SUSTAINABLE OR NOT? A CASE STUDY CHALLENGING TRADITIONAL ARCHITECTURAL DESIGN EDUCATION THROUGH HUMANITARIAN DESIGN

A Thesis in
Architecture

by

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Abstract

A report by UN-HABITAT in 2003 stated that by 2030 there could be 3 billion people living in states of impoverishment throughout the world, requiring the production of 4000 housing per hour. This statistic begs the question of how, in an era of a global economy, rapid advances in communication and computing technology, and increased rates of literacy and education, can such a large portion of the world’s population still be plagued by the basic problem of housing? This thesis suggests that this reality is often the unintentional but inevitable outcome of traditional design thinking models that fail to acknowledge basic principles of the concept of sustainable development. Brought forth as a concept on which to base needed changes in global policy by the Brundtland Report in 1987, sustainable development is changing the way we look at the critical issues of the modern world. William McDonough, architect and advocate for sustainable development, has stated that all models and phases of design require rethinking. He suggests the traditional linear process, a cradle-to-grave paradigm of a design process resulting in an end product should be exchanged for a cyclical, or cradle-to-cradle process that considers the subsequent use and future adaptations of the products of design.

In 2004, the National Architectural Accreditation Board made sustainable design an official criteria of the conditions for accreditation, but examination of this criteria’s definition indicates a manifestation of sustainable development that tries to fit within traditional design thinking models rather than creating new ones. In particular, the definition omits social and economic issues, which are critical to the understanding of sustainable development as encompassing the three interdependent areas of social and economic development and environmental protection. Humanitarian design is the essential architectural discipline that engages social and economic issues, and therefore principles of humanitarian design need to be adopted into architectural discourse in order to realize a complete model for sustainable development. Through the mechanism of a case study, this research therefore examines correlations between architectural curriculum criteria and essential factors to humanitarian design, gathering a body of knowledge on which to inform further development of curriculum models that respond to the interdependent and dynamic qualities of the world’s developing environments. The suggested models embody feet-on-the-ground methods that are manifested in collaborative projects that emphasize extended interaction of designers with local communities and environments, and present a paradigm shift from a linear and individually based design process to one that recognizes the greater community, social and environmental responsibilities of the profession.
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On the road to Ventanilla:

“Manuela, with all the building going on in Lima, don’t you think Peru is becoming more developed?”

“Yes... but at what cost?”
1. Introduction: When Design Fails

In the Sustainable Development era, marked by policy directed towards meeting the needs of today without compromising our ability of meeting future needs, poor planning, lack of forethought, mismanagement and the inability of designers and planners to coordinate the complex and interdependent array of factors influencing modern design problems continues to plague society at large, maintaining cycles of poverty, waste, and disparity that continue to threaten our common future. The era reached global recognition in 1987, when the UN appointed World Commission on Environment and Development presented several global strategies for obtaining sustainable development globally by the year 2000, seeing “the possibility for a new era of economic growth, one that must be based on policies that sustain and expand the environmental resources base … [and] absolutely essential to relieve the great poverty that is deepening in much of the developing world.” Yet after several years of policy implementation that has directed institutions of government, industry, business, and education in the methods of sustainable development, the number people in the world who were either homeless or lived in impoverished housing continued to increase. In 2003, UN-HABITAT reported there were over 900 million people living in such conditions which could triple to 3 billion by the year 2030. Meeting this need would require the production of 96,150 housing units per day, or 4000 every hour; an alarming statistic that begs the question of how, in this time of a global economy, rapid advances in communication and computing technology, and increased rates of literacy and education, can such a large percentage of the world’s population still be plagued with the basic problem of housing?

Consider the situation in Haiti after the 2010 earthquake. The 7.0 magnitude earthquake took the lives of more than 300,000 people, left over a million persons homeless, and decimated the built environment of the capital city, Port-au-Prince. In the following weeks and months, homeless Haitians began establishing informal camps in any open area free of rubble, whether privately or publicly owned, using tarps, scraps of cardboard and wood, or a distributed tent to create some form of shelter. Six months after the quake, there were over one thousand such camps in all of Port-au-Prince, all without any sort of built-in infrastructure. This presented two problems for the Haitian government: first, landowners, after a period of time, began demanding camp residents be evicted by force from properties, causing rising levels of political unrest; and second, the

quickly approaching hurricane season threatened further disaster as many of the informal camps were located in areas prone to flooding and mudslides caused by hurricanes.

The Haitian government, with the assistance of various International NGOs, responded by planning and establishing transitional settlements for the relocation of those persons considered to be at the highest threat of danger. One such settlement, Corail-Cesselesse, was established nine miles north of Port-au-Prince on a piece of an 18,500 acre plot of land planned to eventually house 300,000 people in transitional shelters with permanent facades capable of expanding up to six rooms. Beginning with a few hundred leveled acres, the first camp was equipped with water spigots, latrines, shower stations and some electricity, and outfitted with neat, organized rows of hurricane-proof tents to be exchanged at a later date for hurricane-proof shelters on a concrete slab. But the settlement, initially viewed as a “model camp,” soon became another example of the growing pattern of ineptitude exhibited in Haiti recovery efforts.

Services offered at the camp that most of the city lacked and rumors of job opportunities brought other Haitians, up to an estimated 100,000 persons, to begin settling the countryside around the camp. The job opportunities, however, were still several years off and with no natural source of water or stores close by, the squatters began to poach the camp’s water supply and other services. Aid organizations, conflicted by contractual agreements made to prevent overlaps in servicing camps, were limited in the aid they could give to the squatters, and the government seemingly ignored the situation. Conditions continued to worsen causing political unrest in the camp and fears of a possible cholera outbreak due to poor sanitation conditions in the surrounding squatter settlements. Additionally, because the settlement was located on a deforested plain that offered no shelter from high winds or heavy rains, it was evacuated temporarily in November due to dangers presented by Tropical Storm Tomas, the very dangers the camp was designed to prevent. Furthermore, feuds between the wealthy land-owners who laid claim to the land of Corail-Cesselesse and the Haitian government who were taking possession of the land to move forward plans of a “new Haiti” only prolonged already stalled recovery efforts. Meanwhile, conditions at the camp, as in the rest of Haiti, are slow to improve, leaving some to wonder if the great plans for Corail-Cesselesse are poised to shape the next slums of Port-au-Prince.

In *Housing by People*, John F. C. Turner discusses similar ironies produced by modern urban planning methods in the case of the “supportive shack” vs. the “oppressive house”. The

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“supportive shack”, occupied by a car-painter and his family in Mexico City, was composed of assembled materials claimed from a local dump. Located in the back yard of a godmother’s property the shack, while materially poor, was adequate enough to maintain the health of the family, and tenancy was secure through a godmother/godchild relationship that required no rent and little utility expense. In addition to security provided by the relationship to the godmother, the location was within walking distance to work and school and socially ideal. Moreover, the family’s income was 20% above the subsistence level, which allowed for a small surplus to be saved back for future permanent housing.

In contrast, the “oppressive house” was part of a public housing project occupied by a mason’s family who were relocated from a shantytown that embodied characteristics similar to those described in the case of the “supported shack”. Before being relocated, the family had an income three times the subsistent level in part due to a shop they had built into their house that served tourists. However, shops of this nature were restricted in their new housing project, which limited the family’s potential for income. Although the house was materially and structurally of a higher standard and was equipped with modern services, the total cost of rent, utilities, and transportation exceeded 60% of the family’s reduced income, compared to 5% before the move. Furthermore, the family’s reduced income forced them to cut their food budget by 60%, leading to an unhealthy condition despite their “improved” housing situation.

In both of the examples presented above, design and planning led to conditions that were either the same or worse from the ones they were meant to improve. In each case there were examples of unconsidered factors, such as disputed land tenure and family livelihoods, which compounded to result in negative outcomes, and while the intentions were to improve the living conditions of the respective inhabitants, methods employed did not provide the desirable results. There are those who point to these examples and suggest that design has no place in humanitarian pursuits, but the combination of a global movement towards sustainable development, increased conversation of sustainable and humanitarian topics in the media, and contemporary concerns on the interdependent issues of social and economic development and environmental protection at the local and global scale present the opportunity to evaluate traditional design models and explore avenues for their further development.

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4. The income level of a person, family, or household (living in a cash economy) when they must spend between 80 and 90 percent on food and fuel alone if they are to eat well enough to keep themselves in good health. John F. C. Turner, *Housing By People* (New York: Pantheon Books, 1977), 58.
1.1 PROBLEM STATEMENT: THE FORGOTTEN STEPCHILD, HUMANITARIAN DESIGN

Sustainable development’s official introduction to the architecture industry began a few years after the Brundtland Report via developments such as the creation of the U.S. Green Building Council and LEED and through the writings of architect/authors such as William McDonough. The sustainable design movement, however, did not officially become a part of design education until 2004 when it was introduced into the Student Performance Criteria of the NAAB (National Architectural Accreditation Board) Conditions for Accreditation. Examination of criteria referencing sustainable design, however, leaves doubts that economic and social development issues are as integral to architecture's interpretations of sustainable principles as are environmental protection issues. Furthermore, the absence of descriptive language on poverty or inequality, principle issues discussed in the report by the World Commission on Environment and Development (WCED) and central to humanitarian design projects, illustrate the field’s historical hesitancy to engage the problems. Cameron Sinclair, co-founder of Architecture for Humanity, remembers humanitarian design (the term that addresses issues like poverty and inequality that sustainable design left behind) being “dismissed as the ugly stepchild of the industry” in architecture schools and being told by professors that, “we don’t do that sort of work.”

As chronicled in the chapter entitled “100 Years of Humanitarian Design” in Architecture for Humanity’s book Design Like You Give a Damn, the industry's interest in humanitarian issues has come in waves, with interest often subsiding after a series of unsuccessful endeavors. Take the self-help housing movement for example. Even though participating architects helped mobilize programs, the concept of self-help negated the traditional role of architects, relegating them to mere trainers or, at worst, unnecessary inconveniences; provoking these comments by movement advocate John Turner:

> The certified professional makes a fool of himself and often does a great deal of harm to other people, by assuming that he knows more than the uneducated by virtue of his schooling. All that second- and third-hand knowledge and intellectual exercising does for him, however, is to reduce his ability to listen and learn about situations significantly different from his own social and economic experience – with consequences that can be tragic when he has the power to impose his solutions on those who are not strong enough to resist.

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Turner’s statements on the inability of architects to relate to the social and economic situations of the persons and people groups central to humanitarian design are similar to those made by Garry Stevens in *The Favored Circle* on the divide between architects and society as a result of unquestioned ideals that are infused into the culture of architecture beginning in education. Stevens observed that people seem to get in the way between architects and architecture. He critiqued the present state of architectural magazines and their plethora of people-less photographs, stating, “It may be impossible to clear the streets of New York to photograph the latest skyscraper, but wherever possible it seems the photographers vacate the buildings and surrounds to present the building as a pristine object d’art, uncontaminated by users, clients, and inhabitants.” Furthermore, he remarks, citing Spiro Kostoff on the modern movement, that architectural theories are not truly social theories even when they try to be.

Modernist rhetoric waxed eloquent about the needs of users. It represented architecture as the vehicle of social welfare and set public housing issues as the highest priority of architecture. But there was no question of consulting with the user of the housing estate during the course of their design… [It was assumed that] users did not know what they wanted or, more importantly, what they should have. Their collective needs, interpreted by the architect and the sponsoring agency, would be codified in the “program”- as had been the case with hospitals, schools and prisons in the past. The fit might not be comfortable at first. The setting might appear alien to our habitual ways. The fault was with our habits. We would learn to adjust to the new Wohnkultur because it was based on rationally derived standards… Architectural revolutions required the redesign of humanity.9

The previous comments by Sinclair, Turner, Stevens, and Kostoff do not present a historically admirable view of Architecture in regards to the field's contributions to social and economic issues, which are further justified by the absence of these elements in language concerning sustainable design. Design that does not consider the full spectrum of interdependent factors (social, economic, and environmental), both local and global, cannot be described as sustainable, and as shown in the previous examples, can result in tragic outcomes. However, due to the contributions of designers and thinkers like Sinclair and Turner, the extensive media coverage of recent cataclysmic events such as the 2004 Indian Ocean tsunami, Hurricane Katrina in 2005, and the 2010 earthquake in Haiti, and the fact that 90% of humanitarian projects are found in emerging markets,10 social and economic issues have recently been regaining popularity amongst design students and professionals to the point that the NAAB added criteria in the 2009 Conditions that addressed contemporary concerns of community and social

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9. Ibid.
Responsibility. But will newly kindled interest in social issues translate into positive outcomes or more design failure?

Central to the WCED’s message on sustainable development was the recognition that the modern methods, ways of thinking and behavioral patterns created the current world condition. New strategies would require new methods, philosophies, and patterns. But new ideas require new perspectives, a point crucial to the work that follows. Concerned with the correlations and disparities between architecture curriculum and humanitarian design, this thesis follows the course of an architectural project undertaken by a non-profit organization outside of Lima, Perú in order to inform further development of student performance criteria and new learning methods in design education.

1.2 RESEARCH DESIGN AND METHODS

1.2.1 RESEARCH QUESTIONS

Why does design fail? How do social issues integrate into architectural design? What role could architects play on social issues like the housing crisis or poverty? How do buildings inform, initiate, or affect social change? Who should benefit from architectural design services? These are all important questions but remain only larger overarching themes associated with this research. Specific questions of inquiry to this particular body of work are as follows:

1. What specific determining factors are involved in a humanitarian design project?

2. How do observed factors compare to NAAB criteria?

3. How do humanitarian design methodologies offer new teaching methods for architectural design?
1.2.2 DEFINITION OF KEY TERMS

**Determining factor** *n* the circumstances, facts, and/or influences that cause an outcome to occur in a particular way.

**Humanitarian design** *n* design that primarily addresses complex, social and economic issues such as poverty and homelessness, in addition to traditional design problems.

**Indeterminate system** *n* a complex, underspecified system that has many solutions or no solution at all.

**Maestro** *n* Spanish for “master”. It refers to, in this case, the level of a master tradesman in construction.

**NAAB** *n* (National Architectural Accrediting Board) the sole agency authorized to accredit professional degree programs in architecture in the United States.

**Peri-urban** *adj* an area found on the perimeter of an urban center, between the suburbs and the countryside.

**Squatter** *n* an individual who illegally resides in a building or piece of land that they neither own nor rent.

**Student performance criteria** *n* a list of more than thirty criteria developed by NAAB, requiring an *understanding* or *ability* in relation to specified topics and skills as they relate to architectural design, on which accredited architecture programs base their curriculum.

**Sustainable development** *n* a pattern of development that meets present needs without compromising the ability to meet future needs, and introduced as a global ethic on which to base future policy by the World Commission on Environment and Development in 1987.

**Unincorporated settlement** *n* an informal community that is usually settled by squatters and has no legal affiliation with local governing bodies.
1.2.3 RESEARCH DESIGN

The greater part of this research was centered on the observations from a case study of a humanitarian design project. The project was an architectural project of moderate size (approx. 10,000 sq. ft.), located in a poor, peri-urban community of a large city of a developing country, and was developed and implemented by a non-profit organization. The researcher engaged the project through the design, development, and construction stages as well as observed and/or participated in other non-architectural aspects of the project (promotion, funding, etc.). During the extent of the construction phase, the researcher resided on the project site to better observe cultural, local, and economic factors. Additionally, the researcher/designer/project manager was a recent graduate of an NAAB accredited architecture program in order to observe correlations and conflicts between taught methods in design education and factors and design problems encountered in the field.

Upon completion of the case study (finished construction), observations taken through the course of the study were compiled and analyzed to form a descriptive list of determining factors particular to the project. This list was then organized by category and time and compared with student performance criteria from the 2009 NAAB Conditions for Accreditation. From these findings, further developments were suggested to the student performance criteria and new teaching models specific to humanitarian design were proposed.

1.2.4 DATA COLLECTION METHODS AND ANALYSIS TECHNIQUES

A case study was determined as the definitive method for data collection in this project, although supplementary archival research occurred at select times during the course of the research to inform the conceptual framework, gather historical data and thought on the topic, and create a catalog of precedents referred to in the study. Throughout the case study, data was collected via observation, participation, and reflection, and was recorded through note taking, journaling, photography, and expense reports.

At the conclusion of the case study, the data collected was compiled from which determining factors were discerned. Determining factors were narrowed to those circumstances, facts, and/or influences that caused the project to take place in a particular way; meaning, those factors that should be considered during the design process to lead to positive outcomes. While there were multiple factors beyond the final list of factors that contributed to the project, they were often the cause of one of the root factors presented in the final list. After the determining factors were
listed, each were described by what they entailed, how they related to and affected other factors, and how they influenced the project’s process and outcome. Once listed and described, the factors were organized into three categories:

- **Programmatic** factors entail the purpose and subsequent usage and requirements for the project.
- **Location based** factors are those that relate to those static and influential characteristics of the project’s environment.
- **Investment** factors involve the dynamic characteristic of a project’s environment that influence the means of its development and subsequent use.

This categorized list was then compared to the student performance criteria from the *2009 NAAB Conditions for Accreditation* using a comparison matrix, which allowed for gaps and trends between determining factors and criteria to be easily illustrated. Criteria that were determined as relevant to a particular factor were marked by their respective required level of accomplishment; “understanding” by a lighter shade and “ability” by a dark shade (fig. 1). Additionally, criteria integrated into Comprehensive Design will be marked by a distinct color. The same exercise was conducted with the factors organized by time.

Based on the resulting graphical representation of the findings, a third matrix was composed illustrating an “ideal” balance between NAAB criteria and the determining factors presented on which further developments to NAAB criteria were suggested and new design education models hypothesized.

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**Figure 1. Comparison matrix format**
1.3 SIGNIFICANCE AND SCOPE: OUR COMMON FUTURE

In 2025, the number of city-dwellers could reach 5 billion individuals, two thirds of them in poor countries.\(^\text{11}\)

Of the 33 megalopolises predicted in 2015, 27 will be located in the least developed countries, including 19 in Asia.\(^\text{12}\)

Tokyo will be the only rich city to figure in the list of the 10 largest cities.\(^\text{13}\)

Mumbai’s population has quadrupled in thirty years. Half of the inhabitants live in slums, and 700,000 are homeless. 100 million people in the world have no permanent lodging.\(^\text{14}\)

These statistics, taken from a study by Rem Koolhaus et al. on urbanization, entitled *Mutations*, represent the rapid growth of urban centers in developing countries, which are becoming some of the largest in the world. While developed nations currently account for the majority of consumption and pollution that occurs in the world, as developing countries become more industrialized they will raise rates exponentially, leaving many to wonder if the earth can sustain such growth and maintain current consumption levels in developed nations. Is the earth big enough for all of us?

