Initiation of a framework for closed-loop, integrated design and planning for the simplest of building types, vernacular structures

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INITIATION OF A FRAMEWORK FOR CLOSED-LOOP, INTEGRATED DESIGN&PLANNING FOR THE SIMPLEST OF BUILDING TYPES, VERNACULAR STRUCTURES

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Abstract

The purpose of this review is to promote a framework for the diversification of the built environment, where adequate human shelter can be more readily available. Shelter will be required as the effects of climate change impact more people around the world. The commonalities that are shared among these structures worldwide give reason, as to their importance, and as humans begin to familiarize themselves with descent culture; models for sustainable living that are found in nature. (Holmgren, 2002) Vernacular structures prove that it is possible to build safe, dependable and cost-effective shelter without negatively impacting the surrounding environment. These structures require further analysis, as they have mutualistic relationships with their immediate environment. The review looks at how planning systems can benefit by embracing the diverse methods of construction found in vernacular structures, and considers the possibility of putting forward a framework of holistic design and planning, that includes these structures. Additionally, current trends in development promote a universal architecture, which is one of the main causes of environmental degradation. The review concludes by focusing on international efforts in tackling environmental degradation, through the important and highly publicized issue of “Sustainable Development”, and provides insight as to the recent negligence of vernacular structures.
1. INTRODUCTION

1.1 The Vernacular Structure- Defined

From the Latin word Vernaculus, meaning domestic, native and indigenous. The Encyclopedia of Vernacular Architecture of the World defines vernacular architecture as: “.....Comprising the dwellings and all other buildings of the people, related to their environmental contexts and available resources. They are customarily owner or community built, utilizing traditional technologies. All forms of vernacular architecture are built to meet the specific needs, accommodating the values, economies and ways of life of the cultures that produce them.”

There is no concise definition for vernacular architecture, perhaps precisely because there is a diverse range of such structures, where their functionality ranks as most important in defining them with respect to the environment in which they are located. These dwellings evolve slowly, and are based on actual needs. They are built with locally available materials and deep consideration of the most extreme aspects of local climates.

United Nations High Commission on Refugees (UNHCR) and UN-HABITAT agenda are the only international entities within the framework of the United Nations that have active programs, and focus on providing shelter. UNHCR in collaboration with the Khaled Hosseini Foundation are making progress in providing shelter that aims is to encourage refugees from Afghanistan to return home. “Without shelter it is impossible for humans to focus on a myriad of other problems that they are faced with today.” - Khaled Hosseini
1.1 Purpose of This Review

This review begins by providing an understanding of the role that the industrial revolution and the subsequent industrial culture have had towards shaping the built environment. Vernacular structures are the most common types of human shelters found in the world, where earthen structures alone comprise upwards of forty percent of the built environment. (Meg Calkins, 2009) The paper identifies the commonalities among these structures and provides reasons as to their significance today. Their significance serves to perpetuate the new closed-loop or cradle-to-cradle (C2C) approach to design and planning of the built environment. Closed loop or C2C approach to design, as defined by William McDonough and Michael Braungart in their book *Cradle-to-Cradle, Remaking the Way We Make Things*, refers to the life-cycle of materials, which will be discussed in greater detail in the following chapter. Knowing more about vernacular structures, with respect to their geography and the materials that are utilized in their assemblage, allows for better understanding of our environment as we seek to improve ways in which we shape societies. Amos Rapoport, in his article titled *Vernacular Design as a Model System* addresses the importance of carefully studying underlying experience and theories through Environment-Behavior Studies (EBS), thereby building on principles learned from vernacular structures, which can later be used as models in design. (See diagram below.)

![Diagram of Vernacular Architecture and Design](image)

**Figure 1**: Gaining Understanding from Vernacular Architecture. (Dahl, 2010)

The primary significance of vernacular structures is that they can contribute considerably towards addressing the top ten most pressing environmental issues of our time. The top ten most pressing environmental issues today, according to acclaimed scientists Daniel C. Esty and Andrew S. Winston are: 1) *Climate Change*; 2) *Energy Depletion*; 3) *Water*; 4) *Biodiversity* and
Land Use; 5) Chemicals, Toxics and Heavy Metals; 6) Air Pollution; 7) Waste Management; 8) Ozone Layer Depletion; 9) Oceans and Fisheries; 10) Deforestation; (Winston, 2009) The built environment or infrastructural development as we know it today is the single largest contributor, in any society, to most of the problems listed above. The illustration below serves to show how most buildings that are in use today impact the environment. This illustration does not include environmental impacts as a result of construction and demolition. Those are discussed separately later, and are indicative of even greater impacts that are rarely accounted for today. Most societies continue to pursue and promote, through established planning systems, the construction and use of structures in ways that are most harmful to our environment. These buildings can be classified as structures that have parasitic relationships with the environment in which they reside, where they reduce the health of the host, the environment. (Holmgren, 2002) Vernacular structures seek out a mutualism relationship with the environment, where both the building and the environment benefit one another. (Holmgren, 2002)

![Environmental Loadings Diagram](image)

**Figure 2:** Typical Environmental Impacts of Modern Day Buildings. *(Santamouris, A Handbook of Sustainable Building Design & Engineering an Integrated Approach to Energy, Health and Operational Performance, 2009)*

This review looks at planning systems mainly as they are being implemented in Advanced Industrialized Countries (AICS) and in Newly Industrialized Countries (NICs). Throughout this review I refer to AICS, NICs and Least Developed Countries (LDCs) as the three main developmental stages of countries. (A.G. Ngowi, 2005) I seek to identify what impacts planning
systems have had on vernacular structures, and to identify how vernacular structures could potentially alleviate the pressure continually placed on planning systems. The general deficiencies of planning systems worldwide are revealed, to encourage reassessment. Specific attention is placed on the state of California and its current trend in environmental planning, to identify why progress towards its planning goals will be difficult. It is widely recognized that the State of California is the most progressive state in the United States in terms of promoting reform of its planning system. The paper concludes by reviewing international efforts towards promoting sustainable development (SD). The weaknesses of the present concept of SD are apparent, and will be discussed. If true SD was pursued and implemented it would serve to benefit vernacular structures and not continue to eradicate them. The international community does recognize and acknowledge that these types of structures are continuing to disappear, yet very little is being done to curb this negative trend.

It is not the intention of this paper to promote the building of shelters that are not structurally sound and safe for human occupancy. In fact, the intention is completely the opposite. To be specific, its purpose is to promote a framework for the diversification of the built environment, where adequate human shelters can be more readily available; Shelters that relate with the immediate environmental conditions.

It is also not the purpose of this paper to “sustain” human development, nor is its purpose to solely focus on human development and neglect the development of other living organisms. Its purpose is to encourage Sustainable Living Systems (SLS). SLS are concerned with encouraging the development of all life through diversification. (Holmgren, 2002) Development through diversification yields strength and resilience, which will be required in the next chapter of human history. The paper also recognizes that human development without adequate shelter is impossible. Shelter and human development go hand-in-hand.

1.3 The Historical Aspects as to the Reasons for the Disappearing Trends of Vernacular Architecture

1.3.1 The Effects of the Industrial Revolution

Prior to examining vernacular structures we ought to understand how we got to where we find ourselves, and provide some context to the past. To make sense of what has been happening, it is important to take a historical perspective, which can help lead us to an understanding of the causes of the disappearance or dismissal of vernacular structures globally.

The Industrial revolution, that started to take shape in the mid 1700’s in England, essentially enabled humans to move from an agrarian based and animal dependent society to one that
was machine based, a society which became heavily dependent on natural resources. (Industrial Revolution, 2010) This signaled the beginning of a new era in human history that we now refer to as Industrial Culture. (Holmgren, 2002) This revolution freed humans from being tied to the land and allowed them spend time thinking and working on things other than the land for the purposes of survival. It profoundly changed the way we live and interact with the greater system of interdependencies on earth. The early industrialists did not see us as being part of a larger system, but rather their views were very specific, in that they searched for practical, profitable, efficient, and one-way solutions. (William McDonough, 2002) Industrial culture has evolved since its early days, and the practical, profitable, efficient, and one-way solutions remain prevalent. The one-way or unidirectional solutions are the single greatest creator of environmental problems in the world today, and they will be discussed in greater detail in the following chapter. (William McDonough, 2002)

The illustration, figure 3 below, from David Holmgren’s Permaculture, Principles and Pathways Beyond Sustainability text, depicts the evolution of the Industrial Revolution and its dependence on population growth and energy use. Although the graph does not provide a scale along the vertical axis, the graph does provide a fairly accurate assessment of industrial culture. It informs us that the stability of industrial culture is dependent on continuous population growth and energy supply, until it reaches a climax; once the availability of energy that is dependent on natural resources peaks, growth stops, and contraction begins. He refers to this as Permaculture or Descent Culture, and it means sustainable living that follows patterns found in nature. Holmgren contends that we have slowly begun to enter into the descent culture. We are beginning to experience a demand for energy that is greater than the supply, and where AICs and NICs have death rates that exceed their birth rates. Additionally, Dr. Manfred Max-Neef’s “Threshold Hypothesis” states that: for every society there seems to be a period in which economic growth (as conventionally measured) brings about an improvement in the quality of life, but only to a certain point— the threshold point—beyond which, if there is no more economic growth, quality of life begins to deteriorate. This is why Dr. Max-Neef and other progressive economists are proposing a new category in the international classification of countries, and this is the under-developing category. Decent culture is upon us.
The industrial revolution took shape over time and affected virtually every aspect of daily human life on earth. It allowed humans to make things faster, in greater quantities, it gave people jobs, allowed them to lead more affluent lifestyles, allowed for greater mobility in travel and movement of goods, and the life expectancy of a human increased considerably. (Industrial Revolution, 2010) As it evolved, wherever it arrived, it was for the most part willingly embraced. Yet given all the immediate positive aspects, of which there are many more than the few listed above, it was realized early on that there was a reckless and destructive aspect to this emerging and prosperous lifestyle, given the heavy dependence on the consumption of natural resources without any checks and balances in place. Pollution of the surrounding environment was becoming ever more evident. (Industrial Revolution, 2010) Moreover, the speed at which the Industrial Revolution took hold, grew, and continues to grow, promotes standardization in all aspects of human activity. (William McDonough, 2002)

