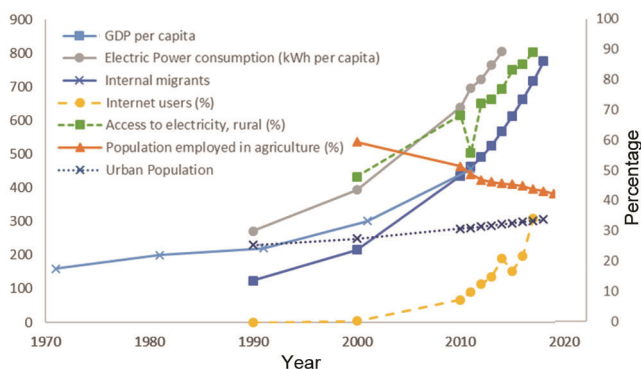


Figure 4. Economic and socio-cultural factors influencing transitions in the built environment, developed based on data from the World Bank<sup>33</sup> and Census of India<sup>32</sup>.

these stages of transition, some of the traditional elements gets retained, carried forward and adapted to meet the changing needs, while others disappear<sup>30</sup>. Often the traditional elements that can be constructed or imitated using modern materials and technology survive.

*Drivers and consequences of transition*

Even though transitioning one’s dwelling seems like a personal decision, it is driven by a combination of various economic, socio-cultural, political, technological and environmental forces. Transitions in dwellings cannot be explained merely by reporting the physical transformations, but should be accompanied by factoring drivers and effects of transitions. The influence of each driver on

transitions and relationships might vary between societies and needs to be scrutinized in depth to explore its effects on transition in the regional context. Ferdous *et al.*<sup>31</sup> established a correlation between transition and influencing factors like income and migration in a village in Bangladesh. Similarly, in the Indian context, transitions shown in Figure 2 can be studied in the light of different economic and socio-political factors. Figure 4 developed using data collected from the Census of India<sup>32</sup> and World Bank<sup>33</sup> shows increase in per capita GDP, migration, urban population, access to electricity and internet users in rural areas and a decrease in population employed in agriculture. These factors directly or indirectly drive transitions. The figure also shows increase in electric power consumption, a major consequence of modern transitions. These relationships are not explicit and need further scrutiny using statistical analysis, which is not dealt with in this article. Here we trace out transitions, their drivers and consequences using the relevant literature reviewed. The following section discusses the drivers and consequences of transitions under five categories: policy, economy, society, technology and ecology. Figure 5 summarizes the drivers, consequences and their relationships under these categories. The size of the bubbles and thickness of the lines represent the frequency in which these parameters and their relationships occur in the literature.

*Policy:* Integration of the world into a conglomerate economy through globalization<sup>9</sup> opened up regional, cultural, economic and social barriers, and introduced standardized construction methods, materials and opportunities