Similar concerns are what eventually led to the formation of the World Commission on Environment and Development (WCED) in 1983 with the mission to formulate “a global agenda for change.”\(^\text{15}\) They spent the next three years holding public hearings all around the world listening to concerns and comments from “government leaders, scientists, and experts; from citizens’ groups concerned about a wide range of environment and development issues; and from thousands of individuals, farmers, shanty-town residents, young people, industrialists, and indigenous and tribal peoples.”\(^\text{16}\) Their subsequent report to the UN General Assembly acknowledged that a world in which widespread poverty still exists is one that is still prone to ecological and other disasters. They state, “…sustainable development requires meeting the basic needs of all and extending to all the opportunity to fulfill their aspirations for a better

\(^{12}\) Ibid., 6.
\(^{13}\) Ibid., 7.
\(^{14}\) Ibid., 25.
\(^{15}\) WCED, A/42/427, foreword.
\(^{16}\) Ibid., chap. 1 ¶ 5.
life.”17 Entitled Our Common Future, the report stressed the importance of a multilateral effort in addressing the greater issues and crises existing in our world, for they “cut across the divides of national sovereignty, of limited strategies for economic gain, and of separated disciplines of science.”18

The aftereffects of this report have reshaped the political landscape of the world, influencing changes in every field, including architecture. The NAAB has responded to these changes with the integration of new criteria relevant to sustainable design (albeit an incomplete version) and social and economic issues. The work that follows is a response to those criteria. Grounded on the declaration of the Brundtland Report and the historical record of the field’s hesitation to address sociopolitical and economic issues in scholarly work as opposed to more tangible environmental problems, this thesis examines these issues and their relation to architectural design problems. It is viewed as a point of beginning for further discussion and scholarly exploration on social and economic crises addressed through architecture.

17. Ibid., intro. ¶ 27.
18. Ibid., foreword.
2. The Sustainable Development Era

The report of the World Commission on Environment and Development in 1987 to the General Assembly of the United Nations marked a watershed event in world history. The report (commonly referred to as the Brundtland Report, named after its chairwoman, former Prime Minister of Norway, Gro Harlem Brundtland) popularized the concept of sustainable development as a necessary influence on changing current policies in all major arenas of development. It was considered to be a holistic prescription addressing current world issues at the time that were acknowledged to have lasting implications, such as poverty, growth, survival, and economic crisis. Since the report was presented to the UN General Assembly in Nairobi the term has become a mainstay in conversation amongst policy makers, theorists, critics, educators, students, analysts, and businessman worldwide. But how was sustainable development defined, what does it mean now, and how is it relevant to the field of architecture?

2.1 SUSTAINABLE DEVELOPMENT AS DEFINED IN THE BRUNDTLAND REPORT

The term sustainable development encompasses a broad and complex array of defining elements. Simply, it is defined in the Brundtland Report as, “meeting the needs of the present without compromising the ability of future generations to meet their own needs.” This definition contains two concepts: the concept of ‘needs’, in particular the essential needs of the world’s poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment’s ability to meet present and future needs.

Another major theme by the commission is recognizing that sustainable development encompasses the components of economic and social development, as well as environmental protection, which were referred to as “interdependent and mutually reinforcing pillars” in a later publication on the outcome of the 2005 World Summit. In other words, when considering strategies for sustainable development, one must realize that environmental issues such as water pollution are linked with economic problems such as poverty, which are linked to sociopolitical problems such as inequality and racism. Recognizing the interdependence of these three components also led to the observation that institutions in those policy areas historically did not

19. Ibid., chap. 2 ¶ 1.
20. Ibid.
collaborate or cooperate, which in a large way, could be considered one of the main causes of the world's condition that lead to the formation of the commission.

A final, major and recurring element in discussing the terms and scope of sustainable development was the understanding that a world plagued by poverty and inequality was not a world where sustainable development could be achieved. Poverty causes mind-sets of survival concerned with the fulfillment of day-to-day needs, leading to the overuse of resources and impoverishment of the environment, furthering the impoverishment of the people. Similarly, inequality inhibits development, preventing the poor from improving their quality of life. As most poor nations depend on increasing exports of unstable resources, growth in these economies required diversification. Yet diversification in ways that would alleviate both poverty and ecological stress is hampered by disadvantageous terms of technology transfer, by protectionism, and by declining financial flows to those countries that most need international finance.

This increasingly global economy, in which many poor developing nations are dependent on unstable export markets, illustrated that current world issues were not solely the problems of independent states, but those of a global community and required a new orientation in international relations and cooperation between all governments. While the principles of developing sustainably would more than likely look different in each nation, it was fundamental that these principles be managed jointly by a functional multilateral system that acknowledged that “not only the Earth by the world is one.”

All these considered, the commission outlined in its report several connected areas of policy and their respectful strategies that could not be treated in isolation from each other in the global pursuit of sustainable development. These include: population, food security, the loss of species and genetic resources, energy, industry, and human settlements. The following summarized those strategies adopted by the WCED as presented in their report: (chap. 2 ¶¶ 27-80)

1. Reviving Growth: Links between economic growth, the alleviation of poverty, and environmental conditions operate most directly in developing countries, therefore, to alleviate poverty per capita income in these countries must be raised. However, because of an interdependent world economy that is affected by levels and patterns of growth in industrialized and developing nations alike, a reorientation of international economic relations will be needed.
2. Changing the Quality of Growth: Development must become less material- and energy-intensive and more equitable. A better quality growth on all fronts will require better income distribution, as development effort must take an account of all of effects, short and long term, unintended and intended. Economic and social development can and should be mutually reinforcing.

3. Meeting Essential Human Needs: Sustainable work opportunities need to be generated enabling poor households to meet minimum consumption standards. Food production and a more equitable distribution need to increase to supply a growing world population and counter malnutrition. Also, Planners must find ways of relying more on supporting community initiatives and self-help efforts and on effectively using low-cost technologies.

4. Ensuring a Sustainable Level of Population: Population size needs to be stabilized at a level consistent with the productive capacity of the ecosystems. This should be accomplished by quickly lowering population growth rates where those rates are increasing. Population policies should be integrated with other economic and social development programs in female education, health care, and the expansion of the livelihood base of the poor. Solving the impending urban crisis will require the promotion of self-help housing and urban services by and for the poor, and a more positive approach to the role of the informal sector, supported by sufficient funds for water supply, sanitation, and other services.

5. Conserving and Enhancing the Resource Base: The Earth's natural resource base must be conserved and enhanced. To achieve this, development policies must widen people's options for earning a sustainable livelihood, particularly for resource-poor households and in areas under ecological stress. Additionally, sustainability requires a clear focus on conserving and efficiently using energy, thus simple duplication in the developing world of industrial countries' energy use patterns is neither feasible nor desirable. Changing these patterns for the better will call for new policies in urban development, industry location, housing design, transportation systems, and the choice of agricultural and industrial technologies.

6. Reorienting Technology and Managing Risk: First, the capacity for technological innovation needs to be greatly enhanced in developing countries so that they can respond more effectively to the challenges of sustainable development. Second, the orientation of technology development must be changed to pay greater attention to environmental factors by enhancing research, design, development, and extension capabilities in the Third World. Sustainable development and environmental protection must be built into the mandates of the institutions that work in environmentally sensitive areas.

7. Merging Environment and Economics in Decision Making: Economic and ecological factors must be integrated in decision making as they are in the working world, and the wider responsibilities for the impacts of those decisions must be enforced. Citizens’ initiatives must be promoted, empowering people's organizations, and strengthening local democracy, as sustainable development will require the unification of economics and ecology in international relations.
To achieve these strategies, the commission specified the following requirements:

- a political system that secures effective citizen participation in decision making,
- an economic system that is able to generate surpluses and technical knowledge on a self-reliant and sustained basis,
- a social system that provides for solutions for the tensions arising from disharmonious development,
- a production system that respects the obligation to preserve the ecological base for development,
- a technological system that can search continuously for new solutions,
- an international system that fosters sustainable patterns of trade and finance, and an administrative system that is flexible and has the capacity for self-correction.26

In summary, sustainable development requires that all human beings have the right to the basic needs of food, clothing, and shelter, as well as have equal access to employment opportunities and to dream of improving one's quality of life without abusing nature. But, in order to achieve such principles, it is understood that some perceived notions of need are beyond the means of the earth's resources and require a change in cultural and social assumptions. Sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development; and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations.27

One cannot simply discuss issues regarding pollution without discussing poverty, or corruption, and vice versa. The very reasoning behind pollution is, at its root, an economic problem. Waste exists as a product of efficiency, which is an economical factor that has short-term logic but leads to long-term losses. Sustainable development is a concept that acknowledges the interconnectedness of things and prescribes an unconventional pattern of growth that goes against the very nature of humanity (i.e. greed, pride, and selfishness). Improving ones quality of life, in this case, does not mean acquiring more material wealth for all; it means becoming a good steward of resources under one’s care and resisting the urge to live in excess. It is acquiring a better quality of life that is both individual and collective.

26. Ibid., chap. 2 ¶ 81.
27. Ibid., intro. ¶ 30.
2.2 DEVELOPMENTS ON SUSTAINABLE DEVELOPMENT SINCE 1987

The Brundtland Report encompassed so many issues with global implications, that it has since been considered a landmark event that set off a chain of events leading to the establishment of significant policies worldwide regarding the future development of the world. And while there remains criticism on the concept of sustainable development in some circles, it has widely been accepted as the “global ethic” on which to base all future schemes of development.

The first of several major publications regarding sustainable development since the Brundtland Report was established at the Earth Summit in Rio de Janeiro, Brazil in 1992, culminating another three years of work in Agenda 21. It was “a comprehensive plan of action to be taken globally, nationally and locally by organizations of the United Nations System, Governments, and Major Groups in every area in which human impacts the environment,” and was adopted by 178 governments. Following the summit, in December 1992, the Commission on Sustainable Development (CSD) was established to “ensure effective follow-up of United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit.” This commission is responsible for reviewing progress on the implementation of Agenda 21 policies and other important declarations and plans regarding sustainable development. The meetings of the commission are held annually to encourage participation from governmental and non-governmental players in discussion of policies aimed at sustainable development.

In 2000 at the Millennium Summit held in New York, the General Assembly of the United Nations established eight Millennium Development Goals (MDGs) to be obtained in 2015, providing quantitative benchmarks and a framework for the international community to address the complex problems of extreme poverty. The MDGs do not necessarily establish anything new, as many of them were previous goals established in several earlier summits and are, rather, a declaration of political will of the international community to make significant progress in these areas. The goals, as found on the UNDP website (http://www.undp.org/mdg/basics.shtml) are summarized as follows:

Goal 1: Eradicate extreme poverty and hunger
  • Reduce by half the proportion of people living on less than a dollar a day
  • Achieve full and productive employment and decent work for all, including women and young people
  • Reduce by half the proportion of people who suffer from hunger

Goal 2: Achieve universal primary education
  • Ensure that all boys and girls complete a full course of primary schooling

Goal 3: Promote gender equality and empower women
  • Eliminate gender disparity in primary and secondary education preferably by 2005, and at all levels by 2015

Goal 4: Reduce child mortality
  • Reduce by two thirds the mortality rate among children under five

Goal 5: Improve maternal health
  • Reduce by three quarters the maternal mortality ratio
  • Achieve, by 2015, universal access to reproductive health

Goal 6: Combat HIV/AIDS, malaria and other diseases
  • Halt and begin to reverse the spread of HIV/AIDS
  • Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need
  • Halt and begin to reverse the incidence of malaria and other major diseases

Goal 7: Ensure environmental sustainability
  • Integrate the principles of sustainable development into country policies and programs; reverse loss of environmental resources
  • Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss of 1. land area covered by forest, 2. CO2 emissions, total, per capita and per $1 GDP (PPP), 3. Consumption of ozone-depleting substances, 4. fish stocks within safe biological limits, 5. total water resources used, 6. terrestrial and marine areas protected, 7. species threatened with extinction
  • Reduce by half the proportion of people without sustainable access to safe drinking water and basic sanitation
  • Achieve significant improvement in lives of at least 100 million slum dwellers, by 2020

Goal 8: A global partnership for development
  • Develop further an open, rule-based, predictable, non-discriminatory trading and financial system
  • Address the special needs of the least developed countries
  • Address the special needs of landlocked developing countries and small island developing States
  • Deal comprehensively with the debt problems of developing countries
The Millennium Development Goals, while criticized on some fronts as all over encompassing policy strategies, have marked a unique moment in the world's history of the unparalleled multilateralism and cooperation among nations in a common pursuit required by the Brundtland Report thirteen years prior. The goals, however, were overly ambitious and most or all will likely not be met by 2015, even with a major push, but that should not overshadow the efforts that were made thus far and the sign for potential, continued cooperation amongst nations.

Even so, a continued revival in multilateralism worldwide is still needed, as stated by Volker Hauff in 2007, chair of the German Council on Sustainable Development, and a former member of the WCED that authored the Brundtland Report. In his opening speech of the European Sustainability Berlin 07 (ESB07) conference, Hauff confirmed the importance of the Brundtland report in changing world policy on development, and specified six areas presented in the report that are still a concern twenty years later: 1. conflict prevention between nations and the disbandment of nuclear arms, 2. eliminating extreme poverty, 3. deterioration of the quality of growth by continued inadequate thinking, 4. energy consumption and climate change, 5. food security and distribution for a growing population, and 6. urbanization, sprawl, and megacities’ consumption of resources and devastation of soils.\(^{32}\)

Since the release of the Brundtland Report twenty plus years ago, the shift in global policy has been significant. However, many of the requirements presented by the commission remain far off. The emphasis remains on developing nations that are urbanizing and developing at rapid paces but with fragile management and policing infrastructure in place. Continued and increased effort needs to be made to keep developing nations from following the same destructive patterns of growth and resource consumption that were established by the industrialized sector. In industrialized nations, the problems are more about changing cultural attitudes of needs and consumption as the world cannot sustain both growth in the developing sector while supporting current consumption levels in industrialized nations. Attitudes and objectives must change at every level of every institution, integrating economic and ecological considerations in decision making as they exist in the working world.\(^{33}\)

### 2.3 SUSTAINABLE DEVELOPMENT AND ARCHITECTURE

As nation leaders from across the globe gathered in New York City for the Millennium Summit in September 2000, another world gathering was occurring at the 2000 World’s Fair in Hannover, Germany. Both linked by the common thread of sustainable development, the

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\(^{33}\) WCED, “Our Common Future,” chap. 2 ¶ 72.
Millennium Summit resulted in the Millennium Development Goals, discussed above, that marked “unprecedented efforts to meet the needs of the world’s poorest.”\textsuperscript{34} In contrast, the 2000 Expo, based on the theme “Humanity, Nature, and Technology” with exhibitions that “tried to ‘present solutions to the pressing problems of the 21\textsuperscript{st} century,’ like energy production, health and nutrition, with impressive virtual-reality installations, electronic gadgetry and provocative biomorphic shapes,”\textsuperscript{35} was a financial failure. The expo was expected to draw 40 million visitors, but less than 26 million actually came and resulted in a financial loss of $600 million, a deficit that failed to live up to the hopes put forth by architect/author William McDonough as the expo being a time to “renew a commitment to living as part of the earth by understanding development and growth as processes which can be sustained, not exploited to impractical limits.”\textsuperscript{36}

For the 2000 Expo, William McDonough, AIA and Michael Braungart developed “The Hannover Principles” to guide planners and designers who would be instrumental in shaping the built environment of the Expo. In planning for the Expo exhibitions, they stated that almost every phase of the design, manufacturing, and construction processes required reconsideration.\textsuperscript{37} Traditional linear ways of design thinking that contributed to modern rates of consumption and pollution should be exchanged for circular or cyclical design methods that think beyond the creation and limited use of a product, but also its adaptation to new uses or reintroduction into the production line. In all, McDonough and Braungart presented nice principles that they hoped would “inspire an approach to design which may meet the needs and aspirations of the present without compromising the ability of the planet to sustain an equally supportive future.”\textsuperscript{38} The nine principles\textsuperscript{39} were as follows:

1. Insist on rights of humanity and nature to co-exist in a healthy, supportive, diverse and sustainable condition.
2. Recognize interdependence. The elements of human design interact with and depend upon the natural world, with broad and diverse implications at every scale. Expand design considerations to recognizing even distant effects.
3. Respect relationships between spirit and matter. Consider all aspects of human settlement including community, dwelling, industry and trade in terms of existing and evolving connections between spiritual and material consciousness.

\textsuperscript{37} Ibid., 5.
\textsuperscript{38} Ibid., 3.
\textsuperscript{39} Ibid., 6.
4. Accept responsibility for the consequences of design decisions upon human well-being, the viability of natural systems and their right to co-exist.

5. Create safe objects of long-term value. Do not burden future generations with requirements for maintenance or vigilant administration of potential danger due to the careless creation of products, processes or standards.

6. Eliminate the concept of waste. Evaluate and optimize the full life-cycle of products and processes, to approach the state of natural systems, in which there is no waste.

7. Rely on natural energy flows. Human designs should, like the living world, derive their creative forces from perpetual solar income. Incorporate this energy efficiently and safely for responsible use.

8. Understand the limitations of design. No human creation lasts forever and design does not solve all problems. Those who create and plan should practice humility in the face of nature. Treat nature as a model and mentor, not as an inconvenience to be evaded or controlled.

9. Seek constant improvement by the sharing of knowledge. Encourage direct and open communication between colleagues, patrons, manufacturers and users to link long term sustainable considerations with ethical responsibility, and re-establish the integral relationship between natural processes and human activity.

These principles were established using a framework adopted from the five “enduring” elements of Earth, Water, Air, Fire and Spirit, which “provided structure for the ancient world,” and have been an important part of Western philosophy and tradition for centuries. In McDonough’s description of the fifth element *Spirit*, which he refers to as the most ineffable yet human of the five elements, sustainability is viewed as more than just compliance with regulations but instead as a recognition of our meaningful existence on the Earth as a good quality worth continuing. To McDonough and Braungart, sustainable development is not merely something to achieve because it is the law, but because it is the right thing to do, which they felt the definition of sustainable development in the Brundtland Report failed to emphasize.

In 1993, the Hannover Principles led to the adoption of the “Declaration of Interdependence for a Sustainable Future” by the International Union of Architects (UIA) and the AIA at the World Congress of Architects. The declaration was a joint agreement by two organizations to:

- Place environmental and social sustainability at the core of our practices and professional responsibilities
- Develop and continually improve practices, procedures, products, curricula, services, and standards that will enable the implementation of sustainable design

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40. Ibid., 12.
• Educate our fellow professionals, the building industry, clients, students, and the general public about the critical importance and substantial opportunities of sustainable design

• Establish policies, regulations, and practices in government and business that ensure sustainable design becomes normal practice

• Bring all existing and future elements of the built environment - in their design, production, use, and eventual reuse - up to sustainable design standards.  

