Re-hashing Haiti: Empowering The People

Edward Dudley
Syracuse University

Follow this and additional works at: https://surface.syr.edu/architecture_theses

Part of the Architecture Commons

Recommended Citation

This Thesis, Senior is brought to you for free and open access by the School of Architecture Dissertations and Theses at SURFACE. It has been accepted for inclusion in Architecture Senior Theses by an authorized administrator of SURFACE. For more information, please contact surface@syr.edu.
Re-hashing **Haiti**

empowering the **people**

Edward Dudley

Professors Terrance Goode | Sekou Cooke
Thesis Prep Fall 2010
ACRONYMS

**AFD** Agence Française de Développement
**CIDA** Canadian International Development Agency
**EFA** Education for All
**FTI** Fast Track Initiative
**GDP** gross domestic product
**HDA** Haitian Development Authority
**MENFP** Ministère de l’Éducation Nationale et de la Formation Professionnelle, or Ministry of Education and Training
**NGO** Nongovernmental organization
**RAND** Research and Development Corporation
**UN** United Nations
**UNDP** United Nations Development Programme
CONTENTS

INTRODUCTION
4 glossary
8 contention

SUPPORTING DISCUSSION
10 proposal
12 time interval
16 timeline

DISASTERS: HAITI AT THE FOREFRONT
20
26 government prior to the earthquake

EDUCATION: REALIZING ITS ROLE AND RESPONSIBILITY
28

BUILDING CULTURE: HAITI
32
34 climate

MATERIAL STUDIES
bamboo 35
concrete 36
metal mesh | gabion wall 39
steel 40
timber 42
SITE 44

THE NETWORK
52

DETERMINING THE PARTS
54
potential relationships 57

PRECEDENTS
druk white lotus 58
hand in hand for haiti 60

BIBLIOGRAPHY
64
GLOSSARY

configuration- the relative disposition or arrangement of the parts or elements

incubator- a unique and highly flexible combination of business development processes, infrastructure and people, designed to nurture and grow new and small businesses by supporting them through early stages of development

structure- a complex system considered from the point of view of the whole rather than of any single part defined by rules of selection and relation

system- an assemblage or combination of things or parts forming a complex or unitary whole

AFTER THE QUAKE, AID GROUPS RUSHED IN PORTA-POTTIES TO PROVIDE SANITATION, BUT THEY COST $13 A DAY TO CLEAN AND EMPTY THE WASTES. SO MANY THOUSANDS OF DOLLARS EACH DAY GO TO COMPANIES WITH THE SPECIALIZED TRUCKS THAT CLEAN PORTA-POTTIES AND THEN DUMP THE WASTES UNTREATED AT THE CITY DUMP.
The January 12th earthquake destroyed 80% of Port au Prince, killing an estimated 250,000, injuring 300,000 and leaving 1.5 million homeless and without livelihoods.¹ The infrastructure, commercial, residential and institutional sectors of Haiti were dismantled. Many of the institutions and infrastructures were weak long before the quake, as Haiti is among the world’s poorest nations, reliant on international aid and subject to severe economic disparity. With these institutions physically dismantled, the Haitian government and international donor community have the opportunity to reevaluate and correctly rebuild these sectors. The Action Plan for National Recovery and Development of Haiti states, “We must act now, but with a clear vision for the future. We need to agree on a short-term program, while creating mechanisms that enable us to prepare and implement detailed programs and projects that will lead to clear action within a ten-year timeframe.”²

"THE PRESENT OF PAST, IT IS MEMORY
THE PRESENT OF PRESENT, IT IS ACTION
THE PRESENT OF FUTURE, IT IS EXPECTATION"
-Paul Ricoeur
AS ONE DESIGNER WHO HAS WITNESSED THIS INCREDIBLY DAUNTING AND COMPLEX SITUATION FIRST HAND, I MUST ASK MYSELF: HOW, WHERE AND WHEN IS THE MOST APPROPRIATE AND EFFECTIVE MOMENT TO INTERVENE? HOW CAN THIS MOMENT SUSTAIN ITSELF?
I contend that integrating an architecture at a local level that economic and political sectors will produce a community that
TEMPORALLY MANIFESTS A RELATIONSHIP AMONG EXISTING SOCIAL, ACTIVELY CONTRIBUTES TO A SELF SUSTAINING HAITI OF THE FUTURE.
The contention will be tested through the planning and design of a hybridized environment that strives to foster participation and collaboration among all members acting within the context. This unbiased space will not discriminate against age, gender, social or economic status, and will instead operate as a networked system of architectural interventions, spatially configured to integrate post-disaster communities, safely, socially and economically. As time progresses and Haiti endures its recovery, the space will evolve in parallel, accommodating an evolving community.