1.3.2 Standardization as a Result of the Industrial Revolution

The speed at which the Industrial Revolution has taken shape and evolved has brought about the need for practical solutions; A “one size fits all” approach that allows for the mass production of goods. (William McDonough, 2002) More goods available to more individuals at
lower prices results in greater profits. A desire to standardize and simplify exists, and later becomes a requirement as a result of increased competition. Efficiency and the bottom-line are the most important aspects for survival in industrialized societies. (William McDonough, 2002)

It is the case today that the greater the developmental stage of a country the greater the standardization that has taken root. Established systems of mass production create a vicious cycle in that they stimulate appetites for mass consumption via various marketing strategies, which in turn stimulates further mass production. (Reich, 2001) This is evident in every aspect of human life, and of the built environment AICs and increasingly so in NICs. To use an example from the United States, an AIC, one can observe that structures, communities and residential homes look the same in all areas of the country. For example, the building materials used in single family residential homes of the continental United States, are ubiquitous even though climatic conditions are drastically different. Homes built in the south-western parts of the country, where the climate is arid, and homes built in the north-eastern part, where the climate is temperate, are built of exactly the same materials. We trend towards the development of a universal architectural style regardless of conditions, which serves to eliminate vernacular structures. Standardization is directly tied to our obsession with greater profits in an economic growth paradigm where nothing is more important than the economy.

1.3.3 Depletion of Natural Resources- The First Crisis

The 1970’s and the 1980’s were marked by a debt crisis in LDCs, continued global environmental degradation, resource depletion, and socioeconomic development worsened in many countries. (MacDonald, 1998) The late 70’s were explicitly marked by the first world oil crisis. The natural resource that humans globally are most addicted is oil. People around the world got an alarming introduction to our dependence on natural resources. The situation gave cause for politicians to address the continued and accelerating degradation of the natural environment due to human activity. The environmental movement which started at this time in the United States quickly spread around the world, and it was clear that further regulation was needed with regards to the ways we plan and develop our built environment.

1.3.4 The Technological Age

During the 1990’s humans experienced an economic boom as a result of technological advances that enabled people to be more productive and practical than before. People were able do things even more efficiently, and at lower prices. (Reich, 2001) Lower prices meant more goods available to more people. Technology also allowed for more businesses to seek out cost cutting solutions worldwide. Communication has been made easier as a result of technological
advancements, which effectively has spurred greater globalization. Globalization is conceptualized as a situation where political borders become irrelevant due to the need for further economic growth. (A.G. Ngowi, 2005) Globalization can be interpreted as the expansion of standardization. No longer do goods have to be available locally. The technological age, although beneficial in many ways, is still an evolving culture where we are currently experiencing its negative economic effects. This age has created greater social ineptitude amongst people, where one can even obtain groceries by staring at a screen and clicking a button, rather than venturing outdoors to the local grocery store. We have been more focused on developing objects and their capabilities than we have towards developing people and their societies. The internet is slowly eroding local economies. Further economic growth has resulted in further overall natural resource depletion worldwide.

1.4 The Descent and What to Expect

There are numerous indications that we are headed into the descent culture that David Holmgren speaks of, discussed earlier. The latest world economic crisis, the continued worldwide energy and food shortages, amongst many other problems, indicate that we are in the midst of making a sharp U-turn in the way that we have become accustomed to experiencing life. The findings of The Rome Club, in 1991, four decades since their initial gathering, indicated the most pessimistic of predictions in terms of the way societies are evolving. Due to not being able to pursue further growth, international corporations are driving farmers to commit suicides, in great numbers, for the sake of market control. Even mother-nature continues to send us messages that the industrial and economic growth chapters in human history need to be closed. We continue to ignore these types of findings and warnings in favor of continued economic growth. Making this sudden and drastic change will not be simple, as life has been too good for too many. Current political discourse in the United States and the EU countries provides ample evidence that there is also considerable fear of treading down the path of the unknown. Making meaningful political change on a national scale is difficult when you don’t have a model to follow. The sudden change in life style will constantly require that we reassess our priorities, something that we are currently not accustomed to doing. Humans will always require shelter, and buildings have been and continue to be the primary energy consumers in most countries of late.

One of the first things that requires acceptance by politicians, policy makers and business leaders throughout the world is that economic growth has limits. Nature is also continually treated as a sub-system to the economy, when in fact this should be the other way around. It is imperative that the economy starts to be treated as a sub-system of nature, and that no economic interest can serve to diminish life.
2. CHARACTERISTICS OF VERNACULAR STRUCTURES

2.1 Introduction

Humans have sought shelter for protection from environmental conditions and predators since the dawn of their existence on this planet. These shelters have acted as a connecting link between humans, the environment, and all other life. The transition from an agrarian existence to one of progressive exploitation of natural resources, as part of industrial culture, was when humans lost a degree of awareness of the earth’s interconnected systems. The methods and means by which these types of shelters have been sought and have evolved are diverse yet similar, and exemplify characteristics which are in common world-wide. The features that exist and can be identified as being in common to all of these structures are as follows;

- The use of locally available renewable materials, where they were not used beyond their regenerative capacity;
- Climatic conditions dictate the design and form of the structures;
- Resilient, decentralized and independent of infrastructure;
- Their assemblage is often a social participatory activity that relies on the collective local skills available in a community;
- A balanced, holistic approach to their design is employed.

As countries around the world today contemplate curbing the use of natural resources and reducing their impact on the natural environment, it is clear that these structures can serve as examples, i) for finding ways to build safe, cost-effective and dependable shelter for those that most need it; ii) to learn from them in our quest to find ways to build shelter for humans that integrate seamlessly into sustainable living systems. Providing adequate shelter to those who are needy has a positive affect all of the United Nations (UN) Millennium Development Goals (MDGs), and has the potential of bringing about a complete solution to one or more of the eight goals. UN MDGs will be discussed in greater detail in the following chapter, a review of the international community’s focus on environmental degradation, and how these efforts affect vernacular structures. Second of all, it ought to be required of today’s designers, planners, and policy makers to give equal attention to the overall environmental dynamics into which structures are being placed.

2.2 Typical Materials Used in Vernacular Structure Construction

What makes vernacular structures unique and yet diverse is the wide variety of materials, and combinations of materials, that are used for their construction. The variations in composition, durability, and effectiveness within a single type of material can be dramatic. Virtually all materials that are used for the construction of vernacular structures; are locally available; have
low embodied energy; the materials durability is well understood; have cyclical characteristics that are understood. Embodied Energy or Emergy (as the term was coined and defined by the famous American ecologist Howard T. Odum) is a measure of energy captured by the material in the case of a plant based resource, or the energy used to extract and refine a raw material. (Holmgren, 2002) Emery of buildings refers to the energy that is needed to manufacture building materials, transport them to a site, and construct the structure. (Masters, 2008) Embodied energy should also include the energy that is required to produce the packaging to prepare the material for transport to a site, and to prevent damage during transport. Large amounts of energy are used to produce the packaging for goods and materials for modern construction. Materials with low embodied energy are supplied directly by the surrounding land, and in a majority of cases are nontoxic and nonpolluting. (Meg Calkins, 2009) After these low embodied energy materials have served their useful life they can easily be replaced and returned to the immediate environment where they are reintegrated, or serve as food for the land. Another consideration is Durability, which refers to usefulness, or more specifically, it is the ability of a material to endure the conditions to which it is subjected, and maintain its useful properties over time. (Mora, 2007) Durability is an indicator that is dependent on maintenance, and it can be quantified. (Holmgren, 2002) Good maintenance of materials allows the material to be reclassified as having transcendent qualities. Western anchored Eurocentric thought place great value on the durable or permanent qualities of materials that are part of the built environment. (Holmgren, 2002) If they are to have inter-generational durability, they also ought to be maintenance free. These perceptions are absurd. All materials move through life-cycles, meaning that they have stages and processes in which they cycle. (William McDonough, 2002) Certain traditions of vernacular architecture intentionally design for intra-generational durability. (Holmgren, 2002) This is especially found to be true in tropical regions of the world. With the exception of stone, the durability of most renewable materials is naturally ephemeral. Using naturally occurring and available materials for construction of the built environment is typically a labor intensive exercise, where material processing typically occurs on or in the vicinity of the building site.