1993 also brought about the foundation of the US Green Building Council (USGBC), perhaps a more significant event regarding the adoption of sustainable development concepts into architectural practices. A non-profit organization committed to a prosperous and sustainable future for our nation through cost-efficient and energy-saving green building, the USGBC made its biggest contribution to architecture regarding sustainable design in 2000, when they released the Leadership in Energy and Environmental Design (LEED) rating system. LEED is a third party certification system that rates buildings and communities on the metrics of energy savings, water efficiency, CO₂ emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts. The rating system has had a significant effect on the field and finally presented a way to gauge the overall effectiveness and truthfulness of sustainable design practices employed by architects and other planners of the built environment. The system’s application has been both in the United States and across the world. LEED measures metrics in eight areas, determining a score of up to 100 points. Four levels of certification can be awarded based on the respective score: Bronze, Silver, Gold, and Platinum. The eight areas considered in the LEED measurements are: sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, locations & linkages, awareness & education, innovation in design, and regional priority.

LEED for all its merits however, has not come without criticism. With fourteen federal departments and agencies, 34 states, and more than 200 local governments encouraging or requiring LEED certification, critics say that sustainability in architecture is more about regulation and good business rather than new strategies for design thinking. McDonough and Braungart, in a later writing entitled Cradle to Cradle, call this being “less bad”, and that most thought and policy derived from sustainable development has followed this pattern of regulation. Limitations and standards were simply being applied to the current model of design, whereas

they suggest it was about time for the model to change. According to them, the current design model paradigm is a cradle to grave, linear thought process where little emphasis is placed on what happens to the product after its intended “use period” expires. They suggest a cradle-to-cradle paradigm that would be akin to philosophies of reincarnation, a cyclical pattern of product design, use, and incorporation into a new product of equal or increased value. This paradigm is proposed to mimic nature’s cycles and would be like designing a building to be like a tree. For example, a tree not only consumes waste like CO₂ and uses it for food, but then it produces good things, i.e. oxygen, and nurtures its local environment with the byproducts of its production processes. Nature not only takes from the environment but also gives something nurturing back, usually in a greater quantity that what was taken. McDonough and Braungart claim that a new design paradigm influenced by sustainability would eliminate the concept of waste all together. “Eco-efficiency”, as most strategies such as LEED promote, only slows the rates of consumption and pollution, which gives the appearance of progress, but in reality, creates a stealth-like destruction of the earth. They offer “Eco-effectiveness” as their alternate design strategy, one that eliminates waste, understands sustainability as both a local and global event, and strives for diversity, eliminating one-size fits all type strategies and offer five guiding principles:

1. **Signal your intention** by committing to a new paradigm instead of trying to incrementally improve the old
2. **Restore** by striving for “good growth”, sustainability doesn’t happen necessarily by the creation of new things, but giving back life to those places and things that are devoid of it.
3. **Be ready to innovate further** by not simply making what you are making but exploring new avenues
4. **Understand and prepare for the learning curve** by practicing trial and error implementing several ideas instead of simply narrowly perfecting one, and finally,
5. **Exert intergenerational responsibility** by providing a good and healthy inheritance to the generations who follow, and a legacy for them to expand upon.\(^\text{45}\)

Ultimately, it is in these “generations who follow” where sustainable development will have the most long lasting impacts. Young designers, taught in the methods of sustainable development, will gradually evolve the industry as their numbers increase in the professional ranks. Accordingly, in 2004, the National Architectural Accrediting Board (NAAB) added “Sustainable Design” to their list of criteria for student performance that all accredited architecture programs must meet. Composed of the ACSA, AIA, AIAS, and NCARB, it is the sole agency authorized to accredit architecture programs in the United States. When the board added the criteria in its **2004 Conditions for Accreditation**, they defined Sustainable Design as the “understanding of the principles of sustainability in making architecture and urban design decisions that conserve

natural and built resources, including culturally important buildings and sites, and in the creation of healthful buildings and communities. Again in 2009, the board made revisions to the Student Performance Criteria (SPC) to be, “reflective and responsive to contemporary concerns in architectural practice (e.g., leadership, civic engagement, and environmental stewardship).” In the 2009 version, sustainability is defined as the “ability to design projects that optimize, conserve, or reuse natural and built resources, provide healthful environments for occupants/users, and reduce the environmental impacts of building construction and operations on future generations through means such as carbon-neutral design, bioclimatic design, and energy efficiency.”

These definitions, however, are incomplete. With more attention over LEED and energy consumption, recycled materials, and waste management, sustainable design, as it has been manifested in architecture, primarily focuses on only one of the three components that make up sustainable development — social and economic issues are noticeably absent. The comparison of the Millennium Summit and the 2000 Expo tells a story of sustainable development taken in two different directions. The former, a gathering of world political leaders, lead to eight goals aimed at eradicating global poverty and inequality by 2015, while the latter, a gathering of futuristic ideas on sustainable design, resulted in a world’s fair with impressive yet temporary works of innovation and technology that failed financially.

Architects’ penchant for innovation and technology have lead to developments in the industry that have, by default, left the fundamental concerns of poverty and inequality from the Brundtland Report out of the conversation on sustainable design. These gaps, however, have given rise to humanitarian design, a movement that has its roots in the various socially conscious design movements of the previous century. Contrary to manifestations of sustainable design, humanitarian design often focus on community-led efforts and incorporate traditional materials and low-tech construction methods, as well as sustainable principles such as wastewater management and passive heating and ventilation to name a few. Humanitarian design, often relegated to “ugly-step child of the industry” status, has not historically been popular in the field, but current political movements and extended media cover of natural disasters and the living conditions of the majority of the world’s inhabitants have brought socially conscious design back into conversation.

48. Ibid., 23.
49. Sinclair, “Admiral Akbar.”
Regardless of the increasing interest in humanitarian design, Architecture that has responded to social issues is nothing new; in fact, many movements in the field have been influenced by or responded to social crises. For instance, the Modernism movement of the early to mid 1900s that occurred in Europe through the works and philosophies of Le Corbusier and Walter Gropius focused prominently on public housing projects brought on by housing shortages caused by the destruction from the First World War and increasing worker migration into urban centers due to growing industrialization. Hannes Meyer, director of Bauhaus from 1928-1930 and a proponent of Modernism is quoted as saying, “Architecture is a process of giving form and pattern to the social life of the community. Architecture is not an individual act performed by an artist-architect and charged with his emotions. Building is a collective action.”

The modernist public housing projects followed schemes like that of the “superblock” and were intended to supply housing for large amounts of people in repeatable forms and attempted to conform to user behavioral patterns. As “machines for living in”, though, they became known for their impersonal-ness and as places, ironically, that were undesirable to live in. These “projects” often fell victim to derelict and disrepair and became synonymous with the very impoverished places they were meant to improve (i.e. vertical ghettos). For the most part, the modernist public housing initiatives of this era were viewed as public failures. A classic example would be the award winning public housing project Pruitt-Igoe in St. Louis, Missouri, which was partly demolished twenty years after its completion as a result of its unpopularity and vandalism.

Criticism of modernist public housing initiatives and their use of mechanical, standardized, or prefabricated schemes gave way to a movement of architectural responses through community and grass-roots organizations known as the self-help housing movement. Advocates of the movement argued that homeowners had been successfully building their own homes for generations, and had done so without the help of architects, which ultimately reduced the role of architectural design in the movement. These programs often resulted in very basic housing, lacking any sense of “design”, leading to continued disinterest in mainstream architecture. Moreover, the International style that came out of the modernism movement had become popular with corporations and their headquarters and much of mainstream architecture began to center around these works, millionaire homebuilders, and art museums - programs devoid of any concern for the plight of greater humanity. In other words, mainstream Architecture’s loyalty to high quality design came before social issues and the organizations and policy makers

51. Turner, Housing by People, 32.
involved in housing initiatives, burdened by a growing need and expectant funding partners, valued broader success and faster results over high-end design. As self-help programs proved successful, housing initiatives naturally gravitated away from designers, and architects away from the initiatives.

Yet, at the advent of the new millennium, the blossoming of the sustainable development era, and societies’ increased interest in design, the number of Architects undertaking socially conscious projects has been steadily growing. In 2006, the NGO Architecture for Humanity released a book entitled \textit{Design Like You Give a Damn}, reflecting the rising interest in humanitarian design, especially amongst young professionals and future designers. At the same time, an increase in internationally media covered disasters such as the 2004 tsunami in Indonesia, Hurricane Katrina in 2005, and the 2010 earthquake in Haiti, as well as increased coverage of instances of genocide, have led to an observable demand of activity in humanitarian design. Even the NAAB has added several criteria to the \textit{2009 Conditions for Accreditation} that revolve around socially and culturally conscious responsibilities of the architect.

This increase in activity in humanitarian design, however, has not come without criticism. There are several critics who have questioned the merits of such a movement and are concerned the profession may fall into the very same trap of the modernism movement that gave rise to imperialistic architecture superimposed on the urban fabric of developing nations by foreign architects, who with good intentions, ended up offending and causing more harm through their good deeds. Furthermore, the challenges and constraints characteristic of humanitarian issues, particularly those of a financial nature, are often at odds with an architect’s professional training, and it remains to be seen how long the current climate of concern for social issues in the profession will last. After all, the modern day issues of housing shortages due to cataclysmic events and increasing worker migration to industrializing urban centers, as is occurring in Asia, Africa, and Latin America, are the very same that brought about architectural interest in post-World War I Europe in the 1920s and 30s. The language is even the same. Modernism movement thinkers talked about “collective action” which sounds similar to phrases heard today, like “community-led” design or “our common future.” Without new design paradigms, like those suggested by McDonough, socially conscious design may hold the same fate it did after the Modernism movement, when the complex problems of social issues mostly eluded architects. As suggest several advocates of sustainability, quoting Albert Einstein, “You cannot solve the problem with the same thinking which created the problem.”

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52. Hauff, “Brundtland Report: A 20 Year Update.”
Nonetheless, propelled by the multilateral and global efforts of the Sustainable Development era, fundamental principles of humanitarian design are being integrated into design education requirements. These principles, however, remain vague as a substantial body of scholarly work in the humanitarian design field is lacking. New explorations of the field are necessary to further development of these principles and propose new design paradigms, as well as to avoid the past and current design failures that only contribute to, rather than alleviate, social and environmental degradation.

As such, the following chapter outlines a case study of a humanitarian design project to compare observations made in the field to criteria and principles taught in design schools. While the study, due to time constraints, only examined one of the many humanitarian design projects currently underway across the globe, it offers invaluable insight into the dynamics of the environments in which humanitarian design takes place and the complexity of factors on which design decisions characteristic of these projects are based. The findings and proposals that derived from the study, as summarized in Chapters 4 and 5 respectively, are far from indisputable, but it is hoped, present a fertile bed of knowledge in which further scholarly investigation and works can be planted, take root, grow, and bear fruit.
3. Case Study: A Children’s Home in Perú

The following pages provide a detailed record of a case study of a humanitarian design project. Initiated in September 2006, the study spanned 4 years and 4 months and followed what became a long, arduous process to design, fund, construct and operate a children’s home for neglected and abused children in Perú by a start-up, faith-based non-profit organization from the US. When the study began there was minimal but growing conversation regarding humanitarian design in the architecture industry. However, the increasing media coverage of significant work by groups like NGO Architecture for Humanity, brought on by recent natural disasters and increased interest in sustainable development, have brought humanitarian design into conversations amongst (mostly) young professionals and design students. By the conclusion of the study, humanitarian design is now more broadly discussed in architecture circles, and its fundamental principles are being integrated into requirements for architectural curriculum. Still, outside of media attention and books like Design Like You Give a Damn, there is little known scholarly work on the field and the dynamic characteristics of its projects, and thus, more study is needed to further development of architectural curriculum criteria in teaching the fundamental principles of humanitarian design. The following recounting of the case study and subsequent summary of findings in Chapter 4 are a direct response to that need.

3.1 CONTEXT

3.1.1 PROGRAM AND CLIENT

In 2005, a faith-based non-profit organization was established in the US with the mission to provide hope to children living in desperate conditions on the margins of society. Within the first years of the organization’s existence, they purchased property in a peri-urban neighborhood in the desert coastal plateau of Perú, 60km south of the capital city of Lima. There they began renovating two existing structures and built two additions to create a maternity center for at-risk, pregnant, teenage girls. In the poorer communities in and outside Lima, young teenage pregnancy is a major problem. Young girls suffering from sexual abuse, often by a male family member, are left to the streets after becoming pregnant because of the disgrace they bring to their families. These girls, barely able to support themselves, often abandon their newborn babies, sometimes leaving them in a trash bag in a dumpster. The maternity center’s purpose was to care for these young mothers, save their babies, and provide the mother with the ability to support herself once leaving the center. An important part of this program was the construction of an orphanage to care for the young mothers’ babies if they chose to give them up, and other local abandoned children.
The Spanish term for “orphanage” (orfenato) is often viewed in negative context because it refers to government run centers for children where living conditions were far below acceptable standards. Thus the term “children's home” (hogar de niños) is more commonly used in Perú. Furthermore, the term “orphan” is not necessarily the most accurate description of the children who ultimately find shelter at these homes. Peruvian law mandates that a child considered to be abandoned must not only have no parents, but no surviving aunts, uncles, or grandparents, or at the very least, any existing family that claims to care for the child. Thus, the majority of the children that are placed in children's homes usually have one or both parents surviving who are unable to support their child. In these cases, the parent(s) sign a legally binding document giving the respective home legal custody of the child for a specified amount of time. A children's home would then be responsible to offer 24/7 care and provide access to an education for the child, whether they are schooled on site or enrolled in a local public or private school.

The children's home considered in this case study was to include sufficient housing for 48 children, boys and girls, 0–18 yrs. of age, and all necessary local staff. The program included 8 bedrooms with 4–5 children each, bathrooms, a nursery, multipurpose room, kitchen, full-time staff housing, classrooms, storage and mechanicals, and play areas. Necessary local staff included: directors (traditionally a married couple potentially with children of their own), full-time care givers (nannies), a cook, part-time tutor(s), part-time psychologist, part-time social worker, part-time nutritionist, part-time nurse, and a groundskeeper/guard. On site housing was specified for the directors (and their family) and full-time caregivers.

The client organization is based in Ohio, and at the time of the project’s conception, did not yet have administrative staff stationed in Perú. The organization’s primary activity is sending “short-term mission” trips to primarily Perú and Ecuador. These trips are of a religious nature, and usually consist of groups from partnering churches in the United States. The demographic makeup of these groups was either a mixture of teenagers and parents and recently retired individuals, or college-aged groups. The trips were 7–10 days in length and revolved around multiple community-service activities in poor, informal communities in and around Lima and Quito respectively. The trips, although made up of mostly unskilled volunteers, were envisioned as the primary construction force for the children's home. Because the trips were dependent on volunteers, the majority of them occurred during the summer months of June–August and the two weeks following New Years, as well as a college-aged Spring Break trip in March.
3.1.2 LOCATION: PAPA LEÓN XIII, CHILCA, Perú

The site for the children’s home was located in the neighborhood of Papa León XIII (fig. 2), part of the municipal district of Chilca, Perú. Chilca is located 60 km south of Lima on the Pan-American Highway, situated in the narrow strip of desert that runs the length of the Pacific coast of Chile, Perú, and Ecuador. The district itself is home to a population of 14,500 persons, according to the 2007 census, which is distributed amongst the city center of Chilca, and the outlying neighborhoods of Olof Palme, Papa León XIII, Las Salinas, and 15 de Enero (fig. 2). 53

Papa León itself was established in the 1960s as an annex to Chilca meant for single family dwellings on half hectare lots for agricultural purposes. A majority of the original residents were said to be retired military. The neighborhood is arranged around three avenues that are perpendicular to the Pan-American Highway and identical, one-story homes of approx. 70 m$^2$ are situated at the front of long, narrow lots that flanked each side of an avenue. Each residence originally had hand-dug wells of about 35 m in depth that supplied water to the homes and any vegetation or animals on the property. In time, because of the close proximity of the neighborhood to the ocean and shallowness of the wells, the water in the wells turned brackish,  

that is, a mixture of potable water and ocean water (tests taken of the well water on the site came back with a salinity half that of ocean water). With no access to public sources of potable water, many of the residents abandoned their properties. Vegetation began to die off and crime began to rise, prompting property owners to begin constructing 3 m high perimeter walls (fig. 3) where trees once flourished, dividing the original community fabric. Considering these events, property values plummeted which, along with un-enforced zoning laws, allowed industries to move into what once was primarily a residential/small-scale agriculture neighborhood. The lower property values also led to the establishment of ten drug rehab centers in the area which were more like glorified holding camps for drug addicts and only further contributed to rising crime rates and decreasing property values.

In time, the homeowner’s association of Papa León XIII was able to install a public water infrastructure fed by a larger well outside of the neighborhood borders. The water supply is not constant, however, as residents receive water 4 days a week for 3 hours each day, and must store water to have for the other days—leading to higher risks of disease spread through the stagnant water and unsanitary storage tanks. Additionally, the increase of major industry moving into the area have many residents concerned of them consuming large quantities of water for their industrial processes and depleting the limited underwater aquifer that supplies the potable wells in the area.

Currently, the neighborhood sits with 60–70% of its properties abandoned (fig. 4). The occupied lots are a mix of medium sized industry and agricultural operations, small-scale agriculture, warehouse facilities, children centers, and single-family residences. The majority of the larger industrial and agricultural facilities are in the far eastern portion of the neighborhood, furthest from the Pan-American Highway and residential areas, which results in heavy truck traffic through the more residential area and causing danger to the neighborhood children who often
play in the streets. Of the residences, some are used as summer homes for wealthier owners who reside primarily in Lima, some are everyday owners and residents, and others are families who squat in properties said to be abandoned. The drug rehab centers were evicted in 2009, and there has since been a sense of rejuvenation in the neighborhood as several lots located closer to the Pan American highway are being purchased and renovated into summer homes. Yet, deep issues still remain between residents in the community and the board of the homeowner’s association of Papa León. The main issues are the continued allowance of major industry to move into an area zoned for single-family residences (leading some to accuse the board of accepting bribes) and continued issues with the public water system. There exists a severe lack of trust amongst community members with each other and the homeowner’s association board.

Denser communities border Papa León on three sides. To the north lies Olof Palme, another sub-district of Chilca, populated by mostly single-family residences arranged on significantly smaller lots than Papa Leon. To the west, on the other side of the Pan-American Highway, sits the neighborhood of Benjamin, which is composed of two to three story brick and concrete residents arranged around central parks and hosts the major food market in the area. To the south, but separated by a swath of empty land, is the neighborhood of 15 de Enero which is considered an “asentamiento humano” or slum, although wealthy landowner’s have purchased property on the outskirts of the neighborhood and begun building luxurious homes.