Leogane, Haiti is a coastal city which had an estimated population of 134,000 people, located 18 miles west of Port au Prince on the north shore of the country’s southern peninsula. Following the earthquake, an estimated 20,000 to 30,000 people were killed and 80-90% of its built infrastructure was destroyed. From an aerial perspective, the city of Leogane consists of a dense and gridded core, which is comprised of stand-alone, residential homes and small businesses. Radiating out from this core are less dense residential zones, all encompassed by agricultural fields. South of the city’s core were three public schools, each operating on its own parcel of land and separated by a roadway. Although these schools were completely destroyed in the earthquake, in preparation to rebuild, the sites have since been cleared of all rubble and architectural proposals have been released for two of the sites. Embedded within the interstitial network of heavily trafficked roadway that separates the sites, is an overlooked transportation hub and an informal market. Considering the central location of the site in relation to Leogane and Leogane in relation to the southern portion of Haiti, I believe the site is vastly underutilized and has the potential to function as a breeding ground of knowledge.

In the initial phase (first 6-9 months) there is a high premium on rapid implementation of relief and recovery programs. Delivery often overrides detailed planning. Large-scale infrastructure normally takes several months to complete procurement and mobilize teams to support works, while more decentralized, smaller programs such as household repair or community based redevelopment can begin. It is important to start preparing these smaller programs early so that they can be implemented once the emergency effort reduces its intensity. Failure to coordinate all efforts in relation to one another produces gaps that only slow recovery efforts.
that could harvest a self-sustaining, model community of the future.

The school typology has the opportunity to address a multitude of issues in a post disaster environment. Not only do these spaces provide a safe environment for children, containing places for play, interaction with nature, and interaction with other people, but they also allow parents to take an active role within the community. Strengthening communities through the implementation of schools is a way to strengthen the country by cultivating participatory residents. As residents feel involved, identity and pride are strengthened, having a larger impact on the strengthening of the country.

My design proposal will accommodate for architectural interventions that are spatially configured to promote collaboration and learning among High School students and community members, while optimizing the design of the existing proposals on the adjacent sites. The interstitial zones between these three sites and their relationship with the community is of equal importance. Considering the economic, social and political disparity that plagues Haiti, I intend to incorporate incentives that are situated to attract and activate additional residents of the community. These incentives will be architecturally realized through integrated spaces that promote job creation, agricultural production and the assimilation of large, diverse groups of people. This hybridized environment will be strategically linked to existing infrastructural and social networks. I believe consciously designing to facilitate a legible dialogue between program and sectors, both formal and informal will produce optimal results when integrating members of the community. Although this proposal focuses on a small community in Leogane, Haiti, prototypical connotations will be embedded in the design, allowing it to be understood among a broader network of similarly functioning and designed interventions, that support, depend and evolve with one another.

Construction and materiality will play a crucial role in the appearance and inherently, the identity of the interventions and community. Building techniques will inspire future construction executed by individuals and larger relief efforts, while solving sustainable issues. Utilizing the local potential of material and labor while appropriately incorporating sustainable technology will strengthen and develop regional identity. The result will respect existing Haitian culture, while applying it in a modern manner. Environmental responsibility will be not only be taught through example as a finished product, but through the actual process of construction.
This diagram conveys the recovery process broken down into (4) time intervals. Following the earthquake ideas/planning are essential to the nation’s recovery, with international aid organizations playing a primary role alongside Haiti’s government. The first phase (0-3 years) is organized by the percentage of funding allocated to each sector broken down by 6 month intervals. The amount of funding was determined by the Post Disaster Needs Assessment. In the second phase (3-5 years), government and education should begin to surface as primary facilitators of recovery while working in tandem with aid organizations. Following the second phase, within (5-20 years), an economy should be born out of agriculture and industry that is fueled by educated Haitians. Relief organizations should begin to play a smaller, secondary role as the country begins to sustain itself.
“THE PROTOTYPICAL FRAGILE STATE IS INACCESSIBLE, OFTEN LAND-LOCKED, SURROUNDED BY WEAK OR PREDATORY NEIGHBORS, AND WRACKED BY TRIBAL, ETHNIC, RELIGIOUS, OR LINGUISTIC TENSIONS. HAITI SUFFERS FROM NONE OF THESE DISABILITIES.”
Haiti is surrounded by comparatively prosperous neighbors with natural harbors and is in close proximity to the largest market in the world, the United States. It has no precious gems, minerals, or other resources that parties may fight over. The fragility of Haiti cannot be blamed on its geography or demography, but rather its unfortunate history.
Haiti is inhabited by the Taíno, an Arawakan people.