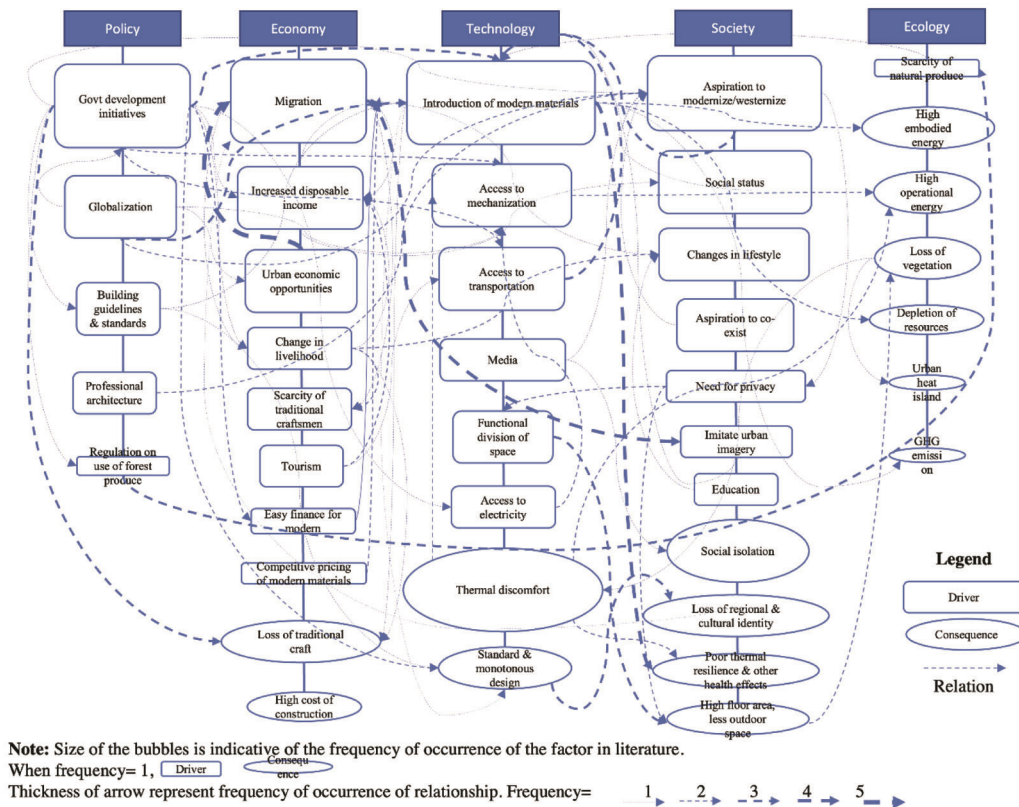


Figure 5. Drivers and consequences of transitions in the built environment.

in different parts of the world<sup>34</sup>, kick-starting a development based on consumerism that is inherently unsustainable. In most developing societies, globalization demands Westernization, as the de facto trend to imitate the ‘developed’ Western society is deep-seated in the minds of people as well as policy makers<sup>11</sup>. People aspire to own houses made of materials of international character and incorporate elements of high-tech industry into building design and construction, made available locally through globalization, overlooking local building practices, architecture and climate. Eldemery<sup>35</sup> discusses how pro- and anti-global factions have responded to globalization. The latter has been found to despise homogenization in architecture and seek to defend and propagate indigenous architecture by endorsing diversity within and among cultures, historical continuity and preservation of regional identity, the way spoken languages and local dialects impart identity. As with many native societies, longstanding oral traditions of folklore (and language) have played a crucial role in preserving and passing on building skills and techniques for posterity<sup>36</sup>. The pro-global faction encourages relentless innovation, new technologies and materials to meet the changing needs and aspirations<sup>35</sup>.

For increased and sustained economic growth, nations have put themselves on paths of rapid industrialization and urbanization. In India, post-independence, the desire to modernize was evident in all the development initia-

tives adopted by successive governments. Several government schemes focused on increasing road networks, access to electricity, global materials, television and economic development<sup>35</sup>. These exposed villages to rapid modernization. The only resistance being the geographic isolation in certain cases, like mountain passes, distance from roads and extreme climatic conditions<sup>37</sup>. Alternatively, Government restrictions on tribal forest rights and timber harvesting intended to protect forests and wildlife, made timber scarce and expensive for communities that depend on forestry for livelihood and construction of houses, which compelled adoption of modern materials<sup>38</sup>. For instance, the labour and wood-intensive kath-kuni construction in Kinnaur, India, famous for its wood-carving heritage, gave way to construction using concrete and steel<sup>24</sup>.

