Advancing Equity and Inclusion in Green Building Design in India:
A Study of Strategic Reintegration of Vernacular Crafts in Architecture and Regeneration of
Livelihoods of Crafts Communities in Maharashtra
September 2016

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Local stone craftsman working on a
green building project.
(Photo Credit: Artha Studio)

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Abstract

This paper investigates the impacts of strategic reintegration of crafts-based vernacular building techniques in design and development of green buildings in the contemporary architecture of India to advance the livelihood capacities of the local crafts communities. The assimilation of local crafts in the green building process has the potential of becoming an essential solution to address the issues of sustainable design in a more socially inclusive and economically equitable manner than what the mainstream green building ideologies—often adopted from the West and tweaked for the Indian context—illustrate, implement, and endorse. This evolving hegemony of contemporary green building milieu based on international context often excludes the vernacular traditions of building with nature, designing through participatory processes, while empowering livelihoods. This vernacular building methodology creates aesthetically vibrant, functionally viable, economically enabling, and environmentally responsive design solutions. The general perception of modern green building industry is that green designs incur additional costs and complexities; however, the vernacular crafts communities have cultivated the strategies of building with indigenous wisdom, local materials, and sustainable techniques in the most economical and equitable manner for centuries. The five projects investigated for their reintegration of local crafts and impact on livelihoods of local craftsmen are developed in the state of Maharashtra in India by a sustainable design organization, Artha Studio. The goal of this study is to quantify these impacts, and encourage building professionals as well as the construction industry to become exploratory in their innovative pursuits and attentive to what the crafts communities can teach, instead of remaining prescriptive in applying high-technology solutions to suit market-driven green building standards. Additionally, the goal is to inform policymakers to tackle policy development and implementation vis-à-vis livelihoods of craftsmen from a multi-sector, comprehensive, and collaborative perspective, rather than from a single-sector and insular focus. The recommendations include an exhaustive investigation of community-centered approach, economic implication, climate responsiveness, market impact, and cultural philosophy emerging from reintegration of vernacular crafts in green building practice. This study also unravels the need for an in-depth impact analysis of existing policy frameworks and industry mechanisms, which promote green buildings and foster livelihoods of craftsmen, to identify multidimensional strategies that not only advance the market for green buildings, but concurrently address the dynamics confronting the livelihood sustainability of India's vital yet vulnerable crafts communities.

Keywords: crafts, green building, vernacular architecture, inclusive design, Indian design

Methodology and Approach

This paper is based on the review of design literature, architectural research, journal articles, analysis of the building industry by national and international organizations, and observations of the author from a decade long architecture and design practice in India. This investigation also includes case studies of architectural design solutions developed by Artha Studio, a sustainable design organization in Maharashtra, India. These case study projects have been designed, developed, and built in the past five years. This paper is an exploratory research, with design strategy and policy recommendations for green building professionals, building industry, and policymakers of India.

Scope and Limitation

Architectural designs, developed by Artha Studio in Maharashtra, India, are studied for their impact on crafts and craftsmen. The data available are captured from multiple surveys of the design and crafts teams on the ground. The limitation of the study stems from the decentralized building construction process on the ground, in which multiple contractors and middlemen are involved in the project. These entities are often hesitant or unable to share the most accurate economic data for the project's material and labor cost. However, the author's effort for this research has been to collect and evaluate the most precise, objective, and relevant data pertaining to the projects examined here.

1. Overview of the Building Industry in Today's India

Hidden behind the brick and mortar geometry, buildings have continually narrated a story of human values and morality, as well as the pursuit of human innovation, excellence, and imagination. However, the energy-intensive production processes, environmentally destructive disposal techniques of design and construction waste, as well as the obsolescence built into buildings and products of today are concerns afflicting many architects, builders, and designers. Products, buildings, urban infrastructure, as well as our cities, create the very foundation of our social system. These physical extensions are the expressions of human actions, ideas, and the imaginative spirit, but also evidences of vulnerabilities, complexities, and the fragility of human mind. Societies have been constructing built-forms since humans learnt how to use the opposable thumb. However, in the modern building process, humans can slice off insurmountable mountains and wipe out millions of acres of idyllic forests in the matter of days to erect structures to satiate their needs (Naik, 2013). In this age of flattening world and homogenizing global culture, buildings become pioneers as their physicality can neither be outsourced nor virtualized. Buildings will exist in one form or the other until the existence of mankind. However, the building substructure is considerably more transient and rapidly transformed in terms of its average lifecycle, compared with its natural counterparts of ecosystems, geological formations, and the environment.

In just the past five years 18-20% of global greenhouse gas emissions have resulted from residential and commercial building stock, a paramount contribution disrupting the fundamental balance of the planet, which has thus far ensured the health, safety, and sustainability of our thriving civilization. The building industry in India is growing at an unprecedented rate today. According to the Center for Science and Environment in New Delhi, India, the industry has been growing at an annual rate of 10% of the GDP, in comparison to the world average of annual 5.5% growth; also, almost 70% of the buildings in India are still to be designed and built, as a result of which the building footprint of India is estimated to grow five times, from 21 billion sq ft in 2005 to about 104 billion sq ft by 2030 (Center for Science and Environment, 2014).

1.1 The Advent of the Green Building Systems in Contemporary Building Industry

The projection of how much additional building footprint will be created in the future provides a unique opportunity for changing the view on how buildings can be constructed and operated. If buildings themselves are addressed as a solution rather than the problem, then the paradigm shifts in a universal sense. 'Green buildings' can prove to be catalysts in developing socially thriving, financially secure, and environmentally just communities, while fostering innovation in material, technology, and skilled labor. The U.S. Environmental Protection Agency (EPA) offers the definition of 'green building' in the contemporary context as:

> Green building is the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle from siting to design, construction, operation, maintenance, renovation, and deconstruction. This practice expands and complements the classical building design concerns of economy, utility, durability, and comfort.

Following this ideology of building green, there have already been several strategic frameworks developed all over the world that allow and implement green building principles in various phases of a building's lifecycle. India has adopted or developed rating systems to identify and quantify these green building features in its buildings. A few of these frameworks include, 1) the Green Rating for Integrated Habitat Assessment (GRIHA), jointly developed by The Energy and Resource Institute (TERI) and the Ministry of New and Renewable Energy of the Government of India, 2) the Leadership in Energy and Environmental Design (LEED) framework originally developed by the U.S. Green Building Council (USGBC) and implemented in India by the Indian Green Building Council (IGBC); and, 3) the green building rating system developed by the Bureau of Energy Efficiency (BEE).

1.2 Challenges of Integrating Green Building Systems in India

Frameworks and ratings systems mentioned above could offer immediate and applicable guidelines, however, cannot educate the industry in the ways which centuries of experimentation, implementation, and improvisation can. The latter is where India has an extraordinary opportunity to bequeath the global community of green building thinkers with its indigenous wisdom, deep green mindset, and profound reverence for nature.

Sanskrit, the classical language of India, has 65 words to describe various forms of earth, 67 words for water, and over 250 words to describe rainfall. Each word depicts the myriad of nuances of that specific element of nature. Each word captures the context, the importance, the beauty, the usage, the geography, the climate, the ecology, and even the personality of that element. The way water would mean differently to a man of the desert than to the one living in a flood zone, these words emphasize the relevance and interconnectedness of elements. Similarly, the vernacular wisdom of building relates to the contextual diversity of forces influencing the process of constructing. LEED and such rating systems struggle to address these ingenious and time-tested crafts and building processes in their framework and functionality (Kochhar, 2010).

Despite this, in the recent times, India has become the second largest hotspot for green buildings, especially the LEED-certified ones. According to the IGBC, from 20,000 sq ft of green built-up area in the country in the year 2003, as of November 2016, there will be more than 3,874 green building projects with a total footprint of over 4.46 billion sq ft in India (Indian Green Building Council, 2016). On the other hand, the construction and demolition waste generated by the building industry in India was estimated to be 50 million tons in just 2013 (Centre for Science and Environment, 2014). To understand the financial and environmental effects of these invisible dimensions of buildings, one must consider all phases of design, and not only the phase when the final manifestation is useful to the consumer. As the globalized market is defining—and disseminating—such extraneous frameworks to India's building industry, the adherence to such green design systems is now confronted with many challenges hindering their potential to accomplish a holistic movement toward sustainable design. Demand for voluntary green building rating is still minuscule and nascent in India. Despite the presence of green building rating systems in India since 2001, the number of buildings that have come forward to get rated for their green principles is very minor (Center for Science and Environment, 2011).

These challenges inhibit India from a broader adoption of green building principles:

1. Building practice in India has been a highly decentralized process, engaging numerous unregulated subsidiary industries supplying materials and services to builders, architects, and designers. In most cases these entities are not required to take in account the environmental impact of their products and services.

2. The organizations and individuals interested in constructing a new building or renovating an old one seldom engage professional architects and designers in their projects, let alone a proactive engagement of trained sustainability or green building professionals.

3. The general awareness regarding the importance and impact of sustainability in the building industry is not implicit in the decision-making entities, including the clients themselves. Until this mindfulness is brought to the masses, the demand will remain lean.

4. Performance assessment systems to measure the impact of green building features are neither mandated nor widely employed. Without the tracking of real savings in terms of energy, emissions, and money, a broad adoption of green buildings will remain challenging.

5. The widespread myth that sustainability integration adds premium to the cost of building creates resistance in the espousal and advocacy of green building practice. The short-term investment is often not calculated in relationship to the long-term savings of green principles.

6. Green building practices are not mandatory at any level of public or private sector building projects, which makes the pursuit of green practice strictly voluntary and evidently scant.

7. Most importantly, the vernacular crafts and building processes that have ensured sustainability in Indian architectures for centuries are now becoming less accessible and desirable in urban centers, where maximum building growth is observed. They are not integrated in green building rating systems as some other high-technology solutions are.

1.3 The Emergence of Green Building as a Non-inclusive and Class-specific Enterprise

The ever-growing realm of mass-produced commoditized consumerism circumventing nearly all facets of life in India has brought in the foreground innumerable questions regarding the ephemeral existence, yet everlasting detrimental effects, of today's buildings. Additionally, the transition away from the handmade to the machine-made has imposed dire implications on the communities dependent on the traditional building techniques and crafts for their primary livelihoods. Millions of craftspeople have depended on building and design activities to sustain their livelihoods. However, the contemporary green building practice uses materials, products, and technologies alien to these craft communities, who are often unable to make the ends meet in a rapidly changing landscape of demand and supply of the globalizing India.

Additionally, the contemporary building practices are primarily industry-driven, rather than community-evolved. Furthermore, the perceived upfront cost affiliated with building green (Jha, Verma, & Chaudhari, 2016) makes the adoption of such strategies cost-prohibitive, hence they remain restricted to the clients and communities who can afford the premium attached with the implementation. Also, much of India still dwells in rural regions. Such green building practices are concentrated within urban hubs, as the practitioners with the expertise and clients are situated in and focused on urban centers. The vast inaccessibility and unaffordability of such

contemporary building ideologies make the green building practice in the modern India a non-inclusive and inequitable endeavor. Thus, the imposition of western definition of and contemporary viewpoints on green building systems in India is creating friction between the climate and the construction, as well as the cultural ethos and the characteristics of the buildings.

1.4. Vernacular Design as a Strategy to Advance 'Sustainable Buildings' in Indian Context

Contradictory to this non-inclusively emerging green building industry, the vernacular building systems have emerged as a highly participatory, inclusive, and community-centered philosophy (Patel & Zaveri, 2009). Socio-economically anchored and culturally inspired definition of 'sustainable design' is hidden within this vernacular architecture. These buildings address the needs of their habitants, are responsive to the diversity of the ecosystems and local climates, employ natural and locally available materials and indigenous techniques of building, and are imbued with traditional richness and innovation of the communities they have arisen from over the centuries. These buildings depend heavily on local crafts, craftsmen, and the communities within which and for whom they are built. They are developed by the people and for the people, and almost always without any involvement of trained architects and design professionals. These buildings include, but are not limited to, structures such as the *Bhungas* of the desert regions of Kutch, the bamboo houses of Assam, and the *Wadas* of Maharashtra.

Table 1. Major issues to assess sustainability performance of buildings (United Nations Environment Programme, 2008)

Issue	Green Building	Sustainable Building
Consumption of non-renewable fuels		
Water consumption		
Materials consumption		
Land use		
Impacts on site ecology		
Greenhouse gas emissions		
Other atmospheric emissions		
Solid waste / liquid effluents		
Indoor air quality, lighting, acoustics		
Longevity, adaptability, flexibility		
Operations and maintenance		
Social and cultural issues	The Missing Pieces: Equity and Inclusion	
Economic considerations		
Urban / planning / transportation issues		

The subtle yet poignant dichotomy between the meaning embedded within a contemporary green building and the value ingrained within the vernacular architecture creating a 'sustainable building,' as represented in Table 1, dwells the critical gap and a missed opportunity for reintegration of crafts and rehabilitation of crafts-based local economies. In this way, a 'sustainable building' is an inclusively and equitably designed 'green building.' The responsiveness to economics, equity, and ecology integrated within vernacular design knowledge has made these buildings epitomes of sustainability-in-action for centuries—ages before the term 'sustainability' or 'green building' became prevalent in the industry or society. Especially in India, where the green building industry is increasingly emulating and endeavoring to comply with the technologies, materials, and strategies invented in and for

foreign countries, the Indian green building dialogue is feared to become homogenous, resource-intensive, and superfluous (Kochhar, 2010).

From its earlier form of being rooted in climate, culture, and traditional technologies, the green architecture is now a conveyor of economic power. The green corporate offices, banks, hotels, all showcase the booming Indian economy and appear to align with the path to champion globalization (Mathur, 2015). However, the vernacular approaches to building design, construction, and operation, which promote integration of local crafts, and thus advance livelihood sustainability of local crafts communities, have a tremendous potential to also address the requirements of the present-day clients with a global mindset. Such design methods satiate the needs of contemporary functionality of modern designs, while proving instrumental in safeguarding the environment, local economies, and cultural richness of the regional context.

2. The Current Status of Crafts Communities in India

In the Indian crafts atlas, Handmade in India (Ranjan & Ranjan, 2009), Dr. Darlie O. Koshy, the Executive Director of National Institute of Design, describes the crafts of India:

> The multitudes of hues and forms seen in the *shandys* and the *melas* of India tell the stories of hundreds of crafts that belong to a vast country with 18 major and 1,600 minor languages and dialects, 6 major religions, 6 major ethnic groups, 52 major tribes, 6,400 castes and subcastes, 29 major festivals and over 1 billion people, 50% of them in rural areas, spread over coast lines, valleys, hills, mountains, deserts, backwaters, forests and even inhospitable terrain. It is not easy to grasp the breadth and depth of Indian craft. There are more than 23 million craftsmen engaged in different craft sectors and it is estimated that there are over 360 crafts clusters in India. (p.17)

2.1 Livelihood Challenges of Crafts Communities in 21st Century India

According to the United Nations, the number of Indian craftsmen has decreased by 30% over the past 30 years, indicating the need to reinvest in crafts communities to preserve history, culture, and an important source of livelihood (Jena, 2007). With India going through a transition to industrial economy, the vernacular crafts have faced unprecedented stresses as they are forced to compete with the affordability and accessibility of mass-produced goods and foreign techniques. The challenges confronted by these local, regional crafts span from the lack of infrastructure and capital investments for their advancement to crafts communities' inability to market themselves in a competitive global marketplace. Additionally, the growing attraction for modern and western notions of design transfers into consumers' resistance to pay the true value for the vernacular crafts. If the value were to be justly recognized, then the benefits of such economically leveled playing field would enrich the livelihood capacities of rural crafts communities. Because of current multifarious livelihood challenges, many craftsmen are now choosing to abandon their crafts, as well as communities, and migrate to urban centers for unskilled employment opportunities.

According to the Cottage and Rural Industries Policy 2016 developed by the Commissioner of Cottage and Rural Industries in the Government of Gujarat, the specific hurdles facing the crafts industries are underscored as the lack of easy access to credit, high level of

disorganization, inadequate raw material supply, inadequate infrastructure and technology, lack of proper education of craftsmen, limited access to markets with broken value chain, and the lack of standards for quality control. India's policymakers are generally aware of these issues, and have put efforts to address these forces from the two contrasting ends of the spectrum of economic and infrastructure development—one being the construction industry's rampant explosion, and the other addressing the endangered livelihoods of rural community. Some of these policies and programs include the Gandhi National Centre for the Arts-Under UNESCO's Program on Cultural Industries and Copyright Policies, Ambedkar Hastshilp Vikas Yojna, and state-specific policies such as the new Cottage and Village Industries Policy 2016. However, the socio-economic, market-related, and resource-driven obstacles threatening the craftsmen are overwhelming and innumerable, allowing these policies to address only a few facets and fragments of the actual stress factors.

2.2 Reintegration of Local Crafts in Modern Architecture as a Strategic Imperative

Indian craftsmen are divided into four labor categories—skilled master craftsperson, wage-worker, fully self-employed craftsperson, and part-time craftsperson—with a well-established hierarchical division of labor between more and less skilled craftsmen and women for specific categories of a given craft. An estimated 63% of craftsmen are self-employed, while 37% are wage earners; and, traditional knowledge and craft skills are passed down from one generation to another, so that whole families and communities are engaged in the production of the crafts, (with estimates that 71% of craftsmen work as family units) and 76% attribute their profession to the fact that they have learnt family skills (Jaitly, 2001).

The official data generated to comprehend the impact and expanse of the crafts sector have integral challenges, such as the counting process of how many craftspeople work on a specific craft in a region does not take in account the multiple family-members of the chief craftsperson. The families of head craftsmen contribute to the primary crafts associated with the family, however only the head of the production unit and individuals earning financial remuneration for their efforts are included in the official figures (Bissel, 2013). Thus the true numbers of hands working on the crafts and the mouths fed by the crafts remain invisible in the official data. This complexity further underscores how the solution for livelihood challenges must be a thorough, all-inclusive and multi-sector process.

Many of these challenges could be attacked by strategic reintegration of relevant crafts in current green building practice, as the building industry is estimated to grow leaps and bounds in the next decade. The Centre for Science and Environment has estimated that since 2005, India has constructed 5.75 billion sq m of additional floor area. In 2013 alone, it constructed more than one billion sq m (Center for Science and Environment, 2014). A paradigm shift of how buildings are designed and constructed to source local materials, to integrate local vernacular crafts, and to respond to local climatic condition can allow the building and construction boom to function as a practical and effective leverage. A policy thrust from both the directions—one from the policymakers focused on rural crafts and village industries, and another from the policymakers addressing construction, infrastructure, and green building issues—could develop

an egalitarian development ecosystem for the strategic revitalization of vulnerable crafts mentioned above. This strategic impetus could allow for the building sector of India to act as a living laboratory of innovative multi-sector policy decisions and directives.

This innovative approach of integration of vernacular crafts in the building sector has been experimented on the ground by private sector organizations. One such organization is Artha Studio, in Maharashtra, India. The results of Artha Studio's projects unravel the potential of such integration on the rejuvenation of local economy in a specific region of the country. The rest of the paper underscores the outcomes of this reintegration, and the necessity for deeper national and multi-sector investigation of this strategy's feasibility at a macro scale.

3. Impact of Strategic Reintegration: Case Studies of Artha Studio Projects

Artha Studio is a sustainable design organization founded with the mission to create meaningful designs to sustainably advance the development of rural and urban communities. Artha Studio is based in Pune in the state of Maharashtra in India, and has offered its sustainable design services since 2008 to the communities primarily of western India. The organization has received many awards and acknowledgements from national organizations such as the New Delhi Television (NDTV), the Indian Architect and Builder, as well as the Architect, Engineers, and Surveyors' Association, for its adherence to sustainable and equitable design practice. Artha Studio has achieved this status by creating a shared social landscape, which echoes indigenous wisdom, rather than merely imitating the western interpretations of design. It has embraced critical regionalist vision that includes identifying, analyzing, and integrating local climatic patterns, topographic features, light quality, materials, and craftsmanship in its designs. Its creations merge the contingencies of crafts and culture, which elevate the intrinsic value of the resulting product for the community it is created for. The studio fervently challenges the idea of commoditization and standardization of building production at every step of design and construction process. The Architectural Digest's 50 Most Influential Names in Architecture and Design (Foster, 2016), highlights what makes Artha Studio's work unique in this context:

> Since its inception in 2008, the multidisciplinary design firm (Artha Studio) has created architecture that has its genesis in the coming together of craft, community, culture, and nature, elevating not just the living experience for families but enriching surrounding communities. (p. 176)

3.1 The On-the-ground Impact of Artha Studio Projects on Local Crafts

Artha Studio has consciously reintegrated dying local crafts, materials, and building techniques in a deliberate and decisive attempt to create employment opportunities for local craftsmen dedicating their lives to struggling vernacular building techniques, such as the cow dung application technologies, pottery making and baking, as well as regional stone, wood, metal, and clay crafts. The organization has been successful in employing hundreds of craftsmen (and tens of local craftsmen within 10-km radius from the project site) for its projects, and in feeding millions of Indian Rupees (INR) back into the local economies of rural Maharashtra through this intentional incorporation of local crafts.

The following case studies underscore how vernacular technologies, while advancing the principles of sustainable design, have created livelihood opportunities for local craftsmen in the past five years. These projects are critical in underscoring the impact of how such reintegration of local crafts addresses trifold risk entrenched within the green building industry of contemporary India. These risks include:

1. Green buildings becoming an exclusive privilege of the affluent, the urban, those driven by the global trends, and embracing the market-driven definitions of 'green building,'

2. Green building process becoming an inequitable pursuit by its affection for high-technology, often western-born, green practices and products, which often diminish the livelihood capacities of local crafts communities traditionally dependent upon their vernacular building techniques, and;

3. Green building adoption remaining inadequate and sparse in comparison to the total size of the building industry, as it currently depends on industry-specified and high-priced technologies and products for the compliance to industry-defined green building standards.

The green building projects described in Table 2 strategically address the issues of energy, water, waste, culture, crafts, and local economy; therefore, they have emerged as local solutions to help overcome the risks facing the current green building approaches. Majority of these projects have received recognition for sustainability principles and revitalization of local economies through integration of crafts. However, the design team has consciously not pursued any industry-driven green building rating systems for them, as the ratings do not incorporate and/or reward the multifaceted, profound, and longstanding benefits of leveraging rural vernacular crafts as a viable green building strategy, as mentioned in Chapter 1.2. Instead, the design team has independently measured the impacts of crafts reintegration as emphasized here.

Table 2. Profiles of Artha Studio's sustainable building projects generating livelihood opportunities through integration of vernacular crafts in Maharashtra, India (Artha Studio, 2016)

Table 2. Artha Studio Project Profiles (Maharashtra, India)						
Projects	Total Sq Ft	Total Cost of Construction	Total Years of Building	Year of Compl-etion	Location (Village, District)	Type of Use
The Wada	16,700	21,000,000	4	2016	Rajapur, Ahmednagar	Single Residential
Farmer's Abode	2,325	4,500,000	2.5	2015	Umbri and Balapur, Ahmednagar	Single Residential
AR Folly	1,500	750,000	2	2008	Kasarwadi, Pune	Flexible Use
Janakee Sadan	5,040	1,800,000	5	2011	Sangamner, Ahmednagar	Office, Public Institutional
Jain House	1,020	3,000,000	3	2012	Khanapur, Pune	Single Residential

The clients for these projects were in line with Artha Studio's ultimate goal for these projects. This alignment also underscores that the market, even at a smaller scale as for these projects, can be educated and made aware of the benefits of such building and design strategies. Upon the realization of these projects, the local economies were rejuvinated as significant portions of the project costs were fed back into the local communities. The building features included in these projects, making these structures sustainable, inclusive and equitable in the most traditional sense, are included in Table 3. Also, the local vernacular crafts that contributed to the tangible manifestation of these green building features are also highlighted in Table 3.

Table 3. Sustainable building designs realized by integration of local vernacular crafts in Maharashtra, India (Artha Studio, 2016)

Table 3. Artha Studio Project Profiles: With Details of Vernacular Crafts Integrated (Maharashtra, India)		
Projects	**Sustainability Features – Allowing Reintegration of Local Crafts and Vernacular Techniques**	**Local Crafts Required for the Implementation of Sustainability Features**
The Wada	Thick Brick Walls, *Mataka*-Bat Concrete, Salvaged Wood, In-situ Crafted Metal Hardware, Stone Work	Pottery, Brick Baking, Carpentry, Wood Carving, Copper Craft, Brass Crafts, Stone Masonry
Farmer's Abode	Stonewalls, Salvaged Local Wood, Cow Dung Flooring, In-situ Crafted Metal Hardware	Stone Masonry, Cow Dung Crafts, Carpentry, Wood Carving, Brass Crafts
AR Folly	Impermeable Local Bricks for Court Without PCC, Locally Salvaged Wood, Bamboo Nets for Windows, In-situ Crafted Metal Hardware	Brick Baking, Carpentry, Bamboo Weaving, Iron Crafts
Janakee Sadan	Locally Salvaged Wood, Locally Salvaged Stone, Bamboo Boards, Lime Plaster, Passive Ventilation to Basement, In-situ Crafted Metal Hardware	Brick Baking, Carpentry, Bamboo Weaving, Stone Masonry, Lime Application, Iron Crafts
Jain House	Local Bricks, Loadbearing Structure, Country Tiles	Brick Baking, Carpentry, Ceramic Crafts

Figure 1. Local potters laying 20,000 clay pots to create thermal buffer on the roof.
(Photo Credit: Artha Studio)

Figure 2. Locally made clay bricks arranged by craftsmen.
(Photo Credit: Artha Studio)

Figure 3. Local carpenters restoring old wooden door for a residential project.
(Photo Credit: Artha Studio)

The following five case studies take a deeper look into the sustainability features of these buildings, and how integration of local crafts played a vital and indispensable role in the process.

3.1.1 Project 1: The Wada. This project is designed for a family of visionary dairy-farm owners in western Maharashtra. This built-form has emerged from the land it stands on, learning from nature, lavishing with traditions, and with flawless responsiveness to the surrounding. In this design, the innovative addition of *Mataka*-bat-concrete of inverted earthen pots above the slab as shown in Figure 1, and 350 mm thick brick walls keep the house warm in the winter and cool in the summer. This passive-design reduces the need for air-conditioning. In fact, more than 80% of the living spaces are passively air-conditioned. In this smart structure, slit windows act as wind-scoop, and circulation corridors around the courtyard act as air-buffers. All the timber and furniture used are salvaged from nearby sites, reducing furnishing cost by 70%, as well as minimizing wastage and labor. Local carpenters have customized old furniture for the functional specificities, as the Figure 3 shows a local craftsman refurbishing a century-old door for this new building. The stone bricks are crafted by local stonemasons, who otherwise struggle for viable employment due to a vast use of Reinforced Cement Concrete (RCC) in ordinary new construction, in spite of RCC's thermal features conflicting with the local climatic conditions. The house has 24x7 hot-water heated using methane gas, a by-product of the owner's local dairy farm, augmented by a solar water-heater. Also, 100% rainwater is harvested as water-flow is directed into the well, replenishing ground aquifers. This built-form is a strategic unification of traditional ideas of resiliency, economic intelligence of vernacular crafts, and modern interpretations of sustainability. Further details of the crafts integration are described in the Table 4, Table 5, and Table 6.

3.1.2 Project 2: Farmer's Abode. This dwelling is a candid reincarnation of materials, forms, and sensibilities preserved by the culture of the people and the contours of the land. This innovative design is born from conserving, repurposing, and revitalizing materials, while invigorating local economies, employing vernacular technologies, and reviving time-tested sensitivities. Most materials used are salvaged from local sites. The bricks are reclaimed from a demolished house; wood and roofing tiles are from the village temple undergoing reconstruction; and, basalt stones are from a nearby quarry. The house stands as a load-bearing structure, built using local vernacular load-bearing and wooden construction techniques, and in the process reveals to the community the rich and mostly forgotten traditions of vernacular building. The openings act as wind scoops, on the principle of *Gomukh*. Cow dung is the primary flooring material, with toilet floor furnished with local terracotta tiles, and bedroom floor crafted with reclaimed wood. Exterior walls are exposed stone and bricks, while interior walls are lime-plastered. Antique brass and copper utensils, refurbished by local metal craftsmen, embellish the interior spaces. Furniture is salvaged and restored by local carpenters. A conscious choice is made to create economically modest, sensually rich, and environmentally sustainable abode. This timeless design is a sincere testament that esteems what the past has preserved and echoes what the future can foster. Further details of the crafts integration are described in the Table 4, Table 5, and Table 6.

3.1.3 Project 3: AR Folly. AR Folly is situated in western Indian state of Maharashtra. Climate of this region is hot and dry, with seasonal monsoons. The site is set in a farm, next to an existing pitched roof structure. The name of the project 'AR Folly,' meaning 'Structure in the Air' in Portuguese, appropriately reflects the core design principles. The primary space of the Folly is elevated from the ground by 2.4 meters to create a permeable pavement on the ground level. This exposed pavement on the ground level, constructed with clay bricks as shown in Figure 2, helps reduce storm-water runoffs, assisting the ground absorption of rainwater. On the facades, horizontally pivoted steel frame windows are knitted with cane and bamboo by local craftsmen. Because of their ingenious design, these windows can also be fitted with humid *Khus* panels in the summer for effective passive cooling. To incorporate natural, local, and renewable materials such as bamboo, cane, and clay bricks, as well as the selection of mechanical roofing system over an electrical one to conserve energy, are a few of the many sustainable decisions made by the design team. Further details of the crafts integration are described in the Table 4, Table 5, and Table 6.

3.1.4 Project 4: Janakee Sadan. Janakee Sadan in Maharashtra, India, is a 150-year-old building, revitalized, repurposed, and restored by Artha Studio into an institutional building housing a nonprofit organization. The structure now serves as a venue for community events, a platform for local artists and craftsmen, as well as a recreational space for children and senior citizens. The restoration addresses these expanded needs, and preserves the spirit of the structure by adhering to its local, climatic, and community-focused context. The details of refurbished furniture, walls painted in white limestone plaster with skirting of yellow *Jaisalmer* stone, long and vaulted gallery customized with *Kadaee* stone fitting, are a few of many vernacular techniques employed in this building. The courtyard in the middle acts as a thermal funnel. The inlaid bamboo ceiling with air cavity, created entirely by local craftsmen, is adapted to reduce heat. The project is planned with traditional materials and vernacular building skills such as stone, flat-brick, lime, mud, and wooden post and beam with wooden joists. Reuse of existing materials from the site has made this effort extremely cost-effective and eco-friendly. Additionally, the project has injected awareness within the local community about the conservation and preservation of local time-tested crafts and creativity. Further details of the crafts integration are described in the Table 4, Table 5, Table 6, and Table 7.

3.1.5 Project 5: Jain House. The Jain House reflects how simple design solutions emerging from local materials could cater to the needs of contemporary lifestyles. The house is a modest project, with minimal use of material, labor, and time, as it prudently uses what is available locally in the most productive way. The house incorporates local technologies of molding, baking, and country tiles installation as a thermally appropriate roofing material. It uses locally made clay bricks for its construction. The project has engaged local wood craftsmen to create fenestrations and customized features of its architectures. The materials and technologies used have emerged from the regionalist and minimalist attitudes. Further details of the crafts integration are described in the Table 4, Table 5, and Table 6.

3.2 The Scope of Engagement of Local Craftsmen

Artha Studio has been able to reintegrate twelve unique local crafts in the designs of these five projects; three of these are thriving in the region, however nine (66.6%) of these crafts are struggling. The status of the crafts in the region is determined based on the experiences and observations of the design team during the identification and engagement of local craftsmen in the region. The 'struggling' crafts are defined as crafts that lack the market to sustain the livelihoods of the associated craftspeople, requiring them to find supplementary and secondary livelihoods. The thriving crafts are those that hold wide market appeal and employment opportunities, allowing the crafts communities to sustain solely through the practice of those crafts and vernacular building techniques.

Table 4. The local vernacular crafts regenerated through Artha Studio's sustainable building designs in Maharashtra, India (Artha Studio, 2016)

Table 4: Artha Studio Projects: Impacts on Vernacular Crafts Regeneration			
Projects	**No. of Crafts Integrated**	**List of Specific Types of Crafts**	**The Status of the Crafts in the Region (Thriving/Struggling)**
The Wada	7	Stone Masonry	Struggling
		Brick Baking	Thriving
		Pottery	Struggling
		Carpentry	Thriving
		Copper Crafts	Struggling
		Brass Crafts	Struggling
		Wood Carving	Struggling
Farmer's Abode	5	Stone Masonry	Struggling
		Cow Dung Crafts	Struggling
		Carpentry	Thriving
		Wood Carving	Struggling
		Brass Crafts	Struggling
AR Folly	4	Brick Baking	Thriving
		Carpentry	Thriving
		Bamboo Weaving	Struggling
		Iron Crafts	Thriving
Janakee Sadan	6	Brick Baking	Thriving
		Carpentry	Thriving
		Bamboo Weaving	Struggling
		Stone Masonry	Struggling
		Lime Application	Struggling
		Iron Crafts	Thriving
Jain House	3	Brick Baking	Thriving
		Carpentry	Thriving
		Ceramic Crafts	Struggling

3.3 The Impact on Livelihood Capacity-building for Local Crafts Community

For each of the five green building projects, more than 50% of the total project cost was fed back into the local communities (with an average of 71% of project cost fed back into the local economy), through employment of local craftsmen, sourcing their skills, and integrating vernacular building technologies. A total of 19,412,500 INR were reinvested into the local economies (communities within <10 km radius of the project). Furthermore, the average daily wage offered to the craftsmen was 435 INR, compared to the national average daily wage of 272 INR reported by the Trading Economics, based on the data represented in Table 6.

Table 5. The engagement of vernacular craftsmen in Artha Studio's sustainable building designs in Maharashtra, India (Artha Studio, 2016)

Table 5: Artha Studio's Engagement of Vernacular Building Craftsmen			
Projects	Total No. of Craftsmen Employed	Host Village/s of Craftsmen (Local defined as < 10 km from the project site)	Total No. of Local Craftsmen
The Wada	72	20 from the same village (<10 km), 25 from Rajasthan, 10 from Orissa, 17 from Bihar	20
Farmer's Abode	16	12 from the same village (<10 km), 4 from Rajasthan	12
AR Folly	12	10 from the same village (<10 km), 2 neighboring villages (<10 km)	12
Janakee Sadan	23	13 from the same village (<10 km), 5 from nearby villages (<10 km), 5 from Bihar	18
Jain House	15	15 from the same village (<10 km)	15

Table 6. The economic impact of engagement of vernacular craftsmen in Artha Studio's sustainable building designs in Maharashtra, India (Artha Studio, 2016)

Table 6: Artha Studio's Impact on Local Economies Through Engagement of Vernacular Building Craftsmen					
Projects	Total Days of Employment in a Year	Total Years of Employment	Average Daily Wage (In INR)	Revenue fed in Local Economy (In INR)	% Of Total Cost of Project Fed into Local Economy
The Wada	275	4	550	12,100,000	57.62%
Farmer's Abode	192	3	500	3,456,000	76.80%
AR Folly	75	2	325	585,000	78.00%
Janakee Sadan	95	2	450	1,539,000	85.50%
Jain House	105	2	350	1,732,500	57.75%

3.4 Lessons Learned by Artha Studio's Design Team

Artha Studio team learned the following lessons during the integration of local crafts:

1. Identification of appropriate vernacular crafts: Identifying locally available crafts that could be integrated in the green building project was challenging, as resources indicating the availability of specific crafts within a specific region were not easily available or accessible.

2. Engagement of skilled local craftsmen: Once the craft was identified, locating and retaining local craftsmen skilled in the given craft was another challenge. The design team had to do on-the-ground search for such craftsmen, as crafts industries primarily work on the word of mouth and personal recommendations. The absence of any regional directory of craftsmen made the search process time-consuming and cumbersome.

3. Understanding fair pricing for the selected crafts: As the crafts industry remains an unorganized sector, price comparison for available craftsmen for specific crafts was another challenge. The team found that there were no readily available standards for comparing pricing, quality, or time involvement quoted by the craftsmen practicing a given craft.

4. Adaptability of traditional crafts in the modern context: Getting the craftsmen to adapt their crafts for green building design required additional time from the designers and architects, as in many cases it involved repurposing the crafts skills to create unprecedented artifacts. For example, stonemasons employed in The Wada project traditionally created stone lamps, however their lamp-making techniques were utilized to create innovative stone bricks.

5. Paradigm shift for designers and craftsmen: The paradigm shift necessary within the crafts community, as well as in the cerebral framework of designers and architects working on the green building projects, to envision their designs in a fundamentally novel context was a challenge. For example, the use of cow dung flooring in a contemporary residence Farmer's Abode was a conceptual and intellectual experiment for the craftsmen, but also for the design team involved in the project.

4.   Recommendations for Professionals, Industries and Policymakers

These lessons engendering from crafts integration in building design at a regional scale, in collaboration with the building trends developing in India, make the role of a green building more vital than ever before. All stakeholders playing their part in the development of these buildings are integral to the process of making the green construction process sustainable, inclusive, and equitable.

4.1 Recommendations for Designers, Architects, and Green Building Practitioners

The following recommendations to strategically address the issues mentioned in Chapter 1 and 2, and tested on a regional and a project scale as outlined in Chapter 3, can form the next phase of this effort of crafts rejuvenation through green building designs.

1. Integration in the design brief: The integration of crafts in design solutions should be in the forefront of the design thinking of architects and designers from the inception of the project. When the client approaches the design professional with a project, that interface offers the very first opportunity for the architect to introduce the client to the idea of integration of crafts, and economic implications of such strategic design decision.

2. Holistic design intervention: Each project should go through a phase of local and regional design intervention. The design team could evaluate vernacular crafts options available to them, before ruling out the adoption of such approaches as green building design measures.

3. Process documentation: Once integrated, the design, development, and construction processes could be well documented. An in-depth documentation of implementation challenges and impact study of crafts on the project's economics, aesthetics, and environmental performance could be instrumental in the reuse of such crafts by others.

4. Dissemination of best practices: A candid and comprehensive study of projects can only be useful if the results of crafts integration model efforts are disseminated to peer practitioners. Often designers and architects are worried about intellectual property rights of their design solutions, as well as industry-wide imitation of their creative acumen. However, making the process of crafts reintegration open-source and democratic can benefit all actors involved.

5. Collaboration with higher education: Colleges and universities are core to how the future of the building, and specifically green building, industry will unfold. The practitioners innovatively employing crafts in their designs should focus on how their learning could enrich the design education in the country. Instilling the understanding and aptitude vis-à-vis holistic design thinking within students of construction technology, architecture, and design fields will be the most effective way to rapidly advance the sustainability discourse.

4.2 Recommendations for Construction and Green Building Industry

1. Creation of links between markets: The green building industry should rethink the definition of and its propriety on green building, to create and cultivate linkages between the domains of construction, crafts, and creative professionals.

2. Investment in research: The building industry, and influential organizations and associations representing it, should invest in research activities to evaluate the true environmental and socio-economic impacts of crafts regeneration in green buildings versus the adoption of high-technology focused, international models of green building designs.

3. Strategic and long-term partnerships with crafts clusters of India: Instead of viewing crafts integration as a one time/one project effort, recognizing and reinforcing it as a long-term strategic partnership with crafts communities and clusters could assist in garnering necessary attention, investment, and awareness from the society, industry, and the government.

4. Review and revision of green building rating standards and systems: To emphasize and incentivize the use of vernacular crafts and further adoption of regionalist approach, the existing green building rating systems and standards must be radical in their approach. A mere imitation and minor tweaking of western models of green buildings will not be sufficient to propagate necessary market force for this process.

5. Promotion and recognition of green building efforts integrating crafts: Industry experts and organizations hold credibility and control over what products and services should receive attention of the market. If these industry-related entities were to embrace vernacular crafts as a strategic priority, then the societal awareness and demand of such crafts products and practices could be made robust and reliable.

6. Patronage of model projects: Industry-lead funding will be imperative in commissioning and creating model projects to experiment with clever reintegration of dying vernacular crafts.

7. Public-private partnerships for policy development and program implementation: One of the most important next phases could be industry's pronounced role in policymaking. Upon following the recommendations outlined above, the building industry can prove instrumental in generating a policy effort to address the livelihood stresses on crafts communities.

4.3 Recommendations for Policymakers and Government Entities

The policymakers within the government entities such as The Office of the Development Commissioner within the Ministry of Textiles, the Ministry of Housing and Urban Policy Alleviation, and Ministry of Rural Development, to mention a few, must launch a collaborative effort to address the issues of livelihood regeneration of crafts communities. As the challenges facing the livelihoods are multidimensional and multi-sectorial, so must be the solutions that address them. Some of the immediate next steps could include:

1. Creation of evaluation and analysis framework for continual examination of existing policies focused on crafts rejuvenation,

2. Assessment of current incentives offered to green building industry,

3. Allocation of resources to develop and maintain a thorough crafts digest in the context of each craft's potential for integration in the green building practice,

4. Regional repositories of price structures and directory of contact details of craftsmen; and,

5. Research and development of multi-sector incentive-based mechanisms to support and reward green building projects that successfully revitalize crafts in urban and rural regions.

5. Conclusion

As India enters an era of infrastructural growth, its emergent building industry is at the forefront of the development dialog. On the flip side of this reality are the struggling livelihoods and economic inequalities embedded within India's vast population. A significant section of this population depends on vernacular and rural crafts to generate a living wage. However, the hijack of the industrial definition and production of building components, materials, and systems, is jeopardizing the livelihood capacities of once thriving crafts communities of India. A strategic reintegration and redefinition of crafts in the contemporary building sector during its quest for green practice can propagate a synergistic and symbiotic ecosystem for buildings to evolve as environmentally and economically sustainable entities, and for struggling at-risk crafts populations to emerge as viable resources in the process. With the advent of globalization, there are opportunities and avenues for vernacular crafts and building technologies to become relevant and instructive, not only locally, but also globally.

A collaborative effort of individual practitioners, industry at large, and policymaking bodies can allow for vigorous programmatic interventions and policy initiatives to incorporate the struggling vernacular crafts into building and infrastructural vision for the nation. Only an equitable and inclusive growth ensuing from such cooperative and collaborative approaches can ascertain sustainable and stable development for the vastly diverse and deeply valuable cultural heritage of India's crafts communities.

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