Communities in these peri-urban areas outside of Lima are plagued by corruption. A caste system and subtle racial discrimination between those of Spanish descent and those of native descent is still very much present in modern day. The local governments are generally viewed as corrupt by most community members as legal paper work and processes can take a considerable amount of time, lending most people to bypass the legal processes, especially considering construction permits and licenses, or bribe officials to get paperwork through.
Corruption and a history of discrimination have led to the underlying conditions of mistrust amongst community members, crippling the ability of communities to organize and work together on many pressing issues, as most individuals are motivated by their own self-interest.

3.1.3 SITE AND CLIMATE

Lot 29, where the project is located, sits on the second and central avenue (Los Alamos) of Papa León. The surrounding lots are mostly residential and are inhabited by older property owners. To the southeast, across the avenue is a small store selling common dried foods, fruits, bread, housewares, and beverages, and to the southwest two lots from the store, is a private Christian primary school. A neighboring double-lot to the north is currently abandoned and was previously a drug rehab center and to the east of that lot is another double-lot containing a paprika plant.

The lot (fig. 5) itself is 5223.5 m² in area, long (161 m) and narrow (31 m). Two of the four property lines were divided with a 3 m high wall, while the other two were divided by tree lines and an old wooden fence. Two single-story structures (a main house and dormitory) existed at the front of the lot totaling 100 m². These structures were added on to and renovated by the client organization, as discussed previously, for a maternity center for young mothers, and a later second story addition of the dormitory, for staff housing. A walkway between these two structures along with the pedestrian entrance in the front property wall creates an organizational axis that runs the length of the property. The terrain slopes gently from front to back, making it generally flat. There are a few trees and other plants at the front of the property that require irrigation, but because of the desert conditions and poor soil condition, there is limited naturally occurring vegetation.

Figure 5. Project site analysis

Papa León resides in a narrow desert coastal plain that stretches along the pacific coast of South America. Resting 3 km from the coast, the eastern edge of the community is bordered by the foothills of the Andes mountain range. Little development exists beyond these foothills. The desert-like climate exists because of the cold water current (fig. 6), called Humboldt, that flows
north along the coast, keeping temperatures fairly mild year long, but also limiting precipitation to approximately 25 mm annually, which occurs as early morning drizzle called “garúa” in the winter months. While situated only 12° S of the equator, temperatures are generally mild and range from an average high of 27 °C (80 °F) in the summer months (December–April) to 18 °C (65 °F) during the winter (June–October). Lows range from 21 °C (70 °F) to 15.5 °C (60 °F) and never go below freezing. Summers are usually sunny, warm, and mildly humid while winters are overcast, chilly, and very damp due to persistent fog and low cloud cover. Skies are often gloomy and overcast for a week or more at a time during the winter months, and the sun is seen only briefly. This mild climate means that most buildings are without indoor climate control systems, and remain open-air throughout the year. It also means the coastal plain of Perú does not suffer from storm events, although, there can be significant breezes in the afternoon year-round that come off the coast and kick up substantial amounts of dust (but not to the level of a dust storm). These breezes are welcome in the hot afternoons during the summer month and coming off the cool waters of the coast are very refreshing. However, the coast of Perú falls on a fault line which causes frequent earthquakes, the last occurring in August of 2007, but the neighborhood is located far enough inland, and on a plateau high above sea level, removing danger from possible tsunamis.

These site observations were made on a preliminary visit to the site over a few days in September 2006. Due to the cost of travel to and from Perú from the US, no further site visits could be made until after the preliminary design was complete. Further information was gleaned from conversations with client organization staff that made more frequent visits and archival data collection on climate and cultural norms for this area of Perú.

Figure 6. Project site climate data
3.2 ARCHITECTURAL DESIGN

As in any architecture design problem, the characteristics of the project’s site, climate, and programmatic elements were important to beginning the preliminary schematic, but a fourth element, the desire by the client to construct the building with teams of unskilled volunteers presented an intriguing component to the preliminary idea. In *Cradle to Cradle*, William McDonough uses the metaphor of a cherry tree to discuss what the embodiment of sustainable development in architecture could be like:

As [the tree] grows, it seeks its own regenerative abundance. But this process is not single-purpose. In fact, the tree’s growth sets in motion a number of positive effects. It provides food for animals, insects, and microorganisms. It enriches the ecosystem, sequestering carbon, producing oxygen, cleaning air and water, and creating and stabilizing soil. Among its roots and branches and on its leaves, it harbors a diverse array of flora and fauna, all of which depend on it and on one another for the functions and flows that support life. And when the tree dies, it returns to the soil, releasing, as it decomposes, minerals that will fuel healthy new growth in the same place.\(^{54}\)

This quality was desired for the children’s home. The area where the home was located was characterized by a sense of hopelessness, especially in the youth. Mothers often related how their children felt trapped in the place, with no opportunity for higher education or steady employment that would lead to a higher quality of life, and many often looked for an “out” through sex, drugs, and alcohol, which only further contributed to their plight. The situations of the children who would live in the home seemed even more desperate. Many of these children would come from broken homes, with emotional and psychological scars from years of neglect and possible abuse. To become contributors in their societies, much would have to be reconciled in their young lives. In some way, the quality of the spaces would need to help encourage this.

\(^{54}\) McDonough and Braungart, *Cradle to Cradle*, 78.
In 2003, UN-HABITAT released a report that stated that approximately 1 billion people in the world live in poverty housing or states of homelessness. By the year 2050 this number is predicted to reach 3 billion people. This condition would require the world to produce 4000 buildings per hour from now until 2030 to meet this need. Can architecture present a solution in meeting this humanitarian crisis?

If architecture is seen as merely the art of building (noun), then no. However, defining architecture as the art of building (verb) opens up another world of thinking. Building (verb) is the process of gathering or assembling parts over time to make something. In this way, architecture allows people to participate with the world in an experiential way. Architecture then is an event that, when sustained, formulates our sense of community, values, and an understanding of a common good.

Several humanitarian aid institutions use the concept “sustainable developmental aid” to define their work. This concept is based on the premise “give a man a fish and feed him for a day, teach a man to fish and feed him for a lifetime.” “Sustainable development” is a common term in the language of contemporary architecture. While introduced in 1983 in the Brundtland Commission as a term applying to environmental, economic, political, and social issues, it is used almost exclusively in regards to the natural environment in architectural circles. If could be used in regards to humanitarian issues as well, but how? In seeing the physical needs of the poor and homeless, these institutions have found that sometimes the most significant thing they do is form relationships with those they help. These relationships act as seeds of hope, and contribute to their continued desire to help people who live in places of hopelessness.

This thesis examines the potential of a sustainable architecture for humanitarian issues. Through the case-study of a volunteer-built and funded orphanage in Peru, it explores the possibilities of architecture as event for fostering and sustaining a desire to help those in need.

Figure 8. Final preliminary design, board 1 of 6, concept
Figure 9. Final preliminary design, board 2 of 6, location and site plan
Figure 10. Final preliminary design, board 3 of 6, plans and elevation
This is where the volunteers come in (fig. 7). The condition of the future children to reside in the home is one that lacks investment; neglect is the absence of investment by persons/families in their lives. Using volunteers in the construction of the home would bring about the quality of “investment” in the activity of building. Furthermore, the level of craft that would go into its construction would speak of the personal investment of the craftsmen who made it. The orientation and arrangement of the spaces to let daylight and breezes into the spaces and the provision of communal interaction and play would exhibit the level of investment that went into its planning. All of these together would contribute to bringing about the quality of “investment” that would provide that feeling of “home” that cannot be described through words, but to which all can relate.

The following three sections outline the components of programmatic layout, build-ability, and natural systems that made up the schematic design of the project in exploring the architectural details that would provide the possibility for these desired qualities to come about. A fourth and final section describes further iterations of the design before construction began.

3.2.1 PROGRAMMATIC LAYOUT

The long and narrow characteristics of the site (fig. 9) compiled with the need for a security wall on the western property line and an existing axis established by two existing structures, lead to a scheme for the children’s home of a long, L-shaped structure. Situated along the western and northern property lines, the L-shaped building would flank a space left for the purpose of recreational activities like soccer and volleyball (two favorites of Peruvian boys and girls). Combined with the zoning limitation of a two-story maximum, this arrangement gave way to a program distribution (fig. 10) by wing and floor.

The public spaces of classrooms, multi-purpose room, kitchen, and storage, as well as the nursery (by code) would populate the ground level, while the second floor would be bedrooms, bathrooms, and local staff living quarters. By wing, the smaller, modular sizes of the bedrooms would fit well over long, narrow classrooms; composing the stem of the L, which positioned along the property line, is long and narrow. A total of eight identical bedrooms with baths and two staff bedrooms make up the second floor, while two classrooms, a nursery, and storage and utility rooms are on the ground floor. Two stairway/open air bays—one at each end of the wing—provide necessary divisions between the staff rooms and the children’s rooms on the upper floor and utility spaces with class spaces on the ground floors, and help draw natural breezes into the multipurpose space.
The foot of the L, situated on the northern property line, is composed of the large multi-purpose room, kitchen and entrance hall on the ground floor. The director's quarters are situated over the entrance hall and a staff room over the kitchen, while the composting toilet stalls flank the eastern side of the multipurpose room below, where breezes will carry any odors away from the building and property. This U-shaped arrangement of program on the second floor around the multi-purpose room allows for a higher ceiling suitable for the scale and purpose of the space.

Finally, the scale of the spaces was based on a 16 ft. x 20 ft. bay that was determined by the adequate sq. footage necessary for a bedroom for 4–5 children outfitted with a maximum of 3 standard bunk beds and a standard full bath, and the standard measurements of materials used in the construction system described below that would utilize unskilled volunteer labor.

3.2.2 BUILD-ABILITY

The client’s desire to use unskilled volunteers who were participants on their short-term trips as the principle construction force led to a scheme that utilized a site fabricated panel structure (fig. 11) where panels would be pre-made on the ground and then assembled to create the varying horizontal and vertical planes of the building. This scheme was modified to create only walls with the panels. It consisted of an assortment of 6 ft. x 8 ft. and 10 ft. x 8 ft. framed panels with different variations on window and door opening placement resulting in a total of nine different panels. In pre-making the panels on the site, templates could be made for each different panel, allowing for task repetition that would require little instruction, enabling a crew of four unskilled laborers to produce large quantities of panels quickly. Light-gauge steel was chosen because it was readily available, light and easy to manipulate by unskilled laborers, and allowed for framed systems assembled with screws, which unskilled laborers would be able to do. Pine, the preferred framing material, was not as readily available, more expensive, lacked quality assurances, and its high susceptibility to infestation wood-eating insects in the area, required that each piece be treated with a preservative that presented possible health issues to those who used it.

These panels would then be used as vertical infill on the ground floor between the wooden post and beam structure and compose the partitions of the entire second floor. Trusses for the roof assembly framed with light-gauge steel would be fabricated from a template as well. These preliminary ideas then lead to a developed scheme of layering structural systems (based

55. The US system of measurement was used in the preliminary design of the building because volunteers would be most comfortable with that system and construction materials' measurements were found to be of the US system of measurement.
Figure 11. Final preliminary design, board 4 of 6, panel assembly and section
Figure 12. Final preliminary design, board 5 of 6, structural layering and elevation
(fig. 12) to allow an assembly-line style construction featuring repetitive tasks by small crews of unskilled volunteers performing multiple tasks throughout the site, thus allowing a larger team of workers to work quickly and efficiently on the project at the same time, much like modern day house construction in large developments. The first layer of the system was a concrete foundation, a CMU property wall that ran the length of western side of the stem and northern side of the foot, and parallel L-shaped row of reinforced CMU columns, together making up the primary structural grid of the ground floor. Concrete and masonry are traditional construction materials but require skill, therefore the first structural layer would be completed by local tradesmen in preparation for the first volunteer teams. The second layer composed the structural assembly of the upper story floor cavity and consisted of built-up wooden beams that spanned the CMU property wall and columns with an intermediate built-up wooden post bolted to a steel anchor cast into the concrete floor, and wooden joists spanning the wooden beams, and wooden decking capping the assembly. The lumber used for the floor assembly is a locally available wood named Capirona that is very strong and dense and doesn’t need to be treated for insects. Additionally, all the connections for the wooden post and beams would be bolts to allow for easier assembly. The third layer is composed of the light-gauge framed wall panels and trusses discussed above.

3.2.3 NATURAL SYSTEMS

The availability of non-traditional materials in Perú that had recently been introduced and were becoming more popular over traditional materials allowed the client organization to rely significantly more on volunteer labor, lowering labor costs and increasing the potential for an expanded donor base. However, the desire to offer employment opportunities to local tradesmen also existed and thus many of the finishes would be completed in a traditional style for which local tradesmen could be utilized. An even more historical tradition in Perú was the ancient Incan’s custom of building that adapted to the natural environment that offers a great historical precedence of environmentally conscious thinking in Peruvian culture. Since the Spanish conquest of the Andean nation, however, colonization, industrialization, and discrimination of the native people led to the endangerment of those traditions. Coupled with modern ideologies that are mindful of the natural environment and passive systems, the intent for the children’s home was to provide multiple opportunities for natural ventilation and daylighting, passive heating and cooling, and the reclamation of wastewater for irrigation (fig. 13).

The orientation of the building’s length to 15 °N lead to pitching the roof of the bedrooms as such to receive solar gain in the winter months when skies can be overcast for up to weeks at
Figure 13. Final preliminary design, board 6 of 6, passive systems
a time. In this scheme, each roof overhangs the next to take advantage of daylight reflected
off the corrugated roofing metal through clerestory windows, like a light shelf. Additionally,
the interior wall and ceiling surfaces would be painted white, or a light tone, to maximize the
amount of daylight that would be reflected into the room. Additional daylighting will occur through
window openings along the exterior walkway on the eastern facade. The walkway trellis would
be covered with translucent polycarbonate sheeting, allowing additional daylight to filter through
the windows and into the bedrooms, while blocking the UV rays of the hot summer sun. This
arrangement would also allow morning sun to penetrate into the bedroom spaces signifying the
awakening of a new day.

While the advantage of the mild climate lends to the lack of mechanical systems for heating and
cooling, long time periods of overcast skies and high humidity due to low, dense fog formations
that blanket the coast in the wintertime can lead to damp and dark interiors and possible mold
problems. In addition to placing the structure on the site to take advantage of direct sunlight in
the winter and shade during the summer months, the second floor is offset from western wall of
the first floor to allow fresh air and daylight to reach down into the communal spaces used during
the day. Inlets on the second level of the western façade also direct cool evening breezes into
sleeping spaces on the second floor in the summer time.

A limited water supply, however, is the disadvantage of the mild desert climate. In
the community of Papa León, a public water system supplies water only four days a week
for three hours each day. Residents must store as much water as they can to provide
for the remainder of the week and for times when the water system malfunctions, or the
water level of the natural aquifer is too low, which happens often in the summer months.
Thus the initial scheme specified the usage
of a greywater reclamation system for all
shower and sink water of the second floor
bathrooms, which are aligned along the
western wall to limit extensive plumbing. This
greywater irrigates a living wall condition
Figure 15. Final preliminary design, exterior perspective

Figure 16. Final preliminary design, aerial perspective

Figure 17. Final preliminary design, interior perspective of multi-purpose room
that will be planted with plants that give off a pleasant aroma that will be carried into the building spaces by the south-westerly breezes. In addition to reclaiming water, decreasing water consumption is also important as composting toilets, located on the end of the multi-purpose room, limit the amount of water wasted in flushing toilets. An elongated chimney like structure over the pits of the toilets and clad in metal sheeting will be heated by the morning sun, exhausting the fumes from the compost to be carried away from the building by breezes that originate from the west. The composted waste can then be used to fertilize gardens on the property where food for the children’s home will be grown.

3.2.4 DESIGN DEVELOPMENT

The preliminary design was developed as a 5th yr. design project in a NAAB accredited architecture program and was completed in early May of 2007. After presentations to the client organization and a return visit to the site in July 2007, several modifications were made based primarily on financial concerns related to the size of the building. In response to these concerns, some program elements deemed unnecessary were removed and others were consolidated. In the bedroom and classroom wing (fig. 18), the length of the stem was shortened by 40 ft. by changing the “open-air spaces” to a simple stairwell, combining the second floor “guard/staff room” with the utility room on the ground level, and reducing the size of the nursery by half. Additionally, the nursery was placed closer to the kitchen and staff room, the two classrooms were divided into five smaller rooms, and an office was added. The division of the classrooms into smaller rooms was influenced by the need of multiple spaces for multiple groups divided by age level, and the need for additional lateral strength to resist seismic forces during an earthquake. The multi-purpose space was reduced in half as well, which also necessitated removing the directors’ quarters from the program to be added as a separate component at a later date if deemed necessary. Additional program elements such as laundry facilities and a public WC were also incorporated into the developed design.

Another issue was the practicality of the composting toilets for the children’s home. While a precedent presented a successful application in a school in China where toilets could be lumped together, it was determined that placing standard toilets would be the better option. Additionally, there lacked substantial development and testing on these toilets to guarantee success. This led to the subsequent introduction of a wastewater treatment system called an Advanced Engineered Environment System (based on the concept of the “living machine” by John Todd) that utilized septic tanks and constructed wetlands to store and filter wastewater. This system would be located along the western property wall south of the structure and would irrigate fruit trees and gardens to be located on the property.
Figure 18. Design development, first floor plan and elevations

Figure 19. Design development, second floor plan, cross sections, and elevation
A third and final change to the preliminary design was the decision to use a mono-slope roof (fig. 19), instead of a saw-tooth configuration, on the bedroom/classroom wing. This change was primarily due the ability of unskilled laborers to construct such a roof without the possibility of leaks being formed in the valleys. Additionally, corrugated sheet metal was found to be an undesirable product for roofing as it rusted quickly in marine air and red thick plastic corrugated roofing is often used instead that would negate the original light shelf scheme. The new mono-slope roof scheme would still allow for clerestory windows to be placed along the eastern façade and provide substantial natural daylighting.

These modifications were made between July 2007 and September 2007 before site preparations began. Major construction began in and was completed in January of 2011. During this time span several additional developments to the design occurred and are discussed in Section 3.4.