For industrial development, supported with adequate labour, governments often follow a pattern of acquiring agricultural land, converting it to industrial zones and providing displaced villagers semi-skilled employment and housing in planned settlements<sup>39</sup>. The end-users, the villagers, are alienated from the design and development of these residences and their original form of livelihood<sup>40</sup>. An industrial township constructed in Bhopal, India, failed to accommodate the traditional craft of the inhabitants like potters, blacksmiths, bamboo workers and weavers leaving them unemployed and the extinction of

their craft<sup>41</sup>. In 1970s, the Government in Taiwan in an attempt to ‘upgrade’ the living standard of the island of Pongso-no-T’au, demolished traditional houses in Tawo villages and replaced them with concrete barracks, which ended up rupturing the lives of the local Ta’u community and in the extinction of four traditional construction practices<sup>42</sup>. The buildings constructed by the state were uniform and monotonous, with no unique characteristic and asynchronous with the lifestyles of the traditional inhabitants<sup>43</sup>. The level of standardization in building design and construction through building regulations, policies and byelaws also reinforced monotony and eliminated regional and cultural identity, uniqueness and the ability to sustain locally<sup>44</sup>. Architects trained in Western idiom with inadequate exposure and alignment to traditional building patterns, tend to restrict their designs to standard building codes and standards<sup>3</sup>. Eldemery<sup>35</sup> accuses modern architects of producing universally applicable ‘international architecture’ that lacks truth, relevance and has little value for the cultural identity of a place. Mainstream architecture predominantly fails to appreciate vernacular dwellings, which are often stigmatized as a relic of the past and not for the present or future<sup>40</sup>. Further, most of the green-building rating systems fail to credit traditional passive design strategies, while appreciating modern means for achieving similar results<sup>45</sup>. Use of terminology like ‘kutcha’ to define houses constructed using traditional materials by Government agencies helps marginalize the houses while increasing the popularity of modern (pucca) houses<sup>27</sup>. However, in recent years, gradual awareness and recognition of traditional architecture have paved the way for revival of traditional architectural concepts, development of the ‘new vernacular’<sup>29</sup>. Valuable lessons from vernacular, understanding of occupants’ lifestyle, socio-cultural values are now being integrated with the modern to produce sustainable designs, making the dwellings socio-culturally suited, climatically responsive and contextually fitting<sup>41</sup>. On the other hand, state intervention through awareness programmes and development initiatives helps improve the quality of life. For instance, the introduction of attached toilets in households, considered a taboo in many traditional settlements<sup>46</sup>, is a key effect of state-driven transitions<sup>47</sup>.

*Economy:* Changes in livelihood like giving up farming for other vocations like setting up a shop, or a salaried, often semi-skilled job in the city, are considered modern and induce transitions. For instance, when the traditional vocation of animal husbandry was replaced with subsistence mixed cropping in Kinnaur, the lower levels of traditional double-storeyed houses, once used for animal penning were reappropriated into storage or living spaces. This encouraged the use of large windows replacing the most noted Kinnauri feature of small windows and doors<sup>24</sup>. Shift from subsistence to market economy, common in rural and peri-urban areas, is accompanied by

change in landuse from farming to residential or commercial, forcing a change in construction materials from agricultural end-products to materials ordered and purchased from the market<sup>7</sup>. New materials and methods demand new expertise for construction, often dependent on modern power tools and a building language which is no longer common. Construction of houses is then carried out by contractors and migrant labourers<sup>48</sup>. Better pay in modern construction practices forces traditional artisans to take up unskilled jobs<sup>49</sup>. Traditional craftsmen and artisans lose their jobs, shift crafts or migrate to urban areas for better economic opportunities<sup>50</sup>, while local crafts wither away<sup>1</sup>. The lack of incentives in economic and social stature discourages the younger generation to inherit or pursue traditional crafts<sup>24</sup>. Non-availability of traditional masons in turn makes way for modern transitions. Migration introduces people to an urban society which inspires them to implement these ideas back home<sup>31</sup>. This creates a loop where change in building practices forces traditional masons to shift jobs, creating a shortage of traditional masons that further drives transitions (Figure 6). Migration also induces transitions in urban areas, that now must make space for increasing immigrants. Mahmud<sup>26</sup>, reported that 100-year-old traditional residences in Dhaka, Bangladesh, occupied by middle class families, were divided into smaller residential or commercial units to exploit their potential for rental use. The study also reports a similar trend in Saudi Arabia, where increase in crude-oil revenue encouraged the Government to provide housing through free plots and loans, allowing traditional Saudi landlords to move out of the congested old city centres, transforming the old dwellings to smaller rental units. In addition, migrants introduce features from their original cultures to foreign land, often creating culture conflicts<sup>26</sup>.