1492

1492 Christopher Columbus discovers the island and names it La Española ("the Spanish Island"), later known as Hispaniola, or Little Spain. Recorded history of the island begins.

1496 - Spanish establish first European settlement in western hemisphere at Santo Domingo, now capital of Dominican Republic.

1697 - Spain cedes western part of Hispaniola to France, and this becomes Haiti, or Land of Mountain.

1801 - A former black slave who became a guerrilla leader, Toussaint Louverture, conquers Haiti, abolishing slavery and proclaiming himself governor-general of an autonomous government over all Hispaniola.

1804 - Haiti becomes independent; former slave Jean-Jacques Dessalines declares himself emperor. All remaining whites are expelled, and Saint-Dominique becomes the first Black republic, the result of the only successful slave revolution in history.

1844 - Eastern part of Hispaniola breaks away to become the Dominican Republic.

1912 - The National Palace is designed by Georges H. Baussan (1874–1958), a leading Haitian architect who graduated from the École d'Architecture in Paris.
1905 Economic collapse causes Haiti to cede financial control to the United States.

1905 A long period of political chaos during which there are twenty-two changes of government that results in heavy international indebtedness, on top of burdensome reparation payments to France.

1915 - US invades Haiti following black-mulatto friction
1915 - The resident U.S. naval commander dissolves the Haitian congress and dictates a new constitution.

1923 over 60% of Haiti’s land is forested

1930 - US withdraws troops from Haiti, but maintains fiscal control until 1947

1934 - US withdraws troops from Haiti, but maintains fiscal control until 1947

1956 - Voodoo physician Francois "Papa Doc" Duvalier seizes power in military coup and is elected president a year later.

1964 - Duvalier declares himself president-for-life and establishes a dictatorship with the help of the Tontons Macoute militia.

1964 - Duvalier flees Haiti in the wake of mounting popular discontent and is replaced by Lieutenant-General Henri Namphy as head of a governing council.

1964 - Duvalier dies and is succeeded by his 19-year-old son, Jean-Claude, or "Baby Doc", who also declares himself president-for-life.

1971 - Baby Doc flees Haiti in the wake of mounting popular discontent and is replaced by Lieutenant-General Henri Namphy as head of a governing council.

1986 - Baby Doc flees Haiti in the wake of mounting popular discontent and is replaced by Lieutenant-General Henri Namphy as head of a governing council.

1986 - Baby Doc flees Haiti in the wake of mounting popular discontent and is replaced by Lieutenant-General Henri Namphy as head of a governing council.
1990 - Jean-Bertrand Aristide elected president in Haiti’s first free and peaceful polls.

1990


1991

1994 - Military regime relinquishes power in the face of an imminent US invasion; US forces oversee a transition to a civilian government; Aristide returns.

1994

1995 - UN peacekeepers begin to replace US troops; Aristide supporters win parliamentary elections.

1995

1997 - Serious political deadlock; new government named.

1997

2000 November - Aristide elected president for a second non-consecutive term, amid allegations of irregularities.

2000

2002 - Haiti is approved as a full member of the Caribbean Community (Caricom) trade bloc.

2002
2004 May -
Severe floods in south, and in parts of neighbouring Dominican Republic, leave more than 2,000 dead or disappeared.

2004 July -
International donors pledge more than $1bn in aid.

2006 February -
General elections, Rene Preval is declared the winner of the presidential vote after a deal is reached over spoiled ballot papers.

2006 less than 2% of Haiti's land is forested

2008 August/September -
Nearly 800 people are killed and hundreds are left injured as Haiti is hit by a series of devastating storms and hurricanes.