3.3 PLANNING AND FUNDING

Midway through the design phase of the project, planning began for the promotion of the project to raise needed construction funds and for the organization of volunteer work trips that would travel to Perú and participate in the construction of the children's home. These elements were essential to the project because of the client’s status as a non-profit organization that relied entirely on donations and volunteers. However, at that time, the client organization was consumed by raising funds for the maternity home project (Hannah’s Home or HH) discussed earlier that was already underway. The task for raising funds and organizing the initial work trip was instead undertaken by a student fellowship at a state university. A past affiliation between the fellowship’s pastor and some student leaders with the founder of the client organization led to the fellowship’s willingness to assist the client in the planning and funding phases of the project, which was given the name “Hannah’s Hope” (HP) in reference to the story of the biblical character of Hannah found in the book of 1st Samuel.

3.3.1 PROMOTION

The student fellowship involved in the HP project was a branch ministry of a local church body and is mostly student led. The pastor of the fellowship is part of the local church staff and serves the fellowship as a mentor and advisor to the student leadership. While the body of the fellowship did not present a viable financial resource, alumni who were once a part of the fellowship, and the current students’ connections to other established church bodies were seen as two of the
three main avenues for acquiring funding. The third was through the individual fundraising that would come through the members of the first volunteer work trip scheduled for January 2008 that was dubbed “PERU2008”. Team members would be expected to raise $2,000 to cover their trip expenses including airfare, housing and food, local transportation in Perú, and team support staff expenses. With trip expenses estimated around $1,500, the other $500 would be reserved for the construction fund. A goal of 50 team members would then net approximately $25,000 or one-quarter of the expected construction costs.

Therefore, it became very important to develop promotional media for the project, not only to send to possible donors, but also in garnering significant interest in participation on the first major volunteer team to begin construction on the project. In January 2007 a taskforce was established to handle the various tasks of managing finances, promotion, and team organization. Flyers (fig. 20) were developed for distribution to alumni and at presentations to affiliated church bodies. A website (fig. 22) was also developed as a way to share updates on the project after the initial wave of flyers were distributed. This website then remained updated through the first two years of the project and featured blog entries of team participants on their experiences working on the project. The third piece developed was two 60 sec. promo videos that were shown at the first two public HP announcement Sundays in March 2007 to the student body of the fellowship. The showing of these two promos, plus teaser slides placed in service announcements prior to the announcement Sundays in order to generate a build-up and excitement of the project announcement (similar to methods used for the promotion of major movie releases), resulted in a total of 85 students signing up as interested in participating on PERU2008. The purpose behind each form of promotion was to share as much pertinent information on the project
while maintaining a simple yet recurring graphical theme that would embody the spirit of the project and encourage excitement in participating. To this end, the tag line, “are.u.ready?” was used throughout the promotional material.

Official promotion of the project began in March of 2007 and by December 2010 the entire $100,000 had been raised. 65% of the funds originated from faith-based organizations associated with the student fellowship, 18% from individual donors, and 17% from the fundraising efforts of Perú2008 participants. In March 2008 and August 2010, two more substantial individual pledges ($70,000 and $35,000 respectively) were made to cover projected shortfalls and to replace original funds that were used on another more pressing staff housing project on the same property (to be discussed in greater detail in section 3.4 “Construction and Licensing Procedures”).

3.3.2 VOLUNTEER TEAMS

The most significant element that influenced the HP project was the importance of using unskilled volunteer teams in the construction of the project. Overall, approximately 30 volunteer teams ranging from less than 10 to over 60 participants and averaging approximately 20 participants per team worked on the project over the span of three years. The majority of these trips occurred during the summer months of June, July, and August and were a mix of adult/youth teams and college-age teams.

The PEUR2008 team, the first major team to work on the project during the first two weeks of the month, was the precedent by which all following teams were organized. This team was the
largest (70 volunteers) and was primarily composed by a group of 46 college students (from the student fellowship mentioned previously) that was the major construction component of that particular team. The college group was divided into 6 crews (4 crews of 8 and 2 crews of 7). Each crew was assigned a male and female leader who directed their respective crews in its daily tasks and interfaced with the project manager (the designer and leader of the project) and construction leaders (volunteers on the team with construction experience). The crew leaders were trained on a specific task by the project manager or construction leader and would then teach their crew. Each crew would work on a specific task for at least two days (fig 23.), overlapping with a new crew on the second day in order to provide continuity in the task and to prevent worker fatigue. Because of the strenuous nature of some tasks (i.e. digging trenches for utilities) compared to others (assembling wall panels out of light-gauge steel), tasks were rotated amongst crews to prevent them from becoming physically run down. Each crew also rotated through community outreach activities throughout the week, keeping the quantity of persons on the job site to a manageable amount of approximately 30 persons. Although precautions were taken to keep the team well rested and energized, many of the team members became run-down and sick during the latter part of the 2nd week, significantly affecting productivity and team morale.
Subsequent teams maintained similar organizational patterns depending on the size of the team and availability of construction leadership on site. For most of 2008 and 2009, only two construction leaders (including the project manager) were available to direct teams, leading to the reduced potential of productivity and poor work quality by volunteers due to confusion and the inability of the construction leaders to oversee and inspect all work being accomplished on the site at once. This led to a substantial amount of work being redone with subsequent teams, wasting material resources and time, and reducing positive feedback of team members who spent their time redoing work rather than making progress on the project. Therefore, in 2009, a group of volunteer interns were used to direct volunteer teams during the busy summer months of June, July, and August and helped resolve the problems of task leadership and supervision, which greatly improved the quality of output by teams. Each intern was instructed in a specific task by the project manager and then led that specific task unto its completion, guaranteeing continuity as well as accountability over the quality of work being accomplished. The addition of the intern group also helped establish a hierarchical system for problem solving as the interns worked as a team with the project manager instead of all team members approaching the construction manager with problems. The intern group could also provide valuable feedback on compatibility of team members to their respective tasks and information on when to restock materials, two persistent problems experienced the previous two years.

Figure 24. Project site before construction began
3.4 CONSTRUCTION AND LICENSING PROCEDURES

After the preliminary design and developments were completed and fundraising well underway, ground was broken to begin the HP project in July of 2007 (fig. 24). Over the next 3.5 years, the project was constructed, at first by unskilled volunteer teams (Section 3.4.1) and later by a Peruvian construction crew supplemented with volunteer labor (Section 3.4.3). For about a year, from July 2008 – May 2009 (Section 3.4.2), no work was completed on the project, as a staff housing project on the same property became an urgent priority. The staff housing project, however, allowed for the experimentation of ideas evolved from the initial construction of HP. As construction on HP resumed, methods explored in the construction of the staff housing were applied to the project, resulting in further development of the original design. Throughout the construction process, paperwork for permits and licenses were continuously in process (Section 3.4.4), as permits were not obtained before construction began at the advice of a local lawyer familiar with the construction permit process. In January 2011, major construction was completed on the project and at the time of this writing, occupancy permits were still being pursued.

3.4.1 UNSKILLED VOLUNTEER LABOR (2007–2008)

After the ground breaking in early July 2007, work on the footers of the west and north property walls was begun. Because the soil in this area is fairly sandy and easy to dig, the trenches for the footers were excavated with shovels, as is the local custom, by volunteering local tradesmen. In the following months the concrete footers were cast and the first four courses of CMU, purchased and delivered from a concrete plant in Lima, were laid by local tradesmen. In that span of time, a major earthquake that affected the area in August 2007 temporarily paused any further construction until a staff team from the client organization could travel to the site and assess any damage. After visiting the project site in September and observing minimal damage, work resumed for preparations of a concrete slab, encompassing the footprint of the building, to be cast in October.

On October 7, 2007, a team of eight skilled and unskilled volunteers arrived at the property to begin building the formwork for the ground floor slab that would be cast later in the week. Upon arrival, grading and leveling that was supposed to have been accomplished by a Peruvian excavator was determined inadequate and plans were made to contact another excavator, on short notice, to finish the work. By midday Monday, the excavator arrived and finished leveling and packing the area for the slab. The following day, work began on constructing the formwork and holes were excavated for the column footers that would be part of the monolithic slab. At this
time, the concrete plant in Lima was contacted to order a delivery to be scheduled later in the week, however, the company was already booked and could only deliver on Sunday (after the team would be gone) or that very night. Perceived circumstances meant that the only option available was to cast the slab that night (fig. 25 and 26), rushing preparations that lead to several problems and oversights that were discovered later.

After completion of the slab, local tradesmen were hired to complete the CMU property walls, and other structural CMU walls and columns on the ground floor (fig. 27) in preparation for the PERU2008 team. Late in December, a small setup crew composed of the project leader, construction managers, and a few volunteers arrived three days prior to the full team to set up workstations and organize tools and materials. On the first day, the discovery that lumber that was supposed to have been delivered before the team’s arrival had yet to arrive, caused scheduling conflicts that significantly affected work flow for the next several days. The team arrived in two groups a day apart. Group 1, consisting of work crews A-C began work on the 31st of December, 2007, with Group 2 following on the 1st of the new year.

The first tasks were the assembly of the principle wooden posts and beams (fig. 28) followed by the placement of wooden joists spanning those principle beams (fig. 29). These tasks spanned the first week with 2-3 work crews working on the task each day. Near the end of the first week, a crew was able to begin framing the light-gauge steel wall panels en mass (fig. 31). Tongue and groove decking began going down by the end of the first week (fig. 30) but was not able to be finished by the end of the second week, thus limiting the amount of wall panels that could be erected. The hardness of the specified lumber (capirona) presented many problems as it was found to be very difficult in which to hand drive nails and pneumatic framing nailers needed to be continuously recharged in order to drive nails fully, requiring a volunteer to continuously man the air compressor and manually recharge the compressor. Additionally, power had yet to be supplied to the back of the property, resulting in extension cords being run over 500 feet from the existing HH buildings to operate compressors and power saws. The cords, because of the long distance, were only able to handle one power tool running at a time. While these problems were able to be overcome, they hampered efficiency on the job site and led to many frustrations on the part of the volunteers and hindered morale. By the end of the two week trip, the wooden structure of the bedroom wing was constructed, two-thirds of the decking for the second floor was nailed down, all the light-gauge steel wall frames were assembled, although only half were stood up (fig. 32), and half of the light-gauge steel trusses were assembled and a few erected (fig. 33). A water

56. Team leadership did not wish to disappoint the skilled volunteers who had made the trip to Perú specifically to help with the slab pour. In hindsight, results would have been better if the order was made for a following week when Peruvian labor could complete the task. A positive experience for the team however was the deciding factor.
Figure 25. All-night concrete slab pour

Figure 26. Inspecting the slab the following morning

Figure 27. CMU walls and columns

Figure 28. Capirona built-up post and beam assembly

Figure 29. Capirona 2x10 floor joists

Figure 30. Nailing the wooden decking down

Figure 31. Assembling light-gauge steel wall panels

Figure 32. Standing up the wall panels
reclamation system (fig. 34) was also installed for the HH buildings at the front of the property. Even though the team did not accomplish as much as they had hoped to, it was still an incredible feat for a group of unskilled volunteers.

Between January and March, two smaller volunteer teams (approximately 10 persons) spent a few days working on the construction site. These teams finished nailing down the decking on the second floor and finished assembling trusses, although neither the project manager nor a construction manager was present to oversee the work, resulting in poorer quality output. In March, another college-aged volunteer team worked on the project for a week. During this week, the remaining wall panels were assembled, trusses and purloins were placed over the first three bays (fig. 35), and a portion of the plastic corrugated roofing was put down (fig. 36). After this work trip the construction site again laid vacant from the middle of March until the first week of June. During this time, the hot summer sun, with most of the project not under roof, baked the wooden decking and shrunk it in places, leaving gaps, and bleached the surface. Originally intended to be the finished surface, the affects of the strong UV rays of the sun at 12 °S of the Equator left the floor unusable in that regard and another finished surface would have to be applied at a later date.

During the 2008 summer months of June, July, and August, six more teams ranging from 10 – 40 persons spent a week each working on the project site. In the first three weeks, the rest of the trusses for the bedroom wing were erected, all of the roofing was screwed down (fig. 37); and in bedrooms 1–3, wall panels were packed with 3 in. of rigid foam insulation between studs (fig. 38) and finished on the interior with ½ in. drywall (fig. 39). By July (fig. 40), however, work on HP was postponed as a staff housing project for HH at the front of the property became urgent.

3.4.2 STAFF HOUSING, PRAXIS, AND CHANGING PARADIGMS (2008–2009)

While halting progress on HP construction was not preferable, the staff housing project, a second story addition of the dormitory building of HH (fig. 41 and 42), provided opportunities for praxis in exploring evolution of design ideas that were then applied in finishing construction of the HP project. These ideas consisted of a different roof structure, experimenting with different exterior finish surfaces, using concrete for finished floors, and integrating more masonry into the design. At the same time, the project manager of both projects (HH staff housing and HP) took up residency on the project site to oversee daily construction of projects underway until their completion. These situations led to two distinct evolutions in the construction process of these projects. First, they allowed for the hiring of a full-time crew of local tradesmen; meaning daily
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Figure 33. Project progress after PERU2008 work trip

Figure 34. Water reclamation system

Figure 35. Trusses going up in March 08

Figure 36. Roofing going down in March 08

Figure 37. Progress at the beginning of June 08

Figure 38. Filling framing with styrofoam insulation

Figure 39. Volunteers mudding drywall in June 08

Figure 40. Progress at the end of July 08
progress would be made on the projects and was no longer dependent on the flow of unskilled volunteer teams. Secondly, it marked the beginning of the incorporation of traditional building techniques specific to this area of Perú into the building projects, specifically the increased use of concrete and masonry. While it was always the intent of the designer to incorporate as much local materials and methods as possible, reliance on the unskilled volunteer teams inhibited the prevalent use of these materials in the beginning. This paradigm shift came about due to the following experimentations in material choices and structural assemblies.

The staff housing was constructed in two additions. The first was a second story addition of the existing HH dormitory. A wooden floor assembly, built a year prior, was serving as the roof for the bunkrooms below but was found to leak substantially in the winter months. To solve the problem an exterior shell was constructed to be finished at a later date when the need for additional staff housing arose. While the wall partitions of the shell were framed in a similar manner to HP, cement board panels (fig. 43) were tried for the exterior finish instead of stucco. This product was readily available in Lima, but it was found that many of the tools and fasteners used with the product in the US were not, resulting in considerable difficulty in applying and finishing the panels, and along with concerns over the products long-term weatherability, led to the decision to not use the product on future construction projects. The second addition was a two-story structure built on the end of the dormitory. Its purpose was to provide an additional bathroom for the bunkrooms on the ground floor and a master suite for married staff. This structure (fig. 44) was constructed with left over CMU from constructing the property walls and was finished with stucco (fig. 45). These additions were built while the project manager was residing at the project site, allowing for the observation of local construction methods that then greatly influenced design changes in the HP project when construction resumed.

Two different modifications of a roof structure assembly were also used on the addition. Both versions utilized wood structural members instead of light-gauge steel framing members, as the light-gauge steel did not provide desirable results in application of finish sheet material. It was discovered that the volunteers would strip screws when attaching the drywall or the roofing and in time drywall seams were cracking and small leaks formed in the roofing. The first modification was a hybrid of pine 2x6 ceiling joists (fig. 46) spanned by a locally fabricated traditional rebar truss system (fig. 47) to carry the roofing material. As opposed to the downside of needing to treat pine to counter insect infection, drywall screws put into pine did not strip and provided better results and was also less expensive than other lumber choices. However, difficulties in applying the roofing material to the rebar structure satisfactorily led to a second iteration. In the first iteration, roofing spanned structural rebar members and was fastened with a bolt and rubber
Figure 41. HH staff housing plans and sections

Figure 42. HH staff housing elevations
washer fastener that allowed too much give in the roofing material for it to remain watertight for an adequate length of time. The second iteration (fig. 48) used deeper pine rafters (2x8), plywood sheathing, felt paper and corrugated roofing. This iteration was found to be the most successful as it allowed for skilled volunteers from the US with experience in wood framing to construct the roof, saving labor costs, and the lumber held fasteners used to apply finish sheet materials well, and provided a ventilated roof membrane that kept spaces below cool in the hot summer sun.

The floor of the second story staff housing addition presented a similar situation to the children’s home. The wood decking, which was applied long before walls and a roof were constructed, had deteriorated significantly in the elements and was no longer suitable as a finished surface. Additionally, the wooden joists supporting the decking were not cut uniformly (as was discovered of most lumber sold in Perú) leading to dips and rises in the floor surface. In discussions on how to resolve the problems, the head Maestro suggested casting a 2 to 3 in. reinforced concrete slab over the decking (fig. 49). This solution met all the circumstances and provided several benefits. First, it was considerably less expensive than any other viable floor options; second, it could be finished smooth and level enough to be considered the finished surface (fig. 50); and lastly, it provided a convenient solution to concealing electrical conduit supplying ceiling lights on the first floor by running a 5/8 in. conduit over the decking before casting the slab and would then be significantly covered and hidden by the concrete. The only downside to this solution was the necessity of additional vertical supports to handle the extra weight of the concrete.

This decision to use concrete as the solution to finishing the floors marked the beginning of increased incorporation of Peruvian construction methods into the construction of the facilities. Prior, many of the design and construction decisions made were highly influenced by North American perspectives. Subliminal issues of arrogance and trust on the project manager’s part and the limitations of unskilled laborers, language barriers, and short-term construction trips prevented many opportunities for the input of local skilled laborers. But with the project manager stationed permanently at the job site, local construction techniques were observed, language and cultural barriers eroded, and local tradesmen were given more input into decision making, allowing local methods to be adapted into further development of the HH and HP projects.

This shift towards more concrete and masonry used in the construction of the two projects had many benefits, but also required a significantly greater dependence on local tradesmen. Materials and tools required for traditional methods were significantly less expensive than wood and light-gauge framing finished with sheet material, but required skilled labor adding considerably to construction expenses. From 2009–2010 labor accounted for 35% of the
Figure 43. Cement board exterior of HH staff housing

Figure 44. CMU masonry addition to staff housing

Figure 45. Typical interior stucco finish

Figure 46. 2x6 pine ceiling joists

Figure 47. Locally fabricated rebar roof assembly

Figure 48. 2x8 roof assembly with plywood

Figure 49. Rebar reinforcement for concrete slab

Figure 50. Finishing concrete smooth with reddish pigment
$166,000 expended on construction during that time as opposed to less than 10% spent on labor prior to 2009. Concrete and masonry structures also took longer to construct, further compiling labor costs. But, the quality of the work was a priority over limiting expenses in this case, and as construction resumed on the HP project in May of 2009, the balance shifted from an unskilled volunteer based effort to skilled laborers with periodic support from volunteer teams.

3.4.3 PERUVIAN SKILLED LABOR (2009-2010)

When construction resumed on HP, the incorporation of techniques explored in the construction of the staff housing project lead to further development of the design of the HP project. A concerted effort was made to integrate local construction methods and materials. In the cafeteria wing (formally the multi-purpose room) especially the paradigm shifted towards almost complete utilization of Peruvian techniques. To accommodate these modifications however, several wall panels that had been erected, but not finished, by volunteer teams in 2008 were removed. The sheet material and framing members were harvested and reused on chases and headers constructed to conceal plumbing and other utilities later.