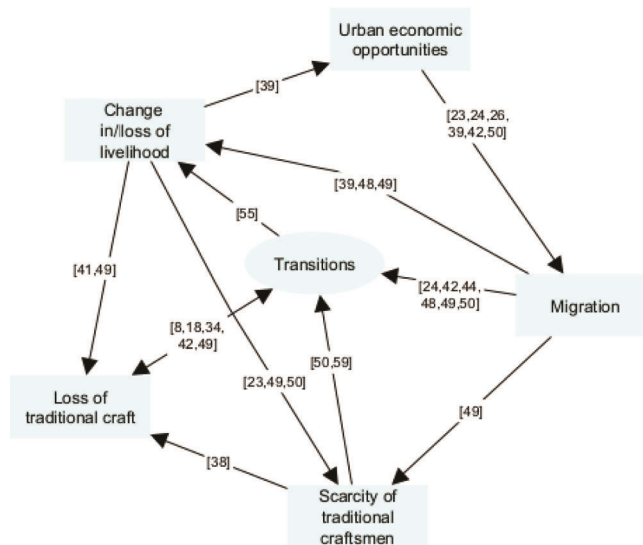


Figure 6. Effect of transitions on livelihood and vice versa.

The uniqueness of traditional culture, craft and construction is a major attraction of rural and cultural tourism, providing additional income to the inhabitants. Attempts have been made to conserve the form of the vernacular dwellings for the purpose of 'heritage tourism' and provide Western and urban tourists with the unique experience of living in indigenous, cultural dwellings. These cottages often end up being a look-a-like of vernacular houses with interiors electromechanically controlled like any other urban accommodation. Many heritage sites like the havelis and palaces of Jaipur<sup>51</sup> and the Fujian Tulou houses in China<sup>52</sup> have been converted to heritage hotels, after alterations in functional design and introduction of air-conditioning in a space originally conditioned through passive designs like jaalis, courtyards and earthen construction. The income from the thriving heritage tourism in Jaipur led to transition of the havelis to shops and parking spaces, and addition of floors to accommodate the increasing family size and cater to modern lifestyles<sup>51</sup>. The increasing homogeneity and tendency to modernize distort the uniqueness and originality of the villages, defeating the sole purpose of tourism<sup>38</sup>.

One of the most cited reasons for transitions in rural India is recurring/annual maintenance. This is often carried out by members of the family with materials from the farm in a traditional setting, which makes it cheap. While maintenance in conventional houses requires readymade products and labour familiar with such materials, making it a costly but convenient affair. Increasing spending capacity of rural households<sup>53</sup>, easy financial aids from the governments<sup>26</sup> and local vendors<sup>23</sup> for modern construction, increased availability of materials and competitive pricing<sup>24</sup> help drive transitions. However, replacing traditional materials with modern ones, with increasing prices and additional cost of transportation will substantially increase the cost of construction<sup>7</sup>. Mani *et al.*<sup>54</sup> compared the cost of construction of a traditional house with a typical conventional house in a village in West Bengal, India, wherein the cost of the latter was twice that of the former<sup>54</sup>.

*Society:* Modern houses tend to not only symbolize modernity in construction, but also modernity in the mindset, higher social status, impression of prosperity, better hygiene and greater durability<sup>48</sup>. Popularity of modern homes makes vernacular houses look obsolete, insubstantial and poor<sup>55</sup>. This is reflected in the social behaviour of the community, especially during inter-household relationships like weddings<sup>49</sup>. As humans integrate into larger social structures, there is pressure to go with the flow, keeping up with changing times without being left out, and fitting into the society of people that build like each other<sup>7</sup>. These influence transition in a neighbourhood, where one house stimulates transition in the entire neighbourhood. Pressures to modernize materialize from inside the house as well. The younger generation exposed to

modern culture through media, education or travel compel the older generation to transition. The older generation tends to resist and retain traditional styles owing to nostalgia<sup>35</sup>, leading to retention of certain traditional elements while yielding to transition. For instance, modern houses in Kathmandu mimic the traditional sloping 'namaste roof' that symbolizes a welcoming gesture in the culture<sup>7</sup>, a mock traditional practice.