2008 April -
Food riots. Government announces emergency plan to cut price of rice in bid to halt unrest. Parliament dismisses Prime Minister Alexis.

2009 May -
Former US President Bill Clinton appointed UN special envoy to Haiti.

2009 -
Parliament dismisses bid to halt unrest. Prime Minister Alexis.

2009 -
President Jean-Bertrand Aristide resigns, declaring himself president for-life.

2009 -
Government dissolves the Haitian military and its wider region - the worst in Haiti in 200 years.

2009 -
International donors pledge $5.3 billion for post-quake reconstruction at a donor conference at UN headquarters.

2010 January -
Up to 300,000 people are killed when a magnitude 7.0 earthquake hits the capital Port-au-Prince and its wider region - the worst in Haiti in 200 years.
It is critical that intervening organizations operate in tandem with one another and the people of Haiti, fully aware of individual and collective roles and responsibilities as they strive to achieve a common goal. Disconnected parties will have a detrimental effect as they cause a slow recovery. The Haitian government has made an attempt to facilitate this critical communication with the release of the Post Disaster Needs Assessment, scripted by a joint team of national and international experts, who were actively assisted by representatives of NGOs and the Haitian civil society on March 20, 2010.

The PDNA proposes to relocate schools and hospitals to smaller cities, in an effort to create an economic incentive and deter people from returning to Port-au-Prince during the reconstruction process. The notion of shrinking the capital and reviving provincial cities dates back to 1987. It was enshrined as a goal in the post-Duvalier constitution by a government seeking to redistribute political power and has been brought up periodically by urban planners ever since, yet to little effect. The environmental and geological concerns raised by the earthquake have made this approach seem all the more critical and even possible. I intend to operate within these poles of attraction, realizing the goals of the PDNA at a local and tangible level.

While the PDNA outlines an approach to rebuilding Haiti, it was also published in an effort to gain and conjure international donor support. The PDNA, “already surpasses any of the early reconstruction plans for post-Hurricane Katrina in New Orleans or for the parts of Asia affected by the tsunami in 2004.” Fortunately, the guidelines’ well-reasoned thinking about environmental threats and the history of urban development in Haiti suggests that the plan should not only function as a reliable blueprint for reconstruction, but also for solving many of the urban issues that have plagued the country for decades.

The causes of Haiti’s troubles can be traced back a century. Haiti was once primarily rural, with its
The growth of Port-au-Prince accelerated in the political turmoil after Duvalier’s son and heir, Jean-Claude, fled the country in 1986. Over the next 20 years, the city’s population nearly doubled, to close to three million people. The shift in power, population and resources was essentially an urban disaster, putting more and more pressure on the capital while draining the provinces of economic opportunity. The result of this build up in pressure was eventually exposed to the world via the earthquake, and now must be reversed.

major economic activity distributed among several ports along the northern, western and southern coasts. But after the United States invaded in 1915, the Americans began to concentrate most trade operations in Port-au-Prince, the site of their military headquarters. As the port was dredged to make room for large, new steamships; other major ports, to the north and west, began to lose their importance. By the middle of the 1960s, François Duvalier had shut down the other ports entirely as part of an effort to concentrate his power base in the capital.
Prior to the earthquake, Haiti's textile industry provided more than 90 percent of the country's export revenues.

The deconcentration of economic activities will require the addition of two more deep water ports.

Haiti currently has only one international airport in Port-au-Prince, hindering its ability to meet air supply needs.

Expanding infrastructure will increase and promote tourism, as cruise ships currently visit the northern portion of the country.

Reviving the inadequate road network is crucial to facilitate development in rural zones and trade.

Agriculture provides the most amount of jobs for Haiti, accounting for 50% of the workforce.
Since the earthquake, 600,000 people have left the capital and Port-au-Prince has lost 800,000 inhabitants. Haiti must end the creation of mega urban concentrations to avoid further demise and to promote balanced economic and social development among the country. Constructing networks of towns to share the use of infrastructures and services are critical in realizing this vision. The creation of such a structure, decentralized and no longer concentrated in the capital, would be the symbol of the country’s rebirth.

<table>
<thead>
<tr>
<th>RÉGIONS</th>
<th>Population before the earthquake</th>
<th>Population movements (displaced persons and victims)</th>
<th>Current population</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NORTHERN</td>
<td>4 424 482</td>
<td>+342 000</td>
<td>4 766 000</td>
<td>47%</td>
</tr>
<tr>
<td>CAPITAL</td>
<td>3 867 000</td>
<td>- 854 000</td>
<td>3 013 000</td>
<td>29%</td>
</tr>
<tr>
<td>SOUTHERN</td>
<td>2 164 000</td>
<td>+262 000</td>
<td>2 426 000</td>
<td>24%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>10 455 539</td>
<td></td>
<td>10 206 000</td>
<td></td>
</tr>
</tbody>
</table>
HAITI MUST END THE CREATION OF MEGA URBAN CONCENTRATIONS
SECTION ENDNOTES


2 Ibid.

3 “Léogâne.” Encyclopædia Britannica. 2010. Encyclopædia Britannica Online. 29 Nov. 2010


8 Ibid.

9 Ourssoff

10 Ibid.


12 Ibid.
groupe sectorielle de l’éducation (sectoral education group) founded 2003

one member/representative from:

Ministry of National Education and Training

Spain (AECID)

Canada (CIDA)

US (USAID)

World Bank

France (AFD)

EU

UN Children’s fund

Fast Track Initiative- helps developing countries to achieve the MDG that, by 2015, all children should complete a full course of basic formal education. 2002
In order to develop a permanent and holistic environment that speaks to the aspirations and advancement of Haiti, refining the educational sector with post-disaster conditions in mind, must be understood as an investment, with results surfacing in 5-20 years. In post disaster environments, education is central to the recovery of the nation. Providing a safe space for children, parents and community members to collaborate, learn and subsequently rebuild both mentally and physically, will produce larger reverberations felt by the country.

As the Haitian government reported in its PDNA, “(the) education system already presented deficiencies before the earthquake that made it unfit to contribute to socio-economic development.” The incoherent education system is a result of the state’s very limited role in providing and regulating schooling. The byproduct was low quality, lack of access, and little oversight characterizing the country’s education sector. Enrollment rates and levels of educational attainment were very low, with about one-half of Haitian adults being illiterate, and according to the World Development Indicators database, the average adult has 2.8 years of schooling.

The 2008 storms and the 2010 earthquake greatly exacerbated the weaknesses already inherent in Haiti’s education system. Approximately 40,000 school children and more than 1,000 teachers died in January 2010. An estimated 49,000 teachers out of an approximate total of 60,000 worked in earthquake-affected areas. More than 80 percent of Port-au-Prince school buildings were destroyed. The system of higher education was virtually obliterated. Since university buildings were concentrated in areas most affected by the earthquake, 87 percent of the institutions of higher education were damaged or destroyed.
zones directly impacted by the earthquake, the problem of inadequate schooling was worse in rural areas prior to the quake, where approximately three-quarters of children did not attend school, even though almost all children (98 percent) lived within 10 kilometers of a primary school. The condition of primary and secondary education in Haiti was, and remains, the worst of any country in the Americas. Given the extremely poor condition of the education system, most donors focused on expanding and improving the formal basic education system. A ‘formal basic education’ in Haiti is organized into three periods over nine years. The first lasts about four years, a second period for two years, and a third (corresponding to U.S. grades 7–9) for three years. The third period is separated into two branches: one for general education and a second for technical or professional preparation. although the issues were exacerbated within
Beyond formal basic education, there is a three year secondary-school system, in which students can choose between traditional, technical, and vocational schools.

Haiti lacks a precedent for an overarching education governance system; at no point in its history as an independent country has Haiti had a universal system of education for its children. Governmental reforms in the 1980s and 1990s did establish a relatively uniform structure for education and a system of national tests administered at those schools that are accredited, but schools are not obligated to operate by these rules. Since the vast majority of schools, including those in higher education, are unaccredited and private, the education “system” effectively consists of ad hoc decisions made by individual schools.

Haiti is unusual in that private institutions dominate the education sector. Prior to the earthquake, 80 percent of Haitian students were enrolled in nonpublic schools. Haitian private schools were largely unregulated with only about 10 percent of primary schools and one-third of secondary schools being licensed. Private schools are financed by a combination of parent fees and subsidies from organizations, such as churches, charities, and foreign government aid. More than half of private schools were religiously affiliated (Protestant groups ran the largest share); church groups often operated rural schools. While public spending on education was about 2 percent of GDP prior to the earthquake, private spending comprised almost 7 percent of GDP—among the highest rates in the world. Annual school fees at private schools were approximately $70 to $80 per child, which is equal to one-sixth of per capita GDP. Considering more than three-quarters of Haitians live on less than $2 per day, this is a daunting statistic.
According to the RAND Corporation, improving the education system can be simply broken down into three categories: expanded access to education, improved quality of education, and a system of oversight.\textsuperscript{22} Low quality characterizes all but a small set of elite schools; most private schools were considered to be of lower quality than public schools, with school teachers at the heart of the issue. In a nation that lacks a middle class, which would normally supply teachers, it is not surprising that teacher quality is extremely low. With such poor conditions, an ability to attract the Haitian Diaspora is difficult. Introducing a design that provides adequate facilities for both teachers and students while operating within a network of similarly functioning schools will combat this dismal situation plaguing the education sector. An awareness of these facilities among the local, regional, international and global level will inspire additional support.

**SECTION ENDNOTES**

\textsuperscript{3} UNICEF
\textsuperscript{4} Republic of Haiti (2010b)
\textsuperscript{5} RAND
\textsuperscript{6} Ibid.
\textsuperscript{7} Ibid.
\textsuperscript{8} MENFP (2010a).
\textsuperscript{9} Ibid.
\textsuperscript{10} RAND
\textsuperscript{11} World Food Programme (2010)
\textsuperscript{12} RAND
\textsuperscript{13} ibid.
\textsuperscript{14} IDB (2010).
\textsuperscript{15} Wolff (2008)
\textsuperscript{16} RAND
\textsuperscript{17} Ibid.
\textsuperscript{18} Ibid.
\textsuperscript{19} Ibid.
\textsuperscript{20} RAND
\textsuperscript{21} Ibid
\textsuperscript{22} Ibid.
Traditional Haitian communities are combinations of buildings that have developed slowly from the values and knowledge of the local people. The signals and symbols of social status or other meaning may seem subtle to outsiders, but they are inherently obvious to residents. Repeated elements and consistent spacing, such as set-back distance from the street and spacing between buildings, define a shared image of the community. The photographs above portray this desire for communal space. The image on the left was published by the New York Times two days after the earthquake. At the center of this informal settlement is an open, communal space, with additional open spaces along the periphery. In comparison to the photograph on the right which illustrates a settlement organized by a relief organization that has not acknowledged a sense of community. The social impact of existing spaces should be understood through their subtle gradation of use and implied ownership of outdoor spaces, enabling the social fabric of a community.

As witnessed in Haiti and most developing countries, there is reoccurring scenario regarding the relationship between owners of property and builders. Often this role is played by a single person, building on their own property. This builder/owner scenario is common within Haiti due to a lack of available funding and almost no building regulations condemning the practice. With the majority of citizens being illiterate and operating as their own builder, they often practice unsafe building techniques. Rather than understood through written and accurate directions, their building techniques are learned through observation. This scenario proves especially problematic when concrete construction was considered the conventional material in Haiti.

Solving the housing crisis of Haiti will require a return to reworked, low-tech solutions. Ideally, Haiti must utilize a building material that is affordable, accessible,
and has the ability to resist hurricanes and earthquakes. Pegged and braced wood frames with infill were originally used for single story construction in Haiti. Infill often consists of a variety of material, including brick and stone. These heavy materials can be rendered ‘earthquake proof’ with the addition of reinforcing. Although these construction techniques weather earthquakes well due to their flexibility and strong connections, many of these materials are considered too expensive to the average Haitian. The common construction in the countryside involves wattle and daub, which consists of woven branches as wall panels between poles that are inserted directly into the ground. These structures are usually safe in quakes, yet they are subject to termite damage, and must be frequently replaced. When addressing the materiality of more infrequent, larger scale spaces that require the accommodation of large groups of people, I believe materiality has the opportunity and responsibility to play a critical role. A construction process that takes on a hybrid form of imported and vernacular materials and techniques will function as a symbol of awareness and inspiration to the local community.
The climate of Haiti’s cities is mostly warm, humid, and usually sunny. Located along the coastline, they usually receive about 8 hours of sun every day, with frequent, intense rain in the late afternoon. By late evening when offshore breezes pick up, the air usually cools and becomes less humid. Haiti receives trade winds out of the northeast, but the northeastern slopes of the mountain ranges receive most of the humidity they carry. Rainfall varies from a very wet 142 inches per year in the southwest, to a low on the gulf side of the northern peninsula of only 24 inches per year. Port au Prince receives about 54 inches of rain each year. The monthly average temperatures range from a low of 68 degrees F to a high of 93 F. Mornings are comfortable in shady, breezy locations and shade is preferred during all hours of the day. The design must account for the air humidity and rainfall, while providing a comfortable space that do not require the use of mechanical cooling systems.
Bamboo is a major non-wood forest product and wood substitute. Bamboo is a naturally growing plant within Haiti and is harvested every 3-5 years. It can be used as flooring, decking, panels, lumber, thatch and furniture. The physical and environmental properties of bamboo make it an exceptional economic resource for a wide range of uses and for poverty reduction. It grows quickly and can be harvested annually without depletion and deterioration of the soil. Bamboo can grow on marginal land, not suitable for agriculture or forestry, or as an agroforestry crop. It has a relatively light weight, because the culms are hollow, and unlike wood can be easily harvested and transported without specialized equipment or vehicles. It splits easily for weaving and is thus easy to handle also for women. Bamboo is often cultivated outside the forest on farms, where it is more easily managed. Processing normally does not require highly skilled labor or special qualifications and can be started by rural poor communities at a minimal cost.

**Pros**
- light
- ability to be reinforced with concrete
- locally available
- variety of techniques
- inexpensive

**Cons**
- technical skill required
- not permanent
- maintenance required
Concrete construction is very popular in Haiti due to frequent storms and termite damage. Much of the loss of life in the recent earthquake was related to the misuse of reinforced concrete, coupled with no building codes and regulation. The mixture of cement, aggregates and water determines the properties of concrete. Essential to concrete’s structural integrity is the quality of these raw ingredients and equally important is how these materials are prepared, placed and cured. When not mixed correctly and not reinforced, dangerous situations surface.

Earth and stone have formed the basis for inexpensive construction in many parts of the world for thousands of years. Unfortunately, Haiti’s seismic risk coupled with damp climate reduces the number of appropriate ways to use them. Adobe requires a drier climate to allow the drying of blocks and stone walls and requires significant amounts of reinforcing steel and cement to be safe in earthquakes.

Concrete block is the earliest application of off-site fabrication for this material. The system relies on a small number of unique shapes and forms that can be combined in endless ways to create an endless variety of buildings. There is a low technology requirement for producing and building with masonry units, yet there is a relatively high cost of transporting them.

Sand and aggregate is commonly sourced from local quarries and river beds. It is believed that beach sand was often used in the mixture of concrete, although high salt content and the smooth nature of the sand reduces structural integrity. The majority of the aggregate used is limestone. Limestone with an adequate density will make quality concrete if mixed properly.

Haiti’s local cement production is limited to grinding of imported clinker which in 2005 made up for 45% of cement used in Haiti (Global Cement Report).

SAND AND AGGREGATE
FORMWORK

Formwork for floors slabs consists of a standard sized plywood sheet. These are typically recycled from project to project and with time significant damage is encountered along the edges. Gaps in the formwork allow the cement paste to seep out of the freshly cast floors, which negatively impacts the quality of the final cast and cured concrete.

PROS

Relatively inexpensive

Ability to resist high winds and termites

Little maintenance

Thermal Mass

CONS

Improper technique often goes unnoticed

Laborious

Structural steel required
**AUTOCLAVED AERATED CONCRETE**

In the production of this material Portland cement is mixed with lime, silica sand, or recycled fly ash (a byproduct from coal-burning power plants), water, and aluminum powder or paste and poured into a mold. The reaction between aluminum and concrete causes microscopic hydrogen bubbles to form, expanding the concrete to about five times its original volume. After evaporation of the hydrogen, the now highly closed-cell, aerated concrete is cut to size and formed by steam-curing in a pressurized chamber (an autoclave). The result is a non-organic, non-toxic, airtight material that can be used for wall, floor, and roof panels, blocks, and lintels which according to the manufacturers, generate no pollutants or hazardous waste during the manufacturing process.

**PROS**
- Light
- Requires less mix

**CONS**
- Technical skill and additional machinery required
- Significantly reduced compressive