As was the case with the staff housing, 2–3 in. of reinforced concrete over wood decking was planned to be used as the finished floor for the second story (fig. 51). To account for the extra weight, a reinforced concrete beam and columns (fig. 52) would need to be set in the middle of each bay, reducing the free span of the wooden joists supporting the floor by half. Additional concern over sufficient lateral support to counter seismic forces in the event of an earthquake as well as the extra floor loads lead to constructing CMU partitions (fig. 53) under the wooden beams supporting the floor assembly. During a seismic event, these solid partitions would perform as shear walls, resisting lateral forces. To properly support the shear walls and additional concrete beam assembly, portions of the concrete slab were cut and removed for new footers to be excavated and cast (fig. 54). These modifications were completed in each bay on the ground floor of the bedroom/classroom wing. In addition to providing extra structural stability, the new CMU walls and concrete columns allowed for additional design features such as a concrete bench (fig. 55) cast into the facade facing the play area.

For a year (May 2009–2010), these projects along with the interior and exterior stucco finishes (fig. 56 and 57) were completed to bring the bedroom/classroom wing to completion. The work was primarily accomplished by the crew of local tradesmen and volunteer teams contributed when available. In the summer of 2009, volunteer teams applied the exterior sheathing that would serve as the underlayment (fig. 58) for the stucco finish of the entire second floor, packed the framing of the second floor walls with rigid foam insulation, hung drywall on the interior
Casting concrete floor over wood decking

Figure 51.

Added concrete beam and columns

Figure 52.

CMU partitions on ground floor

Figure 53.

Excavating footers for CMU partitions

Figure 54.

Concrete cast bench

Figure 55.

Applying stucco to the stairwell facade

Figure 56.

Smoothing stucco

Figure 57.

Applying lath and building paper over OSB

Figure 58.
ceilings and walls of the second floor, and ran wire. When “team season” returned in May of 2010, volunteers assisted the local tradesmen in casting the finish concrete floors for both stories, finished the interior drywall, installed water supply and waste lines, and primed and painted interior and exterior surfaces. These tasks accomplished by the volunteers were greatly assisted by the aforementioned group of interns that directed the volunteer work crews and oversaw construction activities to assure quality.

As many of the tasks remaining on the bedroom/classroom wing were now easily handled by the volunteer teams, the local tradesmen began work on constructing the cafeteria wing in July 2010. At this time, only the back and side walls and slab were in place and the opportunity existed to significantly modify the design of the cafeteria wing. Knowing that there would not be any volunteer teams available to contribute to the construction of the cafeteria wing, plans were made to construct the wing using only local materials and methods with a few hybrid interventions used in the staff housing. A new set of construction documents (fig. 59) were made collaboratively by the project manager and head Maestro.

The new cafeteria wing, maintained a similar layout as previous versions, but the entire structure, with the exception of the patio roof, was to be a reinforced concrete frame with infill masonry (fig. 60 and 61). This new scheme was the result of two years of study of local materials and methods, leading to a considerably better designed structure than the previous projects undertaken on the property.

The cafeteria wing took slightly over six months to construct and finish with a crew of six local workers plus the construction manager and another skilled staff member from the U.S. Because of an end of the year goal for finished major construction, the crew worked overtime for much of the month of December. During this six month time period however, new limitations began to arise as shortfalls in funding were projected. To counter these shortfalls, the structure of the cafeteria roof was changed from an entirely concrete to primarily wooden (fig. 62) structure that would provide some savings in material costs and significant savings in labor.

Additionally, the exterior banister and patio roofs that had yet to be bid out were constructed using left over lumber that was available on the property. This lumber had been originally purchased in 2008 to construct the wooden structure of the cafeteria wing, but when construction stopped on the HH project and the design changed, they were then used as the wooden forms for casting concrete. No longer being used, as all the concrete structural elements were cast, the lumber was cleaned, cut down to smaller members, and used for the patio roof (fig. 63) and

57. “Team season” refers to the time of year when the majority of volunteer teams are scheduled in the months of June, July, and August.
Figure 59. Cafeteria wing construction documents

Figure 60. Ground floor masonry walls (face brick)

Figure 61. Second story masonry (stucco finish)

Figure 62. Pine 2x8 assembly for cafeteria roof

Figure 63. Patio roof out of salvaged capirona
banister. These adjustments allowed the project to be completed relatively on budget and on time.

All major construction was concluded in the middle of January 2011. At the time of this writing, a few of the client organization’s international staff based in Peru continue to tie up loose ends, such as some interior painting, fixture installation, and minimal finished carpentry, and have begun preparations for the application of the building safety inspection and subsequent occupancy permits.

3.4.4 LICENSING PROCEDURES

When the project began in 2006, Peruvian legal counsel to the client organization advised the organization to avoid formal licensing procedures as they were often time consuming and costly because of corrupt local governments. The traditional route taken by locals, it was explained, was to begin a project without permits and apply for necessary permits and licenses after the fact and pay a small fine that is administered. Or, if the project was a simple residence and it was doubtful to be ever discovered, permits were simply forgotten or ignored. Whether or not this was sound counsel is up for debate, but the informal process of obtaining the permits and licenses, in its own right, was time consuming and costly, directly and indirectly.

Several Peruvian run centers in the area that work in the social sector do not often apply for permits and licenses and therefore operate “under the radar”. Custody arrangements are almost always made informally, meaning a parent or family member could at any time remove children from a program, interrupting any progress made with the child their schooling, social behavior, and psychological problems caused by the neglect and abuse they undoubtedly experienced prior to arriving at the center. This removal would also risk returning the child to the dangerous and unhealthy environment from which they came that would undermine any progress made with the child. For example, a child from one such center in the area was creating problems severe enough the directors of that center required the mother to remove the child from the center. The mother, who works outside the department of Lima, is often away from her home for weeks at a time, which was the original reason the child and her two younger siblings were placed in the center. When the mother was asked to remove the oldest child, she took the younger siblings with her as well out of anger. However, the mother’s situation had not changed, and the children were essentially left to fend for themselves. They spent several months living in a small one-room hut, going to aunts and uncles in the area for food, or to bathe. Their ages were 13, 8, and 6.

Informally run centers such as this cannot access local and national government funding and support because they do not have the necessary licenses and permits. They also have limited
access to necessary professionally trained personnel such as psychologists, nutritionists, and social workers. These centers are almost always under-funded, understaffed with under-trained personnel, and housed in defunct facilities, leading to a continuation of the abuse and neglect of the children they are meant to help. Many children in these centers leave for the streets before they would age out at 18, again only maintaining the cycles of poverty, ignorance, and inequality that cripple these communities.

The purpose of the HH and HP projects undertaken by the client organization is to break these cycles. In order to do so, all licenses and permits had to be obtained to maintain a legally operating center and avoid the downfalls of those centers that operate “under the radar”. The process in obtaining these licenses was long, arduous, and confusing. Authorities and clerks at the local municipality building were often difficult to communicate with because of language barriers, and what was perceived as a cultural tendency to withhold helpful information unless specifically requested. Instead of being given advice and information, municipality and government officials often appeared to undermine the process.\(^{58}\)

In time, additional legal counsel and assistance by a Peruvian architect and other international NGOs who were familiar with the process helped greatly in obtaining the construction permits for both the HH and HP projects, which were obtained in December of 2009 and legalized all construction that had been completed and was still underway. In addition to the construction permits, occupancy permits had to be obtained to operate the facilities. In 2010, while construction was still underway on HP, the process began for HH on the front of the property. Part of this permit, was a use and zoning certificate that required the permission of the homeowner’s association of Papa León to operate a center, because the community is zoned for agricultural use with single-family residences, which was unknown by the client organization at the time of the property’s purchase. While the client organization had made many positive relationships with community members and board members of the homeowner’s association, there were still a few community members who were against approving the operation of the HH center. These community members did not disapprove of the social work the organization was doing in the community or the purpose of the center, but rather had concerns on the principal of circumventing the law in this case, fearing it would open the door for more such centers to come in to the area (like the drug centers that lead to a rise in crime during the 90s and were finally shut down in 2009). While these community members did not ultimately prevent the centers’ approval, it delayed the process for several months.

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\(^{58}\) This observation was made through personal experiences over a three–year period working and residing in Chilca, Perú. While subjective, without going through the formal licensing process, it is unknown whether said processes would have been any easier than the informal route taken by the client organization.
In all, four years passed before the HH center was able to open, mostly due to the process of obtaining proper licenses and permits. Not knowing the extent to which the process would last, communication from the organization to its donor base was always that the center would open soon. This continual repetition of the expected opening date, coupled with the economic recession in the 2000s, depleted the organizations donor base, which only caused frustration and stress throughout the organization that adversely affected decision-making processes. These situations may have been avoided by going through formal procedures in pursuing necessary licenses.

3.4.5 PROJECT SUMMARY

When the HP project began in 2006, it was conducted as a traditional design problem handled with the methods taught in a NAAB accredited program. As the project began its construction phase, many factors that had not been accounted for in the original design problem resulted in a project constantly under development and revision. Whether this was a positive or negative outcome is not really known as the project was still constructed successfully and it is too soon for its long term impact and use to be known, and was not a point of specific inquiry for this study. What is known, however, is the direct correlation between further development after the final design stage of the project due to dynamic local factors that were undeterminable during initial site visits.

When scanning the project site, now that both HH and HP projects are complete (fig. 64–78), what is noticeable is the evolution of design and building that occurred over time in the various projects that were built. This was the result of the project manager and local tradesmen’s ability to overcome cultural and language barriers and collaborate as the buildings emerged. In a larger sense, design and construction were melded into one fluid activity that adjusted accordingly to determining factors (discussed in greater detail in the following chapter) as they arose. Design became more “discovery” than “manipulation” as is suggested in this narrative by Christopher Alexander on group process:

“When a group of people try to do something together, they usually fail, because their assumptions are different at every stage. But with a common language, the assumptions should be explicit from the start. Of course they no longer have the medium of a single mind, as an individual person does. But instead, the group uses the site ‘out there in front of them’ as the medium in which the design takes shape. People walk around, wave their arms, gradually build up a common picture as the plan takes its shape… It is for this reason that the site becomes so much more important for a group. The site speaks to the people—the building forms itself—and people experience it as something received, not created.”

Figure 64. HH and HP master plan
Figure 65. Completed HH staff housing additions

Figure 66. Exterior walkway to property gate

Figure 67. Upstairs hallway of staff housing
Figure 68. Director’s quarters in staff housing addition

Figure 69. Light shelf in a staff house bedroom
Figure 70. Project HP completed

Figure 71. Entrance hall to the cafeteria
Figure 74. Cafeteria with tables and lights

Figure 75. Staff bedroom on ground floor
Figure 76. Overall photo at dusk

Figure 77. Looking back to the front from the patio of HP
Figure 78. Project HP completed construction and kids playing in the foreground
4. Determining Factors

In the project observed by the case study discussed in the previous chapter, as in any architectural project, there were “determining factors” that directed the resulting design, construction, and ultimate success or failure of the project. These factors are the circumstances, facts, and/or influences that cause an outcome to occur in a particular way. Some of these factors were static and given at the beginning of the project, such as the client’s needs and the climate of the project site. Others were dynamic and came about in time, such as local customs or local construction techniques. Many of these dynamic factors were unknown during the design stage because of its humanitarian design nature. In the traditional and linear design/bid/build model by which most architectural curriculum is taught, the emphasis for the designer is to analyze the givens and produce a response based on their conclusions. Once this response leaves the design stage, it is seldom altered in major ways; quite the opposite from what occurred in the case study.

Because of the project’s engagement with social and economic issues like poverty and discrimination, the nuances of complex local customs and norms that had major altering affects on the project were not obvious to the designer because of differences in culture and the economic and social background of the designer. If the designer maintained the traditional design/bid/build method and not spent significant time at the project site, subsequently becoming the project manager and understanding cultural nuances, the outcome would have been significantly different and may have led to design failure. As discussed at length in Chapter 2, sustainable development places an urgent need to address fundamental problems related to poverty and inequality, as they have far-reaching effects on the potential for a sustainable future, considering the rapid, unabated industrialization and urbanization that is occurring in the places where these issues are the most pronounced. It is therefore imperative to understand in what ways our current design education models do and do not reflect the real inter-workings of these complex and dynamic environments.

The following sections outline the process undertaken to begin this comparison. Observations from the case study detailed in the previous chapter were analyzed and a list of determining factors was identified. This list was then categorized and compared to current architectural curriculum criteria to see the correlations and disparities between the two. The resulting findings

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60. This is not to say that the cultural customs and norms of Perú where the project took place are more complex than other cultures, only to suggest they were complex to the designer. Truthfully, all customs and norms of all cultures are equally complex, those that are known, however, seem simple to the knower.
will be used in chapter 5 to suggest possible development of NAAB student performance criteria and design education models.

4.1 IDENTIFYING FACTORS

The following determining factors that were identified from the case study are those factors that were considered the root of a particular circumstance, fact, and/or influence. The list is considered to be comprehensive for this particular project and does not represent an all-encompassing or standardized list to consider in any humanitarian design project. While many of these factors may arise in other projects they represent factors specific to this project, and are used only to compare NAAB criteria to possible factors encountered in humanitarian design projects. Additionally, the factors are named in general terms, but represent very specific circumstances, facts, and/or influences that played a role in the project. This specificity and the factors’ effects on each other are detailed after the definition of each factor in the following sections. Additionally, these factors were categorized into the three areas. Those areas and their respective factors are as follows:

- **Programmatic**: client desires and needs, user needs, spatial requirements, equipment requirements
- **Location Based**: site conditions, climate, water supply and wastewater disposal, local construction methods, local materials and tools, local laws and customs, existing urban fabric
- **Investment**: designer(s), project manager(s), donors, volunteer laborers, local tradesmen, local community, local government

4.1.1 PROGRAMMATIC

Programmatic factors affect the typology of building, its purpose, and its layout. They are reflexive of client and user needs, and spatial and equipment requirements, and directly affect building scale, form, and aesthetic and indirectly affect material selection and systems.

**Client desires and needs** specify the vision and purpose of the project and the principle parameters on how it should be accomplished.

The client’s specifications for the project were simple and straightforward. The home should provide living and learning spaces for approximately 50 children, ages 0-18; and living and
working spaces for necessary local staff. The client's desire was for the home to be simple and moderate, yet aesthetically pleasing and durable. As a non-profit organization, the client's need to complete the project with limited financial resources by utilizing unskilled volunteer laborers from the US that influenced the chosen structural system and materials.

**User needs** specify the type, quantity, and quality of needed spaces and equipment.

Living and learning spaces for 50 children required spaces for sleeping, bathing, eating, classroom instruction, and playing. The broad range in ages meant a nursery would need to be provided as well as smaller rooms for up to five children divided by age instead of larger dormitory style rooms which are custom in government run centers. Having girls and boys living in the same structure also led to the need to physically divide the bedrooms into boy and girl zones. Additionally, the majority of the children that will live in the home will originate from situations of abandonment and abuse and limited parenting, meaning the children will tend to be unruly, and will require the building to be built soundly with durable materials.

Local staff anticipated to work at the children's home fall into two categories: live-in and commuting. The staff that reside on the project site will require basic living spaces (sleeping and bathing) separate from the children, although some staff may be required to room with children as care-takers. Separate and isolated spaces are also needed for the staff to rest and rejuvenate through a demanding full day of childcare. Working spaces required for staff include offices, cooking spaces, meeting spaces, and storage and utility spaces required to undertake the day-to-day activities of 24/7 childcare.

**Spatial requirements** specify the area and volume of necessary user and equipment spaces.

Client desires, user needs, and codes led to the spatial requirements of the project, which in turn primarily determined the building scale and subsequent layout. These spatial requirements however, were also influenced by the client’s needs for a cost effective structure, which led to a reduction of spaces and multipurposing of other spaces from the original scheme. For instance, classrooms meant for after school homework and additional instruction double as meeting spaces for staff when children are away at school. The large dining hall, big enough to contain all children and staff and several guests, can be used as an assembly space for special events and indoor play space.
**Equipment requirements** specify the type, quantity, quality and required location and services for necessary equipment.

Equipment requirements for the project were limited to kitchen appliances and recreation. The mild climate eliminated the need for mechanical indoor climate control and local custom is for most buildings to be open air. Local codes also did not require fire suppression systems for this typology of building, only strategic placement of fire extinguishers and signage denoting paths of egress, safety zones, and warning of danger. Kitchen equipment requirements were based on the average quantity of people expected to be served by the kitchen in an optimal amount of time, which in turn determined the spatial requirements for an optimal working environment. Recreational requirements were based on traditional sports and games played by children in Perú, such as soccer and volleyball.

### 4.1.2 LOCATION BASED

Location based factors embody the relatively static characteristics of the project’s environment such as specific site and climatic conditions, existing urban fabric, local laws and customs, locally available materials, and traditional building methods, and directly affect material selection, and systems of the building, while indirectly affecting form and layout.

**Site conditions** specify the physical characteristics and existing conditions of the site while **Climate** specifies the weather and seasonal patterns of the site.

Along with the programmatic factors, site conditions and climate had significant influence on the layout and form of the project. Site conditions such as the narrow and long shape of the lot, the flatness of the terrain, the arrangement of existing structures on the site, and the absence of property walls on the western and northern boundaries were main influences on the elongated L-shape form. The mild climatic conditions, while eliminating the need for mechanical climate control systems, also meant the structure needed to be positioned well to accept natural breezes. This factor together with the need for a larger outdoor play area and the pedestrian axis established by the entrance to the property and the arrangement of existing structures lead to an elongated single loaded corridor arrangement of the bedroom wing, modifying an earlier iteration that had the stem as a double loaded corridor.

At 12 °S of the equator, the sun’s rays can be very intense in the summer months. Positioning openings to allow for winter sun to enter but blocking summer sun led to a mono-slope roof
with clerestory windows and a light shelf that would bounce daylight deep into the rooms while sheltering inhabitants from UV rays. Extensive natural daylighting was very important to the overall scheme. With the long western wall of the building doubling as a property wall to save costs, the wall could not contain openings for daylighting and ventilation on the ground floor. To prevent dark and damp interiors, the second floor was shifted away from the property wall, allowing for skylights along the western façade to provide daylight and natural ventilation to the interiors below.

Locally available materials specify what construction materials are readily available in an area and local construction methods specify construction techniques used by local skilled tradesmen.

Most vernacular residential buildings in the area are constructed with concrete and masonry. When considering the hot summer sun, if spaces are not designed with higher ceilings and well ventilated, they feel like ovens and are very uncomfortable. The mono-slope roof allowed for these high ceilings and, coupled with operable clerestory windows, provided needed ventilation. A vented roof cavity possible by the metal–framed trusses also prevented heat loads from the roof from transmitting into the spaces below.

Concrete and masonry, however, were not suitable materials for unskilled volunteer teams as they require experience and skill. Initial plans to construct the home primarily with unskilled volunteer labor from the United States lead to the decision to not use concrete and masonry for much of the structure, other than the property walls, ground floor slab, and other structural columns along the eastern facade. The decision was instead to use light-gauge steel framing as the main structural component of the second floor walls and roof, and as infill panels on the ground floor. The light-gauge steel framing would be insulated with rigid-board insulation and finished with gypsum board on the interior and lath and stucco on the exterior, a method observed in a housing complex thirty minutes from the project site. This system, while not traditional to Perú, had been introduced in the country some fifteen years prior and was becoming more popular because of the reduced time it took to construct the assembly and because of its perception to being more resistant to seismic forces. All materials and tools needed for the assembly were found to be readily available in Lima and could be easily purchased and delivered to the project site. The light-gauge steel framing system was also considered ideal for unskilled volunteer labor as templates of repeatable wall panels could be created to guide the volunteers in the assembly of the panels. Using common power screwdrivers, the relatively light–weight metal was easy to handle by laborers not accustomed to
strenuous construction work. Rapid assembly of the light-gauge panels was indeed one of the more successful tasks accomplished by unskilled volunteer laborers, but the unevenness of the wood floor presented multiple problems in setting the panels.

Light gauge steel framing and gypsum board was also viewed as a solution to the prevalent wall corrosion observed in the area due to secondary efflorescence. Located in a coastal plain, high levels of salt in ground water and lead to the secondary efflorescence, which can in time, corrode concrete and rebar and compromise the structural integrity of the building. It also leads to bubbling and peeling of paint surfaces that become aesthetically unappealing if not maintained after a few years.

Water supply and wastewater disposal specify the quantity and quality of water available and needed at the site and the type of methods available for handling wastewater.

The underlying factor that led to the historical development of the community, the water shortage, still affects the area today. While water is publicly provided (not a given in this area of Perú) it is regulated to 3 hour windows, 4 days a week, which can be reduced even further by frequent equipment failures and low water levels of the underground aquifer that supplies the area. The water is also unsuitable for drinking because of improper local customs for wastewater disposal. With an estimated total of 70 persons living and working on the property daily, and the need to irrigate desired vegetation and gardens, water supply and conservation was a huge factor for the project.

Because of the limited supply, any water used for irrigation must be provided by filtering and cleaning wastewater from the facilities on the property. To achieve this, wastewater reclamation systems, utilizing constructed wetlands that contain and filter the wastewater, were incorporated into the general scheme. Water efficient fixtures such as low-flow showerheads, water efficient toilets, and automatic shutoff faucets were also specified to limit water consumption as much as possible. Water purification systems were also installed in the kitchen to have clean drinking water readily available instead of buying it, which is considerably more expensive long-term.

Existing urban fabric specify the physical characteristic of the pattern and type of building and development of a given area while Local laws and customs specify the restrictive and regulated conditions of the area and the traditional norms of the local community.
Soil quality and zoning codes for the community limited building heights to two stories, and the large lot sizes of the neighborhood contributed to an expansive yet sparsely developed community. The community’s historical neglect after wells became salty and property values lowered, allowed other industries to buy up lots and construct larger structures for processing or manufacturing. Large agricultural enterprise also developed lots, evident by the several large chicken houses found in the neighborhood. Additionally, abandoned properties and establishment of poorly managed drug rehab centers led to rises in crime which also led to most property owners constructing 3 m high perimeter walls around their properties to keep unwanted intruders out. The resulting condition is a mixed-use community divided by walls that leave a seemingly ghost-town feel, which is fairly accurate considering the community is estimated to be 60-70% abandoned. The higher crime rates in the area, and the project facility’s location at the back of the property because of a desired spatial separation between the children's home and maternity home, mandated the need for limited and smaller openings in the facades that faced adjoining properties. Security bars on these windows and openings and extensive nighttime lighting were also measures taken to prevent intrusion, but other measures such as electrical fences and broken glass, which are commonly observed in Perú, were avoided over concerns of children residing in the home injuring themselves if they attempted to sneak off the property. The children will be assigned to the home by court order, and it would be plausible that some may try to escape.

Because of the client’s heeding of local legal advice to avoid the formal procedures in obtaining construction permits due to local government corruption, and assumptions that codes did not exist in these informal peri-urban communities, design decisions were based on the context of the existing built fabric. In the initial phases of the project, it was also assumed that the neighborhood of Papa Leon was an established unincorporated settlement like its neighboring communities. However, when applying for construction permits after construction was well underway, it was discovered that the community of Papa Leon was a planned development and lawfully zoned as a small-scale agricultural, single-family residence area. This presented possible problems in obtaining permits as the purposes of the planned facilities underway were not agricultural, and special permission from the homeowner’s association of Papa León would be needed.

Other building codes in the area that came into effect when applying for permits were codes that prescribed conditions for egress during earthquakes and structural resistance to seismic forces. The Peruvian coastline is part of the Pacific Ring of Fire that is notorious for its considerable amount of seismic events. Location of safe zones, stairwells, and structural shear walls factored
considerably into the layout and structural scheme of the project and led to several changes from the original scheme, such as the larger, multi-bay classrooms on the ground floor that were divided into smaller, single bay rooms by shear wall partitions that provide more resistance to lateral forces experienced during a seismic event.

4.1.3 INVESTMENT

Investment factors involve the dynamic characteristic of a project’s environment that influence the means of its development and subsequent use and represent the investment of time, knowledge and money by designers, project managers, donors, volunteer laborers, local tradesmen, the local community members, and local governments.

**Designer(s)** represent the individual(s) who invested time and knowledge into developing the project and **project manager(s)** represent the individual(s) who invested time and knowledge into stewardship of the project.

At the beginning of the project, the client organization had only been established as a non-profit for two years, and with limited capital, relied heavily on volunteers at almost all levels of the operation of the organization and project. The lead designer/project manager, a recent architecture graduate, spent two years in the US, while completing graduate studies, developing the conceptual design and construction documents for the project, creating promotional and informational material on the project, and presenting the project to several potential donor organizations. The designer then spent another two and a half years on-site as the project manager, a full-time staff position of the client organization, overseeing construction, developing the design further during construction, developing needed documentation for construction permits, and managing the finances of the project.

**Donors** represent those individuals and or groups who invest money to fund the project directly or indirectly through the client organization. Donors were sometimes also **volunteer laborers** who invested primarily time and secondarily knowledge to directly or indirectly facilitate the project.

Full-time staff positions with the organization were paid, although salaries were a combination of 50% or more funded by “personal relationship” donors and 50% or less supplied from the

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61. Donors that specifically gave to support the salary of a certain staff member due to a personal relationship with that staff member.
general fund of the client organization, which was also provided for by donations. Essentially, the client organization, its staff, and the operation and maintenance on its facilities relied completely on a healthy donor base. If the donor base began to shrink, as it did in 2009, significant problems could arise in the organization that could cripple the sustained success of the project and the organization.

The client organization’s principle activity is organizing short-term mission trips to Perú and Ecuador. These trips provide the teams of unskilled volunteers the client utilizes as its primary labor force for their projects. The benefits of this arrangement were viewed as two-fold: the teams provide free labor and also tend to contribute to an expanding donor base after their trip experience. Therefore, incorporating volunteer teams into the project is good investment on the client’s part that ideally would lead to the continued return investment by volunteers necessary to sustain itself and its activities. A potential donors’ initial investments of time (as volunteer laborers) in a project by participating on a work trip can lead to further investment of financial support.

However, relying on unskilled volunteers presented several issues as well. These trips usually occurred as one-week work trips with at most five days committed to work. In the summer months, back-to-back teams could make significant progress on the structure, but after the project would sit absent for several months. Additionally, each week presented a new labor force that significantly interrupted work flow as new volunteers had to be trained the first two days of their arrival to the site, significantly reducing the days of substantial productivity to three or four. The size of the teams usually averaged 20-30 persons, and compared to the local crew of six, provided the potential for exponentially more work to be completed in shorter amounts of time. But without proper support staff in place, these large numbers often resulted in confusion, lack of communication, and ultimately, work that had to be redone. This situation can then limit a donor’s continued investment into the organization due to perceptions of poor management. Therefore, investment on the client organization and project managers part was considered vital to providing a positive experience for the work teams. One way to achieve this was a group of interns that were brought to the project in the summer of 2010 to help organize and direct work crews.

**Local tradesmen** represented those individual(s) who invested their time and knowledge in facilitating the project in exchange for the return investment of wages paid by the client. **Local community** represents those individuals who invested primarily knowledge and secondarily time in facilitating the project while **Local government(s)** represents the legal body that invested knowledge into regulating the project.
Unskilled volunteer labor crews were also significantly limited by time. Out of the 52 weeks in a year, these work crews were only present on the project site for a total of, on average, 15 weeks per year. In the first year of construction that meant the structure would sit vacant in the elements for long stretches of time. To counter this issue, the project manager moved to the project site from the United States, and a work crew of local tradesmen was formed to work on the project. This moment presented a paradigm shift in the project from something being done for the Peruvian community to something that was being done with the local community and provided opportunities for local community members to invest in the project as well. It was through these investments of time and knowledge by community members that led to several design evolutions to the building structure and opened doors to local architects and engineers who were able to provide guidance concerning Peruvian building codes and processes for obtaining permits and licenses from the local governing bodies.

When the project began, the combination of a young client organization with little capital, reliance on unskilled volunteer labor on short term work trips, the absence of any project managers or staff members for long stretches of time, ten foot high property walls that hid the construction ongoing inside, and the avoidance of formal licensing procedures, led to a few fines being levied by the municipality government for constructing without permits, and skepticism and rumors as to what the purpose of the project was by local community members. Friends in the local community to the client organization, at one time, reported that rumors were spreading that the client organization was trafficking children to the United States.

However, after two years of a permanent presence of international staff residing and working at the project site, the hiring of a Peruvian work crew, and a willingness to understand formal licensing procedures and pay all fines, in addition to the community service and medical clinics provided by volunteer teams, mistrust and rumors subsided. Local governments, even though seen as corrupt in many local eyes, began to see the value of the client organizations’ ability to help with social problems and concerns in the area, and assisted the organization in obtaining proper licenses and permits.
At the onset of the project in 2006 it was assumed, due to a lack of perceived interest in Architectural curriculum, scholarly work, and popular media, that there would be little correlation between those factors critical to humanitarian design and criteria outlined in the NAAB Conditions for Accreditation on which all architectural curriculum is based. A few events have occurred in recent years that have shifted this original assumption. The widely reported devastation of several natural disasters in the last decade that caused massive amounts of death provided a forum on humanitarian response to such disasters and their effects. The release of Architecture for Humanity’s book Design Like You Give a Damn featuring 329 pages of “architectural responses to humanitarian crises” brought forth innovative and quality work accomplished in the field to the architectural public and students. The economic recession in 2008 dried up funding available for the more traditionally covered “spectacle” architecture and shifted the spotlight on works in humanitarian design that had been going on for years. And in 2009, the NAAB, in their revisions to the Conditions for Accreditation, revised the SPC (Student Performance Criteria) “to be reflective and responsive to contemporary concerns in architectural practice (e.g., leadership, civic engagement, and environmental stewardship).” The addition of the criteria Community and Social Responsibility, defined as “understanding of the architect’s responsibility to work in the public interest, to respect historic resources, and to improve the quality of life for local and global neighbors,” exhibited a growing interest amongst the architecture community of design centered on humanitarian issues.

Therefore, as shown in figure 79, almost all of the 18 factors identified from the case study correlated with the criteria specified in the 2009 NAAB Conditions. It should be noted that while the curriculum that informed the design education model in which this project was developed was based on the 2004 Conditions, side by side comparison between the 2004 and 2009 versions showed minimal differences, especially in those criteria that were shown to have a correlation to identified factors. Thus, the 2009 Conditions were used for the comparisons as they represent the current version relevant to curriculum decisions today. The criteria Community and Social Responsibility and Applied Research, however, did not exhibit similarities with any 2004 criteria and was not marked in the following comparison between factors and criteria; Site Design, however, showed similarities with Site Conditions from the 2004 criteria and therefore was marked in the following comparisons. Additionally, while the criteria Collaboration is denoted as “ability” in the 2009 Conditions, the number of studio projects completed by the designer/
### Comparison between NAAB criteria and factors organized by category

**Factors**

- **Program**
  - Client desires and needs
  - User needs
  - Spatial requirements
  - Equipment requirements

- **Location Based**
  - Site conditions
  - Climate
  - Water supply and wastewater disposal
  - Local construction methods
  - Local available materials and tools
  - Local laws and customs
  - Existing urban environment

- **Investment**
  - Designer(s)
  - Project manager(s)
  - Donors
  - Volunteer laborers
  - Local tradesmen
  - Local community
  - Local government

**Program**

- A1 Communication Skills
- A2 Design Thinking Skills
- A3 Visual Communication Skills
- A4 Technical Documentation
- A5 Investigative Skills
- A6 Fundamental Design Skills
- A7 Use of Precedents
- A8 Ordering Systems Skills
- A9 Historical Traditions and Global Culture
- A10 Cultural Diversity
- A11 Applied Research
- B1 Pre Design
- B2 Accessibility
- B3 Sustainability
- B4 Site Design
- B5 Life Safety
- B6 Comprehensive Design
- B7 Financial Considerations
- B8 Environmental Systems
- B9 Structural Systems
- B10 Building Envelope Systems
- B11 Building Service Systems
- B12 Building Materials and Assemblies
- C1 Collaboration
- C2 Human Behavior
- C3 Client Role in Architecture
- C4 Project Management
- C5 Practice Management
- C6 Leadership
- C7 Legal Responsibilities
- C8 Ethics and Professional Judgement
- C9 Community and Social Responsibility
- C10 Cultural Diversity

**Location Based**

- Site conditions
- Climate
- Water supply and wastewater disposal
- Local construction methods
- Local available materials and tools
- Local laws and customs
- Existing urban environment

**Investment**

- Designer(s)
- Project manager(s)
- Donors
- Volunteer laborers
- Local tradesmen
- Local community
- Local government

Figure 79. Comparison between NAAB criteria and factors organized by category.
The matrix comparison between determining factors and the NAAB criteria illustrated a few points. First, the criteria realms of Critical Thinking and Representation (A), and Integrated Building Practices, Technical Skills and Knowledge (B), especially the “abilities” of Pre Design and those criteria integrated into Comprehensive Design, very strongly correlated with the programmatic and location based factors. Additionally, those criteria within the Leadership and Practice (C) realm had the strongest correlation with investment factors. Furthermore, when the factors are ordered by time of influence, as shown in figure 80, there was a strong pattern, as described in Chapter 3, of local factors (not location based factors but those with the local description) that correlated to Comprehensive Design not affecting the project until after construction was begun. Finally, there is also a stronger correlation between Realm C criteria and these local factors than other factors.

4.3 SUMMARIZING FINDINGS

As exhibited in figure 81, the relationships between factors and their influence on the project was very complex. Many factors had influential relationships with project components and other factors, and were sometimes reciprocal in nature as well. What is absent in this illustration, however, is the dimension of time. As illustrated in the figure the organization of factors appears static. However, design and construction happen over a course of time, with factors influencing the process at different points along a projects timeline. This condition created a dynamic quality that is more accurately illustrated in figure 80.

65. Meaning, the event on the project timeline when the designer/project manager encountered the specific factor, and thus came into effect.
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Figure 80. Comparison between NAAB criteria and factors organized by time
Figure 81. Illustration of factor “influential relationships”
As stated in the previous sections, there were clear correlations between local factors that were integrated into Comprehensive Design being introduced to the project after construction had begun and where, in a traditional model, design would be considered complete. This observation is further compounded with the greater correlations between realm A and B criteria and programmatic and location based factors over investment factors. This illustrates that greater emphasis is placed on static, or given, conditions by NAAB criteria. These static factors were easily determined during initial site visits, analysis, and program assessment, and thus were incorporated into the design phase. The dynamic investment factors important to the project, however, required observations over an extended period of time to become known. If the designer had not also fulfilled the role of project manager, many of these factors may not have been incorporated into further design development and led to negative results.

Additionally, there were three distinct disparities between certain investment factors and NAAB criteria. The investment factors of donors, volunteer laborers, and local community did not correlate with any NAAB criteria that required “ability.” Furthermore, only one of these factors—volunteer laborers—showed a correlation with criteria that was integrated into Comprehensive Design. This observation coupled with the earlier observation of correlations between Realm C and dynamic factors that were not involved in the design phase of the project illustrate the effects of a traditional design model where architecture is considered a linear process resulting in a fixed object as opposed to an indeterminate and dynamic system as was exhibited in the case study. This is the principle incongruity between traditional design thinking models and humanitarian design.

The characteristic of many humanitarian design projects as “feet–on–the–ground” endeavors is the characteristic that leads to these projects being dynamic. In a “feet–on–the–ground” model, designers usually work on location and in the local community, enabling them to base design decisions on everyday observations and community interaction. This characteristic allows for more collaborative decision making amongst a wider array of disciplines and people groups as opposed to collaborative efforts with only other design professionals. A greater collaborative body of local individuals and groups invested in a project will often result in sustained success of the project. In contrast, those humanitarian projects that do not follow a community-led, feet–on–the–ground model often fail, like the example of camp Corail Cesselesse in Haiti described in the Introduction, “When Design Fails.”

The feet–on–the–ground model attempts to balance the leadership and project management aspects of architecture with the design aspects, which are a greater focus in design education.
Therefore, design curriculum that seeks to reflect fundamental principles of sustainable
development should require further development of criteria that place more emphasis on the
dynamic quality of architecture as a system and the leadership aspects that relate to that quality.
These suggested strategies for further development of NAAB criteria, based on the previously
mentioned case study findings, are presented in the following chapter.
5. NAAB Criteria Based on Case Study Findings

In 2004, when the NAAB (the sole agency over accreditation of architecture programs in the United States) introduced criteria No. 15 Sustainable Design to its SPC (Student Performance Criteria), defined as “understanding of the principles of sustainability in making architecture and urban design decisions that conserve natural and built resources, including culturally important buildings and sites, and in the creation of healthful buildings and communities,” it demonstrated the industry’s desire to integrate principles of sustainable development into design education. The NAAB verified that desire in the 2009 Conditions and brought specificity to the definition of the Sustainability criteria as the “ability to design projects that optimize, conserve, or reuse natural and built resources, provide healthful environments for occupants/users, and reduce the environmental impacts of building construction and operations on future generations through means such as carbon-neutral design, bioclimatic design, and energy efficiency.” Additionally, influenced by an era that has led to the formation of many policies regarding environmental protection, social inequalities and poverty, etc., such as Agenda 21 in 1992 and the Millennium Development Goals in 2000, as well as a growing interest in the humanitarian design movement, NAAB also added the criteria “Community and Social Responsibility” in the 2009 Conditions. But much like the introduction of “Sustainable Design” in 2004, and because of a lack of scholarly work on humanitarian issues and architecture, the definition of the criteria remains vague and requiring an understanding only. However, the findings from the case study discussed in the previous chapter bring clarity on correlations between NAAB criteria and factors involved in humanitarian design problems, and have informed suggested strategies for further development of criteria. These strategies and subsequent proposals for evolved design education models are discussed in the following sections.

5.1 STRATEGIES FOR DEVELOPING CRITERIA BASED ON CASE STUDY FINDINGS

In comparing NAAB SPC with case study findings there were several correlations between Realm C criteria and Investment factors as well as those local factors that were encountered during the construction phase of the project that led to further design development while construction was ongoing. These findings have led to the formation of three proposed strategies in continued development of the SPC (fig. 82): expansion of criteria integrated into Comprehensive Design, greater emphasis on the study of the locations and people groups

Comparison between NAAB criteria and factors with proposed development of criteria

Figure 82.
specific to a project, and further development of the Community and Social Responsibility criteria to require an “ability” shown by students in incorporating dynamic factors into projects.

5.1.1 EXPANDING CRITERIA INTEGRATED INTO COMPREHENSIVE DESIGN

The Comprehensive Design criteria is defined as the “ability to produce a comprehensive architectural project that demonstrates each student’s capacity to make design decisions across scales while integrating the following SPC: A.2. Design Thinking Skills, A.4. Technical Documentation, A.5. Investigative Skills, A.8. Ordering Systems, A.9. Historical Traditions and Global Culture, B.2. Accessibility, B.3. Sustainability, B.4. Site Design, B.5. Life Safety, B.8. Environmental Systems and B.9. Structural Systems.” According to correlations found in the case study of certain criteria to factors that were influential to the comprehensive design of the project, but not integrated into comprehensive design, the following criteria should be added: Financial Considerations, Collaboration, Project management, and Leadership.

The integration of these criteria would result in a balance of factors, as prescribed by sustainable development and humanitarian design principles, to be considered in the design of project systems. This balance will require an understanding by students of the level of investment needed by multiple parties (on the design team and in the community) for projects to be successful and sustained. This development would also require the level of accomplishment of these criteria to rise from "understanding" to "ability", requiring that students learn by engaging these aspects of a project. As important as it has been for students to exhibit a prescribed level of “ability” in the traditional design aspects of architectural projects, fundamental principles of sustainable development require equal emphasis on exhibited management and leadership abilities in the dynamics of an interdisciplinary, collaborative design project.

5.1.2 GREATER EMPHASIS ON THE STUDY OF LOCATIONS AND PEOPLE GROUPS

As discussed in chapter 4, many of the local factors that caused further iterations and development of the design after construction was underway were not observed during the initial site visit, which occurred over a three-day trip to Perú. Traditional models of site documentation also normally focus on the static or cyclical attributes of a location such as climate type, terrain, existing urban fabric, etc. However, the majority of local factors that came into play later in the case study were centered around the local laws, customs and methods of construction that are more to do with the dynamics of people groups and governments. These factors, it was found,

68. Ibid.
required the feet-on-the-ground model of extended observation of a community through long-term engagement with that community. Many of these factors became apparent once the initial barriers of language and cultural differences were overcome, but even after three years of feet-on-the-ground community engagement, many customs were still not fully understood.

The traditional model of site documentation as presented in architecture schools, however, is normally brief (because of a focus on static factors) and followed by a lengthy design process. In reflection of findings from the case study, the proposed strategy would be to combine site documentation and design into one cyclical process featuring feet-on-the-ground methods.

Accordingly, the definitions of both Historical Traditions and Global Culture and Cultural Diversity should be raised to an “ability” level of accomplishment, which would require students to exhibit long-term site observations of community behavioral patterns, values and needs, and social patterns, and their affect on the development patterns of the locally built environment, and subsequent design iteration based on these extended observations.

5.1.3 FURTHER DEVELOPMENT OF COMMUNITY AND SOCIAL RESPONSIBILITY

As the Sustainable Design criteria was developed and the required level of accomplishment raised between the 2004 and 2009 Conditions, greater specificity should be added to Community and Social Responsibility criteria and the level accomplished raised to a shown “ability” to exhibit an architect’s responsibility towards local and global neighbors. This development will require students to be more thoughtful in their responses to a project, and begin to ask the tough questions that are seldom asked in design school such as: Should this project be undertaken? How will this project affect the environment and economy of local communities now and in the future? What are the long-term local and global implications of this project? And, how may this project be repurposed in the future? These are important questions that have come out of the sustainable development era and are important ones to consider in design education. The criteria of Community and Social Responsibility should suggest that, in the words of William McDonough, “architecture belongs to no one.” Design should be taught to be flexible to allow for the affects of people and place over time. Works of design need, says McDonough, “to balance the sudden flash of individual insight with the slow testing of the waters, so by the time they are built, used, and gently aged, no one person or idea can be identified as being solely responsible.” Curriculum that requires students to show the ability to “work in the public interest,

70. Ibid.
to respect historic resource, and to improve the quality of life for local and global neighbors,” should result in a mindset of plurality that principles of sustainable development embody.

5.2 POTENTIAL DESIGN EDUCATION MODELS BASED ON CASE STUDY FINDINGS

Development of NAAB criteria will require subsequent changes to architectural curriculum. These changes, however, should be considered in the spirit of sustainable development and not only to meet accreditation requirements. The writers of the Brundtland Report brought forth a message of needed change in methodologies and philosophies for all arenas concerned with the development of the environment, in which architecture is included. From the findings of the case study and comparison of factors and criteria, three suggested design models have been proposed. These models focus on collaborative efforts between multidisciplinary teams of designers, scientists, economists, builders, community groups, etc.; real design projects with real clients and real financial constraints; and/or extended periods of study abroad in emerging markets where development is occurring at rapid paces but where poor governmental polices allow for inequality and the status quo of substandard building and housing requirements.71

5.2.1 COLLABORATIVE PROJECTS

Architectural discourse celebrates the individual. From Vitruvius, Michelangelo, and Bernini, to Le Corbusier, Wright, and Ghery, architectural mastery has been presented as an individual quest. However, architectural design is seldom an individual effort these days. Except for the occasional lone practitioner who designs smaller buildings like houses, most design is a collaborative effort in the professional world. Even lone practitioners must collaborate with clients, local builders and building authorities. Then why does architectural design education still celebrate a model of independently driven design? Design that responds to the contemporary concerns of the sustainable and humanitarian design movements is complex and involves multiple disciplines that are beyond the knowledge of many architecture faculty. But what better place than in the university setting, where a broad array of disciplines are concentrated to a single location, to conduct exercises that bring together knowledge from multiple fields to solve design problems? A key point in the Brundtland Report was the critical need for renewed efforts in multilateralism between governing bodies because of the globally interdependent concerns of social development, economic development, and environmental protection. This same strategy translates to architectural design. Multidisciplinary design teams are needed to explore sustainable and humanitarian problems.

71. Cameron Sinclair, “Admiral Ackbar.”
At the conclusion of the case study, the extent of those involved in the design of the project were architects, an environmental engineer, a pastor, businessmen, carpenters, artists, a brick-layer, a concrete contractor, metal workers, an electrician, a psychologist, a child-care worker, and local tradesmen, community members, and governing agencies. As noted by Cameron Sinclair, community-led practices are at the heart of humanitarian design. A requirement to any humanitarian project is the investment of local community members into a project to increase the probability of a sustainable outcome. In the case study, investment of key community members was required to gain support from the board of the Papa León homeowner's association to grant special approval to the client organization to operate a “center” in the residential neighborhood. Without their approval, the client organization would have been unable to obtain necessary operating and occupancy permits that would have forced the organization to operate under the radar, limiting the effectiveness of their program (as was discussed in Chapter 4). But, understanding the dynamics of the investment of people groups in a project cannot be learned through hypothetical projects, it can only be learned through participation in a real project.

5.2.2 REAL PROJECTS WITH REAL CLIENTS AND FINANCIAL CONSTRAINTS

The majority of design projects used to teach design in architecture schools are hypothetical. Most of the time they have a real site, and perhaps a real program, or even a client, but these, aside from the site, are often ceremonious in nature as there is not a “reciprocal relationship,” as was found in the case study, between student designers and clients, users, local community members, or other pertinent people groups that will affect the project's success. Design decisions are, for the most part, based on assumption and the desires of the student rather than those of clients and users. A common phrase heard in discussions between design instructors and students in architecture studios, “if you had all the money in the world, what would you do?” allows for limitless possibilities. The realities of sustainable and humanitarian design are quite the opposite.

Sustainable development, which encompasses both sustainable and humanitarian design, is concerned with “needs” and “limits”. It refers to the necessary provision of essential needs to the world’s poor and limitations inherent by the environment’s ability to equitably supply those needs to current and future generations. If sustainable development, “requires the promotion of values that encourage consumption standards that are within the bounds of the ecological possible and to which all can reasonably aspire,” then design curriculum that is based on sustainable development requires projects that are based on the real world needs of clients and users and the limitations of location and finance. The case study presented several examples
of this. From the beginning, the limitation of a construction labor force primarily composed of unskilled volunteer labor led to design decisions that affected the material choices and structural makeup of the building in order to utilize that specific labor appropriately. Later in the project, when the primary labor force changed to a crew of local tradesmen, it presented new limitations, changing the design in the midst of construction. Local tradesmen meant the stricter use of local materials, tools, and methods, and the building evolved as a result. Even the height of the cafeteria roof was lowered to equal a comfortable working distance for local tradesmen + the average height of local tradesmen + the height of standard scaffolding to reduce the time needed to set up a working platform when finishing and painting the underside of the roof. Limitations can provide challenging design problems, but as was observed from the case study, rather than hindering, limitations often guided the design process. Design became the coordination, rather than manipulation, of factors.

5.2.3 OUTREACH STUDIOS AND PUBLIC ADVOCACY IN EMERGING MARKETS

Real projects, with real clients, and real limitations that are conducted through collaborative efforts, but still based in western communities do not provide the best opportunities, however, for exploration of the social and economic crises critical to the sustainable development movement. Ninety percent of the projects that do address these crises are found in emerging markets where there is a huge potential for exploring new building and developmental models that could have long lasting influence on the good and healthy growth of poor communities. These new models could be informed by outreach studios developed by architecture schools where students contribute to feet-on-the-ground data collection, site analysis, and community workshops that foster long-term, collaborative design thinking in populations where day-to-day provision is of greatest concern. In return, students who participate in the studios would take-in invaluable experiences and understandings on the realities of the world’s condition, leading to the possibility of influencing more holistic and globally conscious design in the US.

An extension to a program of studios, possibly a network of studios around the world with other design education institutions, is the opportunity to develop teaching studios for local communities on good building and urban development practices. On one occasion in Perú after the earthquake in August of 2007, a man was observed breaking up the adobe bricks that formerly made up his house that had collapsed in the earthquake. Adobe is not a good material for constructing walls that are resistant to seismic forces, nonetheless, this man was determined

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72. All materials used for the project were locally available however materials needed for the unskilled volunteers were purchased and delivered in Lima, an hour away from the project site, while materials needed for local tradesmen were available from hardware stores in the same community.
to break the bricks down only to reform them to rebuild his house. This was not an uncommon incident. In the many places where extreme poverty exists, building codes and regulation of those codes is inconsistent or nonexistent. Additionally, the community members in these poor neighborhoods where building goes on unregulated and uninhibited, creating unsafe or unhealthy conditions, are usually discriminated against by race and/or class, allowing local governments to neglect their constituents and for the educated elite, from which local designers and architects usually originate, to ignore the social problems in their own backyards. Outreach studios, staffed with educated foreigners, could serve as a linking agent between neglected people groups and their governments and local design services. In Perú, when engaged in the process of obtaining construction permits, several community members shared their own stories of struggles with the local government on receiving titles for the land their houses stood on. Without titles, many of these people would be unable to apply for savings accounts, or credit for home improvement, or even a cell-phone plan, which forced them to live life-styles that were more costly than they needed to be. Ending dysfunctional systems such as this was and is the purpose behind the HP project and the motivation behind the sustainable development movement. It remains to be seen, but perhaps in time inroads made by those staff members involved in the HP project with the local government will open long awaited avenues of change for the community members who live and work in the neighborhoods around the lot where a children's home named Hannah's Hope now sits.
5.2.4 NEED FOR FURTHER STUDY

The proposals on NAAB criteria development and design education models in the previous sections are ideas based on only one case study. This case study by far does not offer an undisputed reference for the extent of factors involved in all humanitarian design projects. Additionally, the time constraints and focus of this study on providing comparisons between current criteria and existing factors, limited the extent of inquiry on historical developments and philosophies of traditional design models used today, thus limiting the depth of knowledge and specificity needed for new design models. Thus, the previously discussed proposals are considered to be concepts on which ideas of new developments of curriculum models by those more studied in these areas can be based.

Additionally, as mentioned previously, a substantial quantity of scholarly work on architectural responses to social crises is severely lacking. It is imperative, therefore, that additional scholarly work is conducted on other project types, in other locations, and through different avenues to create a great breadth and depth of knowledge pertaining to this subject useful for the continued development of the criteria on which architectural curriculum is based.
6. Conclusions

Given the increasing influence of sustainable development principles over global agendas, and more specifically, on architectural curriculum, two movements are growing in the architecture industry. The first, sustainable design, has been steadily growing in influence since the early 1990s and integral to design education beginning in 2004. However, sustainable design is a misnomer, as the industry’s inclination has been to heavily focus on environmental degradation while omitting the other two critical “pillars” of sustainable development (social and economic development) from consideration. Noticeable growth in the second movement, humanitarian design, has evolved because of this common oversight. In reality, humanitarian design has developed from disaster relief programs and grass roots and self house movements over the last 100 years, but has not historically been attractive to architects because of the long-term, feet-on-the-ground methodologies that the discipline employs.

But the introduction, within the last decade, of criteria that is based on sustainable and humanitarian design into the Conditions for Accreditation, verifies the industry's commitment towards sustainable development. This commitment, however, comes with the understanding, as those who wrote on sustainable development suggest, that many of the world's traditional models of thinking and problem solving are, essentially, the root cause of the world's currently undesired condition. Therefore a declaration for a “global agenda for change” has come hand in hand with the proliferation of sustainable development, acknowledging that commitment to this objective means exploring and adopting alternative models of thought process. Specifically, in architecture, traditional design paradigms can not simply be applied to sustainable and humanitarian design problem, but rather the principles critical to sustainable development (manifested through sustainable and humanitarian design) must influence the development of new design paradigms. The relative newness of both disciplines, particularly humanitarian design, presents the challenge of interpreting their principles to the practical, everyday activities of design and construction and building, and presented the premise behind the preceding work.

In it’s conclusion, a key point of discussion has been the clear incongruence of the traditional design education model of design/bid/build with the humanitarian strategy of a long-term, feet-on-the-ground methodology for conducting site research that leads to an indeterminate model of design. It is an atypical method compared to the design education models that depend on individual inspiration and development of a project. However, the benefits of the feet-on-the-ground method gave the designer/project manager opportunities to engage the local “investment groups”, which translated into better design and hopefully (it remains to been) continued
engagement and “investment in” the project by that community that will provide long-term benefits. The feet-on-the-ground method, however, came late in the project. The first two years of the project were modeled after the linear, individual inspired design process traditionally taught in architecture schools. One can only wonder how differently the project would have transpired if the designer, acknowledging their status as an outsider, spent significant time in the culture and community of the project site, observing local customs and building techniques, and discussing ideas for the project with local tradesmen, community members, and officials. Thankfully, the opportunity arose for that very process, before construction of the project was too advanced to be altered without causing substantial waste.

These opportunities are rare, however, in architecture schools. While the design education models proposed in the previous chapter suggest challenging changes to decades of tradition in the teaching of architectural design, they are challenges the industry must embrace. The current world conditions outlined by the Brundtland Report were not meant to be considered lightly, and as world leaders have exhibited in such unanimous declarations as the Millennium Development Goals, traditions and former ways of thinking are being put aside in the global effort to achieve the objective of sustainable development. The same must occur in the architecture industry as its responsibilities to communities and society outweigh the preferences of aesthetics and form that have been exhibited in the acclaimed works throughout its history.

This does not, however, signify the neglect of design in favor of pursuing sustainable development. Many, in searching for an architecture model that points to sustainable development have considered the vernacular traditions of old, such as Italian hill-towns, as precedents of a once known sustainable archetype and known for their delightful and pleasing atmosphere that all architecture should aspire to. The distinctive quality of these built environments was their evolution over time allowing for a diversity of ideas that contributed to their development. McDonough admitted once that, “…most of the world’s best architecture is not designed by any single force, but represents a community solution to a variety of problems which are often better understood by diverse parts of the social fabric, not just the designer or planner.”

The rapidly developing environments of our world, do not necessarily provide, however, opportunities for lengthy projects with multiple iterations. On the other hand, the increasing complexity of site dynamics found in emerging markets necessitates more observation and more study to provide suitable solutions. The interdependent and interconnecting nature of these

73. Ibid., 49.
environments also present several factors outside the realm of traditional architectural thinking. But rather than develop curriculum to provide a broader array of knowledge to future designers to better inform them of these dynamic environments, further encouraging individualistic thinking, perhaps a more sustainable developmental model will be to encourage the ability of students to collaborate with a multidisciplinary team that can provide depth in a broad array of topics that will better inform a design process that allows for continual adaptation and evolution. Design that embodies the quality of "delight" by which places like Italian hill-towns are viewed necessitates this plurality of knowledge and ideas. Furthermore, Architecture that embodies sustainable development requires the consideration of sustainable and humanitarian principles, not one or the other, to manifest places where humanity and nature are in harmony with each other on a local and global scale.

Ultimately, the continued practice of sustainable developmental principles and models that explore the social, economic, and environmental factors of a project’s context will depend on design education models that value the importance of the objective for sustainable development. Proper training of these young designers will subsequently rely on continual examination of design thinking models and curriculum criteria. Design problems that serve to engage atypical conditions, regardless of perceived correlations to architecture are an important part to this examination. At the very least, they expose designers to the complexities and inter-workings of the world, which will only serve to their further enlightenment of the potential unintended long term effects of design decisions based on the assumptions of an individual-based design process and understand the greater community, social, and environmental responsibilities of the profession.
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