Functional division of space and need for privacy are the other reasons for transitions<sup>10</sup>. While traditional settlements have multifunctional rooms, conventional dwellings have dedicated rooms for specific functions like cooking, sleeping, recreation, etc.<sup>56</sup>. This demands an expansion in floor area incorporating outdoor areas, reducing open spaces for interaction, recreation and resting. The private, conditioned indoor spaces protected from dusty and noisy outdoors by closed windows, facilitated by entertainment centres with television and internet help isolate the individual from within the family and society<sup>17</sup>. The disappearance of alcoves and central courtyards, and the prevalence of compound walls with video surveillance are few evidences of increased mechanization and the urge for privacy<sup>34</sup>. In the traditional settlement, where a tightly knit neighbourhood generated a sense of security, closing doors and boundaries to each other in modern society increased insecurity and investment in security and surveillance. On the other hand, improved privacy in households helped in the development of individual identity, closer interaction between wife and husband as well as father and children, and eased behavioural restraints around women present in traditional households<sup>3</sup>.

*Technology:* As discussed earlier, globalization ensured local availability of global materials. These materials have higher preference as they are ready-to-use, require less maintenance, and come with a sense of modernity and compelling advertisements. Easily accessible modern materials possess strong preference with growing difficulties in procuring traditional local resources due to shortage and restriction on use of forest products<sup>24</sup>. Typical conventional buildings with materials designed to be easy to transport and assemble efficiently, unlike traditional buildings are not always designed to withstand changes in weather without engaging mechanical control<sup>14</sup>. People living in modern buildings made of RCC, metal roofing sheets, etc. in tropical climates, have often expressed higher thermal discomfort<sup>57</sup>. Modern material transitions in vernacular dwellings in a village in India with warm-humid climate increased average indoor temperature especially in summer, demanding active air-conditioning<sup>8</sup>. Their adaptability to long-term climate change is doubtful<sup>14</sup>.

With increased access to electricity, people rely on electric controls for thermal comfort than traditional passive methods<sup>49</sup>. This is evident from the increasing sales of heating/cooling appliances, expected to rise by 120%

**Table 1.** Embodied energy (EE) of some vernacular and conventional materials<sup>63</sup>

Vernacular materials		Conventional materials	
Material	EE (MJ/kg)	Material	EE (MJ/kg)
Clay tile	6.5	Mineral fibre tile	37
Straw	0.24	Asbestos	7.4
Slate	0.1–1.0		
Rammed soil	0.45	Common brick	3
Timber-framed window	230–490	Aluminum-framed window	5470

between 2006 and 2031 in Indian villages<sup>58</sup>. Higher dependence on electric controls consequently increases operational energy of the dwellings. Researchers have pointed out that the physiological resilience and adaptability to thermal extremes is higher among inhabitants of naturally ventilated houses, a result of prolonged exposure/acclimatization to prevalent climatic conditions<sup>13</sup>. The over-dependence on active air-conditioning systems reduces thermal resilience of the inhabitants, further increasing dependence on electric controls.