Building codes around the world do not address construction methods that utilize materials with renewable qualities, mainly because specific material characteristics may vary from site to site, rendering them impossible to standardize. (Meg Calkins, 2009) Additionally, there is an existing public perception that structures that are built utilizing these materials are not structurally sound. This perception exists as a result of an unjust labeling of these structures in that they are built using the poor man’s building materials. (Bill Steen, 2003) This perception is especially evident in Advanced Industrialized Countries (AICs) and in Newly Industrialized Countries (NICs). It is for these reasons that structural performance of such materials is not well documented, and structural engineers throughout the world are seldom trained to design using these types of materials. Examples are the adobe structures from the Pacific Southwest region.
of the United States, made of earthen materials, which have survived numerous seismic events. These adobe structures are proof that materials in common to vernacular perform as well, or better than materials of conventional building methods. (Meg Calkins, 2009) They ought be considered to be utilized as low Emergy replacements for high Emergy materials. Even though perception of renewable materials is changing in Advanced Industrialized Countries (AICs) a lot remains to be done before renewable materials are accepted and incorporated as necessary supplements to conventional building materials.

2.2.1 Earthen Materials

It is estimated that forty percent of the world’s population lives in earth structures. (Meg Calkins, 2009) All construction methods, utilizing the earth, incorporate soil with some percentage of clay and water. Earth can be molded into virtually any shape or form, unlike most other materials. It combines well with a variety of materials, especially straw and other natural fibers, thereby reducing its weight and enhancing its structural characteristics. Earth suitable for construction can virtually be found everywhere and at low, or no monetary cost. It performs well in a variety of climatic conditions. (Bill Steen, 2003)

Methods of improving soil for earth construction, referred to as stabilization processes in construction jargon, do exist and continue to be documented. These methods are widely varied as natural soil consistency is also widely varied. Most structures made of stabilized soils can be reintroduced as living soil without any environmental consequences. When the stabilizer is Portland cement, reintegration into living soil may have environmental consequences, and in most instances the only option may be to rework the material into another earthen structure. This is however depends on the amount of cement that is used, and the nature of the soil. A soil that is determined to be acidic can benefit from a highly basic, cement-laced material, in that it will balance the pH levels of the surrounding soil.

2.2.2 Stone

Highly durable, non-toxic, and when quarried locally has low embodied energy. It cannot be taken up as food by any other living organism and it is fireproof. (Holmgren, 2002) Using stone as a building material immediately implies that a long term transcendent solution is sought. (Mora, 2007) Working with stone has more to do with puzzle work than with construction, as it is a tedious process. Searching for the right stone takes longer than putting it into place. However, when seeking long-term non-experimental solutions, it makes sense to invest the time and energy that exemplify perfectionism. In vernacular architecture a stone façade, due to
weight and density, is required to be thick, therefore allowing the nights coolness to be stored during the day, and the day’s heat to be kept for the nights. (Dahl, 2010)

2.2.3 **Wood**

If harvested sustainably from non-monoculture forests that do not use pesticides and fertilizers, wood is the most favorable of all construction materials. (Meg Calkins, 2009) Wood is easy to handle and use. It can be integrated into almost every facet of construction. Although there are many varieties which can be used for construction, it generally performs decently in all climatic conditions; decently, because wood is not the best nor is it the worst in terms of durability, thermal qualities, and embodied energy. It is the most versatile of all renewable materials, and for this reason, it has been accepted as the most dominant renewable construction material in the construction industry. However it has been standardized. In the United States for example, Southern Yellow Pine is used in all climatic regions of the country. Its ease of use and handling has given rise to poor construction and unsightly buildings. It remains the only standardized material in modern construction that is grown with solar energy inputs.

2.2.4 **Bamboo**

Bamboo is a grass that can grow in excess of 90 feet and has structural integrity as well as lightweight. There are over 1200 varieties of bamboo, and it is commonly found in regions with tropical and temperate climates, climatic regions where the decay rate of materials derived from living organisms is greater than in other regions. (Bill Steen, 2003) Bamboo however grows very quickly, needing only three to five years to gain structural integrity suitable for building. Therefore in tropical regions where there is a largely outdoor lifestyle, and the threat of floods and extreme weather is frequent, it makes sense to utilize this ephemeral material for construction of dwellings. By utilizing this type of material in these types of climatic conditions, one is prolonging a stage in the materials lifecycle, and is able to assemble structures very quickly. (Holmgren, 2002)

2.2.5 **Thatch**

Thatch is the world’s most common roofing material, and it is often utilized as a façade in tropical regions where moisture and humidity are prevalent. Air circulation through the structure is of primary importance in tropical regions. Thatch can be anything that has been dried and originates as a grass, reed, leaf or tree bark. It comes from naturally grown local
vegetation or it is the remainder of a food crop. Whatever the material, it is important that it not be grown with the aid of nitrogen fertilizers, which speeds up the decay of the thatching material. (Bill Steen, 2003) Thatching is a labor intensive exercise.

2.3 Climate and Vernacular Architecture

Vernacular structures worldwide are characterized by their ability to respond to local climatic conditions through an optimized level of energy and material resource utilization. Availability of local materials and local climatic conditions are the two factors which determine methods of construction and forms that vernacular structures have and continue to take on throughout the world. Other influences on the design and form of structures stem from cultural, social and religious traditions. These influences will be discussed in greater detail later.

All vernacular structures respond to the toughest of local climatic conditions. (Dahl, 2010) Environmental conditions make it more difficult to support human dwellings in some environments than in others. They either serve to respond to the more extreme of either seasonal winter or summer conditions. In all cases these structures are designed such that their envelopes, screens or membranes interact and utilize the outdoor climatic conditions. (Dahl, 2010) Generally four types of climatic classifications exist, and are indicative of how vernacular structures utilize outdoor climatic conditions to stabilize the indoor climatic conditions according to the climatic characteristics of the region. These are referred to as phase offset variations and those are: The Tent, the Cabin, the Stone house and Cave climates. (Dahl, 2010)

The tent climate indicates poor insulation capacity where the indoor climate is directly dependent on the outdoor climate. These types of shelters warm up quickly in the morning and cool down quickly after the sun sets. A phase offset variation does not exist, the indoor climate follows the outdoor climate. (Dahl, 2010)

![Figure 4: Indoor Temperature Follows the Outdoor Temperature. (Dahl, 2010)](image)

The cabin climate indicates better insulation capacity. However the membrane separating the inside from the outside is still relatively thin and permeable. The temperature variation of outside conditions versus inside conditions is delayed by a few hours. (Dahl, 2010)
Figure 5: Slight Phase Offset in Indoor Temperature Compared to Outdoor Temperature. (Dahl, 2010)

*The stone-house climate* indicates considerable mass and membrane-thickness increase in comparison to the cabin climate. The greater thickness allows the membrane to have an energy storage capacity. Membranes such as these are able to store the night’s coolness for the day and the day’s heat for the night. (Dahl, 2010)

Figure 6: Daily Phase Offset Variation. (Dahl, 2010)

*The cave climate* indicates a membrane of exceptional mass and thickness. More often than not one wall of the shelter is thicker than the entire useable space thus creating a virtually stable indoor climate throughout the year. The indoor temperature is the same throughout the year, and there is little to no variation in inside temperature between night and day. In the northern hemisphere, structures that have one wall buried into a side of a hill, preferably the north wall, will accomplish this condition. (Dahl, 2010)

Figure 7: Seasonal Phase Offset Variation. (Dahl, 2010)

The use of thermal mass combined with the use of ephemeral materials is relevant in that it serves to indicate how we are able to manipulate indoor climate as it relates to the outdoor, without external energy input. This is especially relevant to the problems that mankind faces
today. The termite mounds of Africa and Australia are another example of the use of thermal mass principles. Termite mounds are able to control temperatures by utilizing membrane mass and wind. (Dahl, 2010) They have been closely studied by architects, biologists and engineers who are conscious of energy and resource use.

Figure 8 (Above): Termites Maintain Constant Thermal Conditions by Utilizing Outdoor Climatic Conditions. (Dahl, 2010)

Figure 9 (Above Right): Termite mound in Australia. (Wilson, 2010)

It is evident that the tougher the climate, the more characteristic and distinctive the resulting architectural forms. The examples that follow, towards the end of this chapter, serve to substantiate this claim.

2.4 Decentralized and Independent of Infrastructure

Vernacular structures were present prior to the advent of centralized infrastructural amenities upon which modern architecture is highly dependent for its ability to fully function. Amenities available from central sources such as electricity, water, sewage, natural gas and telecommunications are convenient, and humans continue to become increasingly dependent on them. Being highly dependent on centralized essential services is proving a long-term
liability rather than an asset. More people continue to become dependent on infrastructure, while resources on which the infrastructure depends continue to diminish. Additionally, the list of available amenities provided by societal infrastructure continues to grow, meaning that human dependence on amenities for survival is currently increasing.

*Passive Survivability* as a design criterion for buildings that is gaining interest in the US, as a result of the well documented conditions that New Orleanians were subjected to at The Superdome in the aftermath of Hurricane Katrina. (Wilson, 2010) It deals with designing structures that can maintain livable conditions during prolonged failure of societal infrastructure to provide utility services, such as power, heating fuel or water. Given that this design criterion is directly tied to life-safety of the occupants (This is considered to be the most important aspect and purpose of building codes.), it is bound to gain traction. Although this is a new concept, buildings designated as emergency shelters, hospitals and emergency service buildings stand to be the first beneficiaries of this design criterion. (Wilson, 2010)

### 2.5 Construction of Vernacular Structures, a Participatory Activity

Cultural, social and religious factors play important roles in influencing the design of vernacular structures. However what stands out in reviewing these structures is that there is a united approach, exemplified with respect for others. Greed is absent, and the building of a structure is a process in which the entire community contributes and has a role to play. The knowledge behind the erection of a particular type of structure is dependent on an oral history. This involves making small and slow changes, where knowledge by the elders of a community is greatly respected. The older community members have the greatest experience and understanding of the entire process. Understanding supersedes knowledge, which eliminates the desire to horde knowledge, as is the case in modern society.

### 2.6 The Balanced and Holistic Approach to Design

Aesthetic traits of vernacular structures are easily dismissed as not being of particular significance to individuals exposed to modern architecture. These structures have a tendency to be viewed as “not thought out” and lack the element that is commonly referred to as “attention to detail” in design circles. Vernacular structures also blend in with the surrounding, rather than stand out to make an architectural statement, as is the case with modern architecture. Just as in nature, they lack symmetry and precision. It is often the case that statements are made within the structure rather than on the exterior. Since the local environment acts as a primary consultant on the design team of vernacular structures, it should
not come as a surprise that aesthetics are not a primary concern. The vernacular structure is a product of the dynamics that make up the entire environment in which the structure is situated rather than a focused set of trend setting solutions. These structures provide functional and practical solutions to the environment in which they are created.

Very few architectural projects these days begin with an analytical study of a site’s environmental conditions which identify the uniqueness of the site. If such studies were conducted at the onset of a project, not only would the local environment and the dwelling benefit from such a study, but the builder, the dweller and the authoritative agency, would stand to benefit from the discovered knowledge and understanding as well. The visual aspects that we have become accustomed to associate with design cannot begin to encompass the flows, processes, history and anticipated future transformation of a site. There is promise in the fact that we are beginning a trend towards holistic design, which this approach entails. Design teaching today is no longer focused on a single solution to a single problem, but rather it focuses towards balancing a more complex set of problems that are part of a dynamical system, which works together. Real design is about the cycle, while classical design has been about a snap shot in an entire film. The questions that designers ask now are similar to what a builder of a vernacular structure would have asked before starting to build that structure from available materials.
2.7 Examples of Vernacular Architecture

The ensuing examples show that cultures have used stone and other ephemeral building materials to successfully adapt to local environmental conditions. Each of the four examples is chosen from different climatic conditions to show how simple design can serve to make use of the local environment. These examples are intended to serve as inspiration towards designing structures that integrate with the environment.

2.7.1 Example 1: Adobe Block House

Below is a typical earth plastered adobe block house common to the Pacific South-west region of the United States. Walls are typically built thick, allowing the structure to store the day’s heat for the night and the night’s coolness for the day, in this typically arid region. As stated earlier, these centuries’ old dwellings are structurally sound, and are known to have performed well in this seismically active region.

Figure 10: Adobe Block House, South-Western Continental United States. (Bill Steen, 2003)
2.7.2 Example 2: Thailand House on Stilts

This example is from a tropical region where the constant heat, humidity and heavy rain are persistent and where natural disasters such as cyclones, hurricanes, floods and mud-slides are expected. The Thailand House on stilts is specifically designed to stabilize high humidity and mitigate heavy rainfall. The life styles in these types of regions are generally outdoors. The structure is built from light weight ephemeral materials. The structure has an open skeleton construction with light walls and high ceilings. The materials used for construction are wood, bamboo and thatch. Materials in these regions are prone to rapid decay rates, and it makes more sense to let them live out their useful life, rather than constantly having to perform maintenance work. There is also an abundance of rapidly grown materials, such as bamboo, which have structural strength. This structure is designed to ensure the best use of wind for ventilation, by allowing air to move freely through the house and heat to escape through the high thatched ceiling. The stilts upon which these shelters are built protect against moisture, flooding, and provide dwellers with a sense of security from earthquakes and landslides to which this region is prone. Stilts also serve to keep small animals out of the living space. It is for all these reasons that building with ephemeral materials in these types of environmental conditions makes more sense than in any other region of the world. When maintained bamboo structures have been known to have life spans in excess of seventy-five years. (Bill Steen, 2003)

![Figure 11: Cross-section of Thailand House on Stilts. (Dahl, 2010)](image)
Figure 12: Thailand House on Stilts. (Bill Steen, 2003)
2.7.3 Example 3: The Japanese House

The traditional Japanese house, although somewhat similar to the Thailand house, is slightly different and unique. It is primarily constructed of wood, a light weight ephemeral construction material. All materials used in construction are natural and are not finished. Unlike the Thailand house the Japanese house is built to be more durable, and greater attention is given to detail in design. More time is spent indoors in the Japanese house. Just as the Thailand house, the Japanese house is also built on stilts primarily for maximum ventilation, and for protection against moisture and high humidity. Japanese winters are marked by cool winter winds, where a heavier façade is needed. Moveable screens are used to mitigate the cool winter winds. The adaptability to more than one seasonal climatic condition is what makes this structure unique and interesting. This vernacular building is designed to adapt to the high humidity of Japanese summers and cool windy winter conditions. The subtropical climate of Japan is not characterized by an extreme climatic condition. This allows the dwelling to be designed to have chameleon-like characteristics, where the structure adapts to two seasonal conditions. Buffer zones between the outdoors and the indoors are common to the Japanese house. Culture plays an important role in the design. The major religions in Japan are Shinto and Buddhism. Buddhism emphasizes simplicity and connectedness with nature, while Shinto emphasizes animation of nature.

Figure 13: Cross-Section of Japanese House. (Dahl, 2010)
Figure 14: Outdoor View of the Japanese House where the Porch Acts as a Buffer Zone between Indoor and Outdoor Climatic Conditions. (Dahl, 2010)
2.7.4 Example 4: The Maltese Farmhouse

The Maltese Farmhouse or in Maltese Ir-Razzet, is typical of the semi-arid or moderately dry Mediterranean climate. Buildings all around the Mediterranean Sea are characteristically built of heavy locally quarried stone. The Maltese farmhouse utilizes locally quarried globigerina limestone, which is the predominant building material throughout the archipelago. This structure is built to offer privacy and relative safety given that Malta has historically been a stopping point for those who dared to embark on a voyage across the sea. The early structures were further away from the sea, and hidden from direct visibility. However, these structures are mainly designed to protect against the summer heat, where they provide a stable indoor climate throughout the long summer day. Heating of the indoor space is required during the cool humid winter. The scarcity of water made the building of flat roofs mandatory to serve as rain catchment areas. Mediterranean courtyards are common, as they act as buffer zones for outdoor living in the summer, and serve as protection from cool winter winds. Small apertures and shutters are very common, as they also protect from the summer heat.

Figure 15: The Maltese Farmhouse. (Jaccarini, 1998)
2.8 Conclusion

Today most materials are processed off-site, and this is why quantifying embodied energy is continuing to be of greater importance. It is also often stated that building vernacular structures is a labor intensive exercise, but what gets neglected is that material processing happens on-site. Below is an example of a machine that is used to process a construction material on-site. This machine is designed to produce tongue and groove earth blocks at a rate of four to five per minute. (Meg Calkins, 2009)

![Figure 16: TerraBuilt's Portable Green Machine Produces Compressed Earth Blocks at a Construction Site. (Meg Calkins, 2009)](image)

Just as it was important for builders of vernacular structures, prior to industrialization, to understand the life-cycle characteristics of materials for survival purposes, it is just as important to understand them now for the same reasons. Humans prior to the Industrial Revolution, made use of particular stages in the life-cycle of naturally available materials, and sought to prolong a stage in the cycle through maintenance. With the abundance of available resources and with more time available to experiment rather than worry about survival, the Industrial and post-Industrial Revolution era enabled humans to produce materials for which their cyclical impacts weren’t cared for, or were unknown. Famed environmentalist Paul Hawken indicates that of the total volume of raw materials that mankind uses today (estimated to be 500,000 tons) only 6% become usable products. The remainder is returned to nature with little understanding of their impact on the environment. Furthermore, this technological era in which we currently find ourselves, is continuing down a path of one-way experimentation with organic “materials” for which cyclical processes and impacts are further unknown. An extreme
example would be the genetic modification of food. Maintenance of the built environment, that allows materials to have transcendent qualities, is bound to have greater value, as natural resources are depleted and abundant energy declines. (Holmgren, 2002)

Today’s sustainability focused architectural discourse, such as the German-Austrian Passive House Concept, is focused on energy savings and the reduction of CO2 emissions. This is understandable, given that climate change due to CO2 emissions is the most pressing environmental issue of our times, and that buildings are the greatest consumers of primary energy worldwide, when one accounts for both operational energy and embodied energy of a structure. (Masters, 2008) However, approaches such as these minimize energy consumption by creating greater barriers and serve to further separate indoor and outdoor climatic conditions. It is apparent that this is too narrow a response to energy related design, as it promotes further isolation of the shelter from the overall dynamics of the environment. It can be seen as supporting the introduction of air-conditioning systems. The artificial phenomenon of air-conditioned space was never a problem until we solved it by artificially redefining the notion of comfort. The result has been that we now notice when it is missing, but we do not notice when it is present indoors. All of the earlier examples show that thermal comfort can be achieved without the aid of artificial air-conditioning.

Vernacular structures are implementations of climate adapted, and resilient architecture, in the embryonic stage of evolution that requires further analysis by means of a cross-disciplinary approach to further evolvement. It is apparent that today’s designers have a unique opportunity to redefine design of the built environment.
3. WORLDWIDE PLANNING SYSTEMS

3.1 Introduction

Planning, as an organized profession, is relatively new. The forethought and conscious design in layout and function of a community, neighborhood, city, and beyond has existed less than 100 years. (Ellis, 2010) However the first settlements, forms of community living, arose when humans learned how to domesticate plants and animals. These first settlements in what is today Iraq, Egypt and India are known to have thrived since 3,000B.C. These settlements displayed both, “planned” and “organic” urban form, however they required little or no legal certainty on contextual decisions which accompany planning as an organized profession. (Ellis, 2010) So why is it that humans were able to live without planning as an organized profession for 5,000 years, and yet in the past 100 we can’t get enough of it? The past twenty years have been especially interesting in terms of this systemic addiction that we have developed. Planning systems as they are implemented today, serve to acknowledge our addictive behavior, in the form of standardization and lack of diversity in buildings. They serve as a barrier to development. One may conclude that planning systems are rather young, given the temporal scale, and that they should be allowed to evolve slowly to properly take root and be effective. Unfortunately this profession can’t evolve fast enough, and it is imperative that it does.

Planning systems in Advanced Industrialized Countries (AICs) and Newly Industrialized Countries (NICs) guide how the most basic of residential structures are developed. Local planning codes specify, in detail: height, density, setback, permissible uses and other aspects of development. They dictate how development occurs, once a private entity determines if development is to occur. (Langlois, 2010) Prior to the Industrial Revolution planning systems with respect to development of structures were strictly concerned with the safety of structures towards the dwellers. Regulation towards the safety of the built environment is known to have been in existence since 1750 B.C. (Gibson, 2010) However only recently, did planning systems begin dictate how structures are developed, and which materials are permitted for use in construction.

Vernacular structures promote diversification, and integration of the built environment with the natural environment, and can ease the pressure that is placed on planning systems. Reform of planning systems, is necessary such that their purpose serves society and environment equally. The very word “planning” implies the formation of intent, yet professionally it is generally viewed as being reactive and laden with bureaucracy. Vernacular structures, and the knowledge behind them, are likely to be diminished, given the current trends towards disintegration in planning systems. Disintegration of planning is a result of the complexity of planning as it is today. An example as to how planning reform is being tackled in California with respect to global climate change clearly demonstrates disintegration due to complexity, and
lack of focus towards the real problems that societies around the world face. My motive for investigating planning in this manner, and with some focus on the United States, is not to celebrate its deficiencies but to move planning towards acceptance of descent culture. This can be viewed as the beginning of the constant reassessment and monitoring of progress that is required in the descent culture. (Holmgren, 2002) It is apparent that it is not enough, to simply regulate how we develop the built environment. This review is focused on planning systems, as they have been implemented since the advent of the Industrial Revolution.

3.2 History of Planning Systems

As the Industrial revolution took shape, there was the immediate realization of a need to separate industrial and residential development. This realization led to the formation of regulating entities, as branches of government that are tasked with controlling developmental activity. Zoning plans were first introduced in Germany in the late nineteenth century, when technological and economic progress gained momentum, resulting in the need to keep residential and industrial development separate. (Gardenvist, 2010) Economic growth, infrastructure, and land-use were the first priorities of planning, and to date remain the main priority of planning world-wide. (McDonald, 1996) The first steps towards definitive protection of the environment was introduced in the United States in the late 1960’s, and early 1970’s, as a result of further realization of the reckless and destructive patterns of industrial culture.

3.2.1 Introduction of Environmental Planning

Public outrage and frustration that environmental objectives were not being considered in society led to the establishment of Environmental Planning as a branch of government in the United States. It is widely believed that Rachel Carson’s book of 1962, Silent Spring, focusing on the now banned pesticide DDT, and the public uproar in the aftermath of the events on The Cuyahoga River in Ohio in 1969, resulted in the development of environmental planning in the United States. (EPA, 1985) The United States became the first nation to enact and establish a national environmental planning policy, now known as the National Environmental Policy Act (NEPA) of 1969. (EPA, 1985) It is very important to note that environmental planning was established as a separate entity from mainstream planning. This meant that planning as a profession now followed two separate tracks in the United States. Mainstream planning is concerned with economic growth, infrastructure, and land-use. Environmental planning, is concerned with environmental impact assessment (EIA), pollution control, environmental quality standards, and natural resource management. These planning entities remain as separate branches of government in most countries. (McDonald, 1996)

At the same time that the United States introduced NEPA, it unsuccessfully attempted to introduce a national land use policy act. (McDonald, 1996) Had the United States successfully
introduced the National Land-use Policy Act, planning world-wide would unquestionably be more integrated, organized and more anticipatory. Instead the United States has a piecemeal collection of federal programs related to environmental, economic, infrastructure and land-use planning. These federal programs include: pollution standards, housing, resource management, endangered species, and others. Both branches of planning remain in place as an absolute necessity, as command and control tools, given the vicious cycle of natural resource depletion and pollution, that has been persistent since the onset of the Industrial Revolution. Other countries, especially those that fall under the category of AICs and NICs have similarly structured planning systems. Least Developed Countries (LDCs) do not have established planning systems, and issues of land ownership remain as dominant and contentious issues.

3.3 Purpose of Planning Systems

Forming intent, which planning is meant to do, has an anticipatory dimension. The intent is to serve global communities as a protector and promoter of life on earth, by directing growth of local developments. Developmental planning across the world is supposed to articulate visions and provide foresight for development. Planning systems provide approvals for proponents to develop the built human environment and alter landscapes of a site. Planning systems are meant to provide guidelines that are supposed to simplify and streamline the development process. They are meant to make the process less cumbersome for both the planner and the developer. It is known that developments can have environmental impacts off-site, and the intention of planning systems is to address and mitigate potential issues ahead of time. The EIA has served as a valuable tool in curbing out of control development. (McDonald, 1996)

3.3.1 The EIA as a Planning Tool

The EIA is a tool that was derived out of NEPA in 1969. (EPA, 1985) It is a systematic process that examines the environmental consequences of larger planned developments; including housing. Its emphasis is on the prediction and prevention of environmental damage through mitigation. Mitigation of environmental impacts is an important stage in any EIA process. (Kiesecker, 2010) The EIA has been an essential safety net in preventing larger projects from being developed in such ways that would have grave environmental impacts. (McDonald, 1996) The concept of the EIA has spread globally, and it remains as the only essential tool by which the environment is taken into account in project approval. Zoning plans that incorporate smaller residential dwellings, such as the vernacular structure, undergo an EIA process which
determines the zoning regulations that are to be established for a zone, slated for development. (Gardenvisit, 2010)

3.3.2 The Problems with Planning Systems as Implemented Today

Planning systems continue to become more complex as a result of accelerated developmental growth. As the world population continues to grow and standards-of-living continue to rise, the demand for land to be developed increases. (Ajay Garde, 2010) The less ecologically sound land that remains means greater pressure on the planning profession to make decisions that are centered on economic growth. The constant evolution of the built environment is an integral component to continuous economic growth. It is estimated that US$22 trillion will be invested to support increased infrastructure development by 2030, mostly in NICs. (Kiesecker, 2010)

Planning is reactive, in that changes to projects approval only occur after a problem has been encountered with a previously approved project. Planners implement regulations based on standardization and knowledge gained from previous similar projects, and by means of a worst-case scenario approach. (William McDonough, 2002) In other words this kind of approach concerns itself with avoiding the worst rather than planning for the best outcome. (Gardenvisit, 2010) To planners this approach is convenient in that it serves as a protection for unintended consequences and prevents possible litigation. The developer constantly searches for cost-cutting measures, including loopholes in the system, to improve efficiency and complete projects on time and on budget.

3.3.3 The Problem due to the Separation of Mainstream and Environmental Planning

The separation of mainstream and environmental planning, along the horizontal scale, has caused the two branches of government to grow further and further apart theoretically, legally and administratively. (McDonald, 1996) Legally, the two branches have continued to compete for control and power. Based on anecdotal evidence, the resulting administrative process can be painfully bureaucratic, where many permits may be required for a development, and where compliance requirements may vary amongst agencies. Progress towards integrated planning, as a result, continues to become more difficult to achieve. This organizational structure, which on the surface appears deliberate and well thought-out, is truly a piecemeal and outdated organizational structure.

3.3.4 The Problems with the EIA as it is generally Implemented Today

The EIA process is not implemented directly in the case of smaller projects, such as residential structures. However, it is worth examining due to the interdependent nature of the environment. It is applied on a project by project basis for larger projects, where it does not
take into account the cumulative effects of many projects. (Kiesecker, 2010) It is also a reactive tool that mitigates problems based on previous negative outcomes. It is a tool that is more often than not marginalized in favor of short-term economic growth. (Kiesecker, 2010)

A Statement of Overriding Considerations is all too familiar to planners, politicians and policy makers. This statement is often used to sideline the identified environmental impacts in favor of job creation. Zoning plans and regulations, as they have been implemented, restrict land-use diversity. In the case of housing, this not only means that the end result is economic segregation, but that there is natural segregation in terms of living organisms. The EIA is not utilized in securing improvements to a project design. For example, it is not used to determine which materials would have least impact on the natural environment with respect to a particular development. The EIA has only served to slow down the course of environmental catastrophe, as a result of societal obsession with economic growth.

The EIA may be viewed as a stepping stone in policy making that now needs reform. Therefore, what appears to be more applicable for smaller projects and their cumulative effects is the Life Cycle Assessment (LCA) tool, given that we are beginning to consider the cyclical characteristics of materials, and their environmental impacts as descent culture takes hold.

3.4 Life Cycle Assessment (LCA)

LCA as it is employed today, is the most comprehensive approach towards analyzing environmental impacts of a system, which includes building assessment. When applied to buildings, LCA focuses on building materials, specific aspects of a building system, or a specific stage of a building’s life cycle. It consists of a set of systematic procedures that quantify the inflows and outflows of energy and other resources throughout its total life cycle. The specific stages of a structure’s life cycle include the construction, use, and demolition stages. LCA recognizes that all of the stages have environmental impacts that need to be identified, quantified, analyzed and improved. The areas which LCA is most concerned with are resource use, human health and ecological consequences. (Santamouris, A Handbook of Sustainable Building Design & Engineering, 2009)

Modern LCA methodology is based on the standards developed in 1991 by the Society of Environmental Toxicology and Chemistry (SETAC). However, this method of evaluation of a system has been around for approximately 40 years, when the oil crisis of the 1970’s triggered an advancement in developing such studies. It initially focused on energy related issues and analyses. In the US the initial method became known as the Resource and Environmental Profile Analyses (REPAs), and in Europe this method became known as Ecobalance. A few years later the International Organization for Standardization (ISO) released the standard series ISO 14040 on LCA, as a supplement and expansion of the ISO 14000 series on environmental management. ISO 14040 is based on the SETAC methodology. Due to the dominant
international status of ISO their standards have superseded the SETAC standards. The latest version for ISO 14040 standards were released in 2006. (Santamouris, A Handbook of Sustainable Building Design & Engineering, 2009)

![Diagram of LCA Methodology]

*Figure 17: The Application Phases of the LCA Methodology. (Santamouris, A Handbook of Sustainable Building Design & Engineering, 2009)*

### 3.5 The Vertical Scale Problem in Planning Systems

The average planner, working in a local community, has a tendency to overlook or turn a blind eye to potential environmental impacts. The basis of this perception is that efforts to curb environmental degradation locally will be thwarted due to the bigger problems that already exist on a larger scale. Unfortunately, there is no incentive for planners to “Think Globally and Act Locally”, in fact they are discouraged and restrained from thinking in this manner. Planners are also restrained, as they have become accustomed to thinking in the globalized, “standard” way, and are ignoring the localized attributes that must be protected. These localized attributes have given vernacular structures their diversity and uniqueness in relation to place over time. This is a case of giving new meaning to the Precautionary Principle by local planning agencies, and not allowing freedom to act within a distinct set of parameters. This can be attributed to a lack of command structure that links the different levels of planning.

The main point is that there are impacts as a result of decisions that are made on all levels of the vertical scale of planning systems. The earth is a closed interdependent system that has no boundaries related to our political boundaries. The current disjointedness along the vertical scale is paving the way for a global scale tragedy of the commons. In other words the sources of pollution may be located in one area of the world, and the consequences are felt in a completely different area of the world. Interdependencies of planning systems on the international level have only begun to be recognized through a hodgepodge of international
treaties. The entire global economic system is increasingly more dependent on the movement of goods, resources and energy. The conventional thinking of a local planner that realizes this economic interdependency, is that the problem is too broad for him to exert any influence.

So the key question is; how does the world, the nation and the community, begin to address the problems that exist along the vertical scale. The answer to this spatial scale problem lies in creating, reforming and defining powers and responsibilities amongst all institutional structures. Defining institutional structures and assigning responsibilities, as outlined in the table 1 below, would signal the beginning of solving the spatial scale problem of planning.

Table 1: Institutional Assignments for Planning Along the Vertical Scale. (McDonald, 1996)

<table>
<thead>
<tr>
<th>Level</th>
<th>Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global</td>
<td>Elaboration and enforcement of international agreements on the global atmosphere, biodiversity,</td>
</tr>
<tr>
<td></td>
<td>transboundary environmental issues, environmental issues, poverty alleviation, trade, security</td>
</tr>
<tr>
<td>National</td>
<td>National policies and laws on natural resources, trade, biodiversity, basic human needs, equity</td>
</tr>
<tr>
<td>Regional</td>
<td>Regional policies and laws on natural resources (especially water, nature conservation), waste</td>
</tr>
<tr>
<td></td>
<td>management, transportation, and social development</td>
</tr>
<tr>
<td>Local</td>
<td>Local policies and plans on community development, nature conservation, and waste management</td>
</tr>
</tbody>
</table>

Decision-making difficulties increase as you add layers and move further up the scale, therefore it makes sense to start on the smallest of levels and work up. From a realistic perspective, it is worth noting that, European efforts in this exercise of integration have an additional vertical assignment that includes the responsibilities of the entire union, which falls in between the national and global levels in the table above. Therefore one would expect that as the European Union nations move closer towards vertical integration their job is expected to become more difficult than that of a large nation like the United States, Canada or Australia. Nations like the United States, Canada and Australia have additional vertical assignment layers that fall between the regional and national assignments, the state or provincial levels. Smaller nations such as Malta would be expected to achieve national vertical integration rather quickly, where other larger nations could use their experience to achieve integration along the vertical scale. In any case achieving integration along the vertical scale will not be a simple task, where constant reassessment, and monitoring, of planning systems will be required.

The lack of a coherent integrated planning system in the United States makes the existing system more complicated and more difficult to interpret. The end result is an endless array of overlap in terms of local, state, and national laws that in reality does little to stem the
proliferation of development with negative environmental consequences. The list of voter approved big ideas for which funding has not been established continues to grow. These big ideas are not systematically vetted, such that projects can integrate neatly into all levels of a vertical scale.

3.6 Example: The State of California, USA

California is the state with the highest population in the United States, and Californians should have particular interest in integration of its planning system along both the vertical and horizontal scales. Southern California alone is expected to have its population increase of 5 million by the year 2030. (Ajay Garde, 2010) Population growth will undoubtedly fuel increased land-use. It should also be noted that states in the United States have substantial independence as to how they develop their planning systems. The vertical scale exists in the United States however the responsibilities are not clearly defined. There is a considerable amount of ambiguity with regards to jurisdictional control, resulting in frequent legal mediation. California, for example has its own Environmental Quality Act (CEQA), which was passed months after congress passed NEPA in 1969. The two measures are so similar in nature and structure that California court cases have held that Federal Cases interpreting NEPA can be used in interpreting provisions in CEQA. (bgpappa, 2009)

As a testament to California’s progressive stance in the union, in 2006, California governor Schwarzenegger signed state Assembly Bill 32 (AB32), known as the Global Warming Solutions Act. The overall measure requires that the state reduce its carbon emissions below 1990 levels by 2020, putting California into near compliance with the provisions of the Kyoto Protocol. (Legislature, Assembly Bill 32: Global Warming Solutions Act, 2006) This also stands as an example of how in the United States, states are going out and doing things on their own. Part of the Act was an executive order by the governor, S20-04, which calls for the greening of all state buildings. As a result, The California Building Standards Commission (CBSC) introduced CalGreen requiring that new state buildings, both commercial and residential, be built in a “green” fashion beginning January 1, 2011. This is the nation’s first green building code applied on a statewide scale. This code will not apply to all construction on the lower levels of the vertical scale. This code strictly applies to new construction that is being built with state funds. (Defendorf, 2010) Again, this is an example of non-alignment along the vertical scale of planning systems.

With regards to the greening of newly proposed communities in California, Senate Bill 375 (SB375) is supposed to enhance California’s goal of achieving AB32 goals, by promoting better planning. (Legislature, Senate Bill 375: Redesigning Communities to Reduce Greenhouse Gases, 2008) A fine idea, but in speaking with local City of Los Angeles environmental planning officials, I am told that they are required to implement a bill for which they have no guidelines.
California state senate bill 1445 (SB1445), introduced on February 19th 2010, is intended to create a funding source, such that planning entities can be assigned to identify ways of implementing SB375. (DeSaulnier, 2010) As of this writing this bill has not passed, and planning officials do not have guidelines as to how they should implement SB375.

The primary concern of all the subsequent bills to AB32, and the reason as to their drafting, was to, avoid litigation, rather than aid planning officials in decision making. (bgpappa, 2009) The CEQA environmental policy enhancement, for example, has been driven by the judiciary, rather than the legislative and administrative processes, which is a problematic phenomenon. (bgpappa, 2009) Additionally, politicians continually call for the suspension of AB32 until the economy in California has been revitalized. The continued result is inaction in terms of implementing a planning system, whose main purpose should be to enhance nature rather than promote economic growth.

### 3.7 Conclusions and Implications for Vernacular Architecture

Today’s planning systems, are primarily focused on preventing further pollution, and their existing methods to control development and protect life are limited and disjointed. Their attempt to control development is ever so important, yet their ability to implement viable solutions is characterized as reactionary. Evolvement of planning systems has been dictated by the direction in which AICs have moved. Worldwide implementation of the EIA is a case in point. As a result, planning systems have sought to encourage standardizing the methods of development. Nowhere is this standardization more evident than in residential buildings in AICs and NICs. Unfortunately, environmental conditions can vary from site to site, and this diversity in conditions ought to be recognized and utilized to benefit the entire system.

Having the LCA supersede the EIA should be considered as a preliminary step, where the EIA is a sub-category that is additionally utilized when a development is expected to have negative environmental impacts. Structures that utilize ephemeral materials, and are known not to have negative environmental consequences would not require an EIA. Planning systems require constant evaluation and revision if they are going to continue to have meaningful value. Solutions that are intended to allow humans to build simple, safe and diverse structures, having mutual relationships within the environment in which they are integrated, ought to be rewarded. Vernacular structures would promote diversification in the landscape, and relieve planning systems of the burdens they currently have.

Lastly, much has been made of alternative development approaches, such as, New Urbanism and Smart Growth, in AICs. However this reform of planning systems is not enough to make a noticeable and improved impact towards curbing Green House Gas (GHG) emissions. Any discussion of reform of planning systems ought to be more radical, as buildings contribute 40%
of overall GHG emissions worldwide. Reform should include vernacular structures, as they
remain as the most common type of shelter worldwide.

4. CURRENT FOCUS OF THE INTERNATIONAL COMMUNITY

4.1 Introduction

Politicians, world business leaders, and policy makers, who operate on the international level,
have realized that there are continued negative environmental consequences due to the
unidirectional approach of industrial culture. As a result there has been a considerable
international effort towards integration of planning along the vertical scale. It is an effort that
emphasizes integration of planning systems by means of a bottom-to-top approach on the
vertical scale, (See Table 1, Chapter 3, Worldwide Planning Systems), and the concept is known
as sustainable development (SD). International discourse today with regards to SD is very much
tied to shelter in its vernacular form, however it is seldom mentioned.

Additionally, adequate shelter in its most basic form, is not provided in a proactive manner to
areas where it is needed the most. Educating the public as to how to create their own shelter in
disaster struck areas is not being considered. The country of Haiti serves as an example of the
international community’s failed efforts in assisting the provision of adequate shelter to the 1.5
million people who have been affected as result of a strong earthquake in January 2010.
Furthermore, sea levels are expected to rise as result of melting ice and thermal expansion of
water. If sea-levels rise up to 3 feet, which climate scientists expect to happen, the low lying
and heavily populated country of Bangladesh will be submerged under water. (Pollack, 2010)
The people that were displaced as a result of Hurricane Katrina are a small group, in
comparison to the potential displacement that this effect of climate change may produce.
Provisions for displaced people as a result of natural disasters, failed states or political struggle
are not being made internationally.

There is an ample amount of literature and debate concerning a clear and concise definition for
SD. However, there is little discussion about the premise that development’s primary focus
ought to be about people and all life in all of its manifestations. This discourse should not place
economic interests ahead of living things, as is currently the case. A great amount of tension
continues to exist between environmentalists and business leaders as to how SD ought to be
pursued. Business leaders believe that commerce must seek growth in order to perpetuate
itself, and environmental conservationists believe that a no-growth policy ought to be
instituted to preserve nature.

As shall be reviewed here, Agenda 21 is a testament that progress can be made, although it is
slow and misdirected. All humans seek to improve the quality of life, and development ought to
be about enabling people to improve their lives and the lives of their communities. The next step in International negotiations towards so-called SD will require that economies be sub-systems of nature. If it were to become widely accepted, that economies are sub-systems of nature, only then will vernacular structures be accepted as a strong weapon in fighting all forms of environmental degradation that exist today. SD as it is being discussed, negotiated, and implemented, amongst countries today ought to include vernacular structures. Buildings contribute 40% of Green House Gas emissions, the biggest cause of environmental degradation today. (Masters, 2008) (Winston, 2009) The following historical account regarding international negotiation towards implementation of SD serves to prove why this is the case, and why vernacular structures remain removed, and threatened due to the focus placed on economic growth internationally.

4.2 Historical Context of International Focus on SD

While it cannot be concluded that the international community became focused on environmental depletion by simply following in the footsteps of the US, it can be concluded that something had to be done, given the changes that were taking shape. In 1972, shortly after the United States introduced NEPA, the United Nations Conference on The Human Environment (UNCHE) in Stockholm Sweden marked the beginning of international concern and action on environment and development. (MacDonald, 1998) Very few nations at the time had any experience with environmental management, and this conference prompted the establishment of environmental ministries in many nations around the world. (McDonald, 1996) This marked the beginning of the realization, that natural resource supplies used for fuel were not endless, and the recognition that environmental degradation was occurring as a result of the use of these different types of fuel. SD is a term that in 1980 initially became popularized from an ecological perspective, in promoting conservation. The World Conservation Strategy (WCS), a combination of the United Nations Environment Program (UNEP), the International Union for Conservation of Nature (IUCN), and the World Wide Fund for Nature (WWF) is credited for popularizing the term. (McDonald, 1996) The WCS recognized that there was an intimate link between poverty, economic growth and the natural environment. However it did not explore the interdependencies between the three conditions. The WCS’s report was firmly anchored in the natural environment.

1983 marked the beginning of exploring SD in an interdependent fashion, recognizing the link between the social, political, economic and ecological conditions. (MacDonald, 1998) No longer was SD solely viewed in terms of ecological criteria within the international community. The discussion from this point on, was included this broader set of conditions for SD. Amongst champions of SD, this is known as the “triple bottom line”, and through this approach they have
managed to achieve many positive effects in incorporating sustainability concerns into the global economic growth paradigm. (William McDonough, 2002)

This resulted in the UN’s decision to appoint an independent commission, known as the World Commission on Environment and Development (WCED), to take a fresh look at environmental and developmental issues globally. The resulting report, *Our Common Future*, also known as the Brundtland Report, published in 1987, reviewed the global situation and presented a strong case for the need to take greater action in addressing the accelerating pace of development, resource use and environmental degradation. (UN, 1992)

Table 2: Conditions for Sustainable Development. *(McDonald, 1996)*

<table>
<thead>
<tr>
<th>Ecological Condition</th>
<th>Compromising future generations ability to meet their needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Condition</td>
<td>Meet the basic needs of all people and extend to all the opportunity to fulfill their aspirations for a better life</td>
</tr>
<tr>
<td>Political Condition</td>
<td>Effective citizen participation in decision making</td>
</tr>
</tbody>
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The Brundtland Report caught the world’s attention, and is often referenced as being one of the more important documents of our times. The key achievement was that it recognized the impossibility of convincing global leaders to pursue SD unless the concept incorporated social and economic dynamics. Its recognition and importance are grounded in economic growth. The report gave us a definition of SD which is the most widely used today, and states the following:

*Humanity has the ability to make development sustainable-*"*to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs.*" (UNEP, 1992)
The WCED’s report served as a launching pad for the 1992 Earth Summit in Rio de Janeiro, Brazil, which happened to be the largest ever gathering of heads-of-state, a true testament of how effective the WCED’s report was in attracting attention to the evolving situation. (MacDonald, 1998) The success of the conference is debatable, the difficulty and the nuances that come with global diplomacy are unquestionably difficult. The conference did not produce a specific plan of action for SD, however the conference did produce key outcomes: The Rio Declaration on Environment and Development, the UN Convention on Biodiversity, the UN Framework Convention on Climate Change and an agenda for the 21st century, Agenda 21. (MacDonald, 1998)

The Rio Declaration is a set of 27 principles concerning the environment and development. The principles assert a commitment to development and poverty eradication with environmental protection. The principles can be summarized as follows:

- A commitment to development and poverty eradication with environmental protection
- A commitment to the promotion of international cooperation in environmental affairs, trade, and peace based on national sovereignty
- A commitment to defining an implementation process for planning process principles concerning how planning should be done including capacity building, laws, economic policies, and Environmental Impact Assessment (EIA). (MacDonald, 1998)
This last point is particularly of interest here, as it acknowledges that planning as profession globally is in its embryonic stages and needs to be better defined. Additionally, two principles of the Rio Declaration are of particular interest here:

- **Principle 8**: To achieve sustainable development and a higher quality of life for all people, States should reduce and eliminate unsustainable patterns of production and consumption and promote appropriate demographic policies. (UNEP, 1992)

Principle 8 acknowledges unsustainable patterns of production and consumption. It confirms that unsustainable patterns require reduction and elimination in order to achieve SD. This is an important principle in that it admits that our behavior since the industrial revolution and the economic growth paradigm that is continually exasperated by corporate culture, are unsustainable. (Tauli-Corpuz, 1996) The examples of vernacular structures provided in chapter 2, have proven not to be unsustainable in patterns of their production and their consumption. Allowing, and promoting this type of architecture to be implemented world-wide would noticeably begin to improve environmental conditions immediately.

- **Principle 22**: Indigenous people and their communities and other local communities have a vital role in environmental management and development because of their knowledge and traditional practices. States should recognize and duly support their identity, culture, and interests and enable their effective participation in sustainable development. (UNEP, 1992)

This principle acknowledges that in this reinforcing cycle of striving for prosperity and endless consumption which humanity is caught in, those people who model sustainable lifestyles are being eradicated. Therefore the principle calls for the protection of indigenous people and their communities. Principle 22 is directly tied to vernacular structures and their exclusion from worldwide planning systems. Indigenous people and their reluctance to willingly adopt the economic growth paradigm, is an attribute that has allowed vernacular structures to remain in existence. If planning systems were to accept and incorporate these structures, not only would they be providing affordable shelter to the masses, they would make for noticeable improvement to the environment almost immediately. The Thailand House on stilts, with readily available materials from which it is made of, and the ease with which it is constructed, is an example from chapter 2 that could be adopted in certain geographic areas immediately.

As the conference did not produce a definitive definition for SD, another statement from the Preamble of the Rio Declaration stands out, encouraging the evolution of planning systems. It states the following: “...integration of the environment and development concerns and greater attention to them will lead to the fulfillment of basic needs, improved living standards for all, better protected and managed ecosystems, and a safer more prosperous future” (UN, 1992)
The main vehicle to spell out the implementation of the Rio Declaration was Agenda 21.

Based on this short historical summary, within a span of twenty years the international community has recognized and had chosen, in a united fashion, to vigorously deal with the threat of extinction of all living things on earth. The Earth Summit spread further awareness of the message from The Brundtland Report and produced a framework in the form of Agenda 21, signed by 178 nations, to use as a guide in reforming their national planning systems.

In the last eighteen years since the Rio Summit very little has happened to further sustainable development on the international level, as outlined in Agenda 21. A conference was held in Johannesburg, ten years later in 2002, where there were no further achievements beyond those achieved in Rio de Janeiro. The international community has focused on another outcome of The Rio Declaration, the UN Framework Convention on Climate Change. Along with climate change negotiations, considerable attention has been given to the Millennium Development Goals (MDGs) that will be discussed later in this chapter. SD is a sub-category of the MDGs. Outcomes of the latest MDG conference, held at the UN headquarters in New York City, include working towards a successful SD conference in 2012.

All action with regards to SD since the Rio Summit has been local, with no major breakthroughs. Additionally all international approaches in addressing SD remain centered around economic considerations. Social and ecological benefits are not given equal consideration. (MacDonald, 1998)

4.2.1 Agenda 21 and SD

The significance of Agenda 21 cannot be overstated, even though it is a wordy 500 page document, which is a conglomeration of general statements, within which there is plenty of room for interpretation. It takes a philosophical, broad based approach, and emphasizes the importance of the issues facing life on earth due to human activity. The agreement on the document by 178 nations signified a clear commitment to review national developmental planning structures. The United States is a participant, however, Agenda 21 has never been debated in the U.S. congress. (MacDonald, 1998) Therefore Agenda 21 has not taken root on the national scale in the U.S. Individual states in the union have taken it upon themselves to move towards SD in their own ways, and are not using Agenda 21 as a guideline. (Reilly, 1990)

The entire document impacts planning, and turns the broad principles of SD as part of the Rio Declaration, into concrete programs and projects. Each content area has a problem analysis or basis for action followed by a set of objectives, accompanied by activities or action plans. Each chapter, each program area, and many of the proposed activities, have implications for what
planning goals should be for SD, how planning should be better organized and coordinated, recommended planning methods and techniques, and what planning measures should be used. (McDonald, 1996) It seeks to adopt a local approach to SD by means of a vertical scale that can be tied into a global approach. The document consists of 38 chapters that are divided into four distinct sections: social and economic, conservation and management of resources, strengthening the role of major groups, and means of implementation. (MacDonald, 1998) The document is firmly based on local implementation. Mining and energy were intentionally omitted so that an international agreement can be reached, a testament to the fact that economic considerations commonly trump those of ecology and equity. (Tauli-Corpuz, 1996)

For the purposes of this paper, Chapter 26 of the document stands out and needs special analysis as it directly related the vernacular structure. This chapter is titled, *Recognizing and Strengthening the Role of Indigenous People and their Communities.* (UN, 1992) First it is a step toward protecting the rights and values of people who have not been legally represented in any significant way prior to Agenda 21; people for whom monetary and economic gain is primarily an afterthought. The chapter acknowledges that indigenous people and their way of life continue to be degraded and threatened and that they need protection if they are not to be completely eradicated. (Tauli-Corpuz, 1996)

Second, it recognizes that indigenous people have over many generations developed a holistic traditional knowledge of their lands, natural resources, and environment. It acknowledges under its objectives, that recognizing the values, traditional knowledge and resource management practices is a way of promoting SD. Therefore it can be deduced that this objective is encouraging nations to pursue SD by acquiring knowledge from indigenous people. (Tauli-Corpuz, 1996) Lastly, it is an admission that the current developmental paradigm is unsustainable.

It is unfortunate that Agenda 21 hasn’t taken on a greater role in local planning circles globally because it clearly was a first step forward in integrating the environment with development. It is a testament that common ground can be found between environmentalists and industrialists. However the economy continues to be placed ahead of the environment. Both groups were well represented at the Earth Summit. Industrialists, who seek commercial growth in order to stay competitive amongst fellow competitors, and environmentalists, who view industrialism as a cancer that grows to only fuel itself. (William McDonough, 2002)

### 4.3 Global Trends with the Implementation of Agenda 21

In the 1990’s a number of cities from within the European Union took steps to implement Agenda 21 locally. The city of Berlin in Germany is the largest city to make considerable
headway with the adoption of Agenda 21. (MacDonald, 1998) The results are proving beneficial and positive. However if local government Agenda 21 implementation is to continue to be successful it will need the support of national government policies and programs. Few existing local Agenda 21 efforts are linked to national-level strategies. Europe remains the most active region in working towards the implementation of Agenda 21. However, Agenda 21 has yet to take shape on any national level, even in Europe. Most countries have not begun to tackle Sustainable Development (SD) as proposed in Agenda 21.

4.4 The Millennium Development Goals

The United Nations held a summit in the fall of 2000, where the outcome was the adoption of eight goals by 189 nations, known as the Millennium Declaration. The secretary general of the UN at the time, Mr. Kofi Annan, later commissioned an independent advisory board to develop a concrete action plan to achieve the terms of the declaration. In 2005 the advisory board, headed by Professor Jeffrey Sachs, presented a set of time bound and quantified targets for addressing extreme poverty. These targets are known as The Eight Millennium Goals and they are: 1) Eradicate Extreme Poverty and Hunger. 2) Achieve Universal Primary Education. 3) Promote Gender Equality and Empower Women. 4) Reduce Child Mortality. 5) Improve Maternal Health. 6) Combat HIV/AIDS, Malaria and other Diseases. 7) Ensure Environmental Sustainability. 8) Develop a Global Partnership on Development. Today’s international sustainable development discussions fall under goal number seven of the eight development goals. (UN MDGs, 2010)

Sustainable Development and shelter are specifically addressed under goal number seven. However, it is apparent that providing adequate shelter can be used as a tool in aiding to achieve all of the goals. Goal seven addresses the need to prioritize national urban planning strategies with participation by all stakeholders, promoting equal access to public services, including health, education, energy, potable water, sanitation and adequate shelter. Goal seven addresses the need to promote sustainable consumption and production patterns of resources. Worth noting also is that considerable amount of funding and attention has been directed to the eradication of diseases such as Malaria and AIDS, and considerable progress has been made in achieving this goal. Goal seven emphasizes the need to pursue SD through nationally owned, comprehensive and coherent planning frameworks, for which there is a considerable lack of funding, and educational progress towards improving infrastructure through vertical scale organization. More children die crossing the street, due to poor planning systems in newly industrialized countries (NICs) and in least developed countries (LDCs), than they do from Malaria and HIV/AIDS combined. (Sachs, October 2010) Planning systems are underfunded
Progress towards achieving the goals, after their adoption, has been considerable all around, and the achievement of a majority of the goals may be realized by 2015-2020. The lack of progress in achieving the goals is found in LDCs. There are many reasons that contribute to this lack of progress in LDCs, but what stands out the most is that Advanced Industrialized Countries (AICs) who promised funding to LDCs, have not kept their promises. (UN MDGs, 2010)

4.5 Conclusion

Progress towards SD since the early 1970’s is a clear indication of the will and intent of the international community. The outcome of the Brundtland Report and Agenda 21 would not have been possible without the deal being anchored in the economic dynamic that comprises SD as it viewed today. Intense international negotiation through careful maneuvering produced this progress. The inclusion of the economic component is what allowed the Rio Summit to be considered a success. Encouraging local, or bottom-to-top, integration of planning systems is the correct approach. However, it is evident that further progress in negotiations towards SD will only be possible when key AIC countries accept that the economy is a sub-system of nature.

It is important to note that international attention has shifted to focusing on the MDGs and includes SD as a sub-category of them. Shelter is tied to most of the MDGs. When considering the sole problem of human migration due to natural disasters, failed states or political struggle, all of which are expected to be on the rise, it is imperative to consider shelter as a solution. The vernacular structure is bound to be of help when seeking out possible solutions in particular areas.

Shelter is not dependant on the economic component of SD, rather it is heavily anchored in the social and environmental components of SD. Solidarity of people, respect for others, and the absence of greed is what allowed the vernacular structure to thrive prior to the advent of the economic growth paradigm that is imbedded in industrial culture. Interestingly greed is absent in the absence of money, and when one is left to survive on the basis of what is available. What economists and world leaders are not willing to admit, but have realized, is that growth has limits, development does not. Development is the liberation of creative possibilities that has no limits. So then why do we refer to this attempt to improve environmental conditions for life as Sustainable Development? Are we currently trying to sustain human creativity for the sake of economic growth? As discussed, the international community acknowledges, via Chapter 26 of Agenda 21 that the most vulnerable are paying the highest price. Business leaders, politicians and economists are obsessed with endless growth, and as long as we continue to pursue
endless growth, sustainable living systems will continue to be diminished, and the most vulnerable will continue to pay the highest price. Development is not money dependent, it is a result of people freely living in a healthy environment, interacting with one another both socially and economically in ways that improve the quality of life. A vernacular structure is a component of this system.

5. CONCLUSIONS

Vernacular structures signify that there is a better way to live. Most societies today recognize our obsession with the environmental growth paradigm, and acknowledge that our behavior is negligent towards all living things. The difficulty in addressing the problems lie in knowing which core values to hold on to, and which ones to let go.

Finding a place for vernacular structures in planning systems and international discourse towards sustainable development is an important step in improving living systems. Cyclical characteristics of buildings, and the materials with which they are assembled, are how we should be developing societies nowadays. Development has no limits.
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