*Ecology:* Modern construction materials are predominantly extracted from naturally occurring raw materials, manufactured through high energy-intensive processes and have higher embodied energy (EE; total primary energy consumption associated with a product) than traditional materials (Table 1)<sup>59</sup>. The extraction, manufacture and transportation process has various ecological consequences from exploitation of natural materials to high emissions. Accounting for 39% of energy-related carbon-dioxide emissions in 2018, the building sector is one of the major contributors to climate change<sup>60</sup>. In addition, processing of raw materials induces irreversible physical changes in the materials, disrupting the sustainable, closed-loop local resource cycle of traditional settlements<sup>13</sup>. Life-cycle assessment of dwellings in a village in West Bengal, revealed an increase in ecological footprint (area of productive land/water from nature required to support energy and matter flows to and from a defined economy) from 0.5 to 1.3 gha as a result of material transitions<sup>54</sup>. The introduction of modern materials into and as part of the household also poses a threat to the health of the inhabitants, to the extent that ‘sick building syndrome’ is now a major concern among health professionals, builders and inhabitants. The higher concentration of pollutants from modern materials, lower ventilation rate coupled with modern societies spending a large fraction of time indoors affect the occupants’ health<sup>61</sup>. Indoor air quality was a major concern during the COVID-19 pandemic and the subsequent lockdowns, as a result of which people spent most of the time indoors<sup>62</sup>. Dwellings derived from natural materials pose no such health risk to the inhabitants<sup>54</sup>.

Transitions in the built environment are inevitable, but the nature of such transitions can be of grave concern given the consequences. In Asian and African countries,

with majority of the population residing in rural areas and predominantly in vernacular dwellings, such rapid transitions coupled with the size of the population pose a serious threat at both local and global scale. Traditional dwellings are more climatically suited and ecologically sensitive when compared to conventional dwellings that tend to disregard prevalent climate, rely on energy-intensive materials and exhibit poor thermal comfort. Transitions from vernacular to conventional dwellings, therefore, exerts extreme pressures on natural reserves, resulting in a steep rise in energy and material demand and consequent green house gas emissions. Rapid transitions in these economies can fuel climate change at alarming rates. The study of transition, its nature, drivers, and consequences, is thus of utmost importance in the path to mitigate climate change. Understanding transition helps design houses that meet societal aspirations and changing lifestyles of people and are climate-responsive and ecologically sensitive, when supplemented by scientifically scrutinized and validated for energy-efficient and climate-responsive vernacular designs<sup>14</sup>. Design solutions should be based on the understanding that vernacular dwellings are not simply historic, cultural artefacts, but hold valuable lessons and ingenious solutions for resisting extreme climatic conditions and maintaining comfortable living conditions.

## Conclusion

From the time man built his first shelter, human settlements have witnessed successive stages of evolution. Industrial Revolution, colonization, followed by post-independence development put nations on a path of modernization resulting in rapid transitions in the built environment, unlike former transitions. These transitions are characteristic to transitioning economies and are evident in the use of materials, form and space-use. Here we define five different stages of transition based on a structured review of the literature. These stages were products of successive hybridizations in the built environment, materialized from a combination of pro- and anti-transition forces. While combinations of multiple socio-cultural and political factors drive transitions, factors like nostalgia and inaccessibility to electricity and transport due to the topography pose some inertia in the face of rapid transition.



Transitions helped improve sanitation, privacy and relationship between members of the immediate family, but resulted in adversities like higher embodied and operational energy, loss of traditional craft and cultural identity. This article examines these drivers and consequences, and the inter-relationships between these factors categorized into political, ecological, economical, societal and technical based on the literature reviewed.

While vernacular architecture possessed a unique identity while responding to the climate, topography and traditions of the people, modern architecture more often meets modern societal requirements. The contemporary consumer or inhabitant of a dwelling often leads a mix of both modern and traditional ways of life. This makes it necessary to rethink both conventional and vernacular architecture. Very little scientific study has been done to understand the materials and climate-responsiveness of vernacular dwellings. The long tradition of vernacular design offers lessons in climatic design and sustainable construction, two powerful tools for improving buildings of the future. It is paramount to academically and professionally incentivize architects and builders to specialize in vernacular construction. Scientific scrutiny and revalidation of geographically diverse vernacular designs could promote regionally attuned building codes and standards. State supported incentives to revive, preserve and encourage traditional craft and cultural identity could significantly reinforce global efforts towards net-zero buildings and sustainability.

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Received 12 October 2020; revised accepted 23 November 2021

doi: 10.18520/cs/v122/i1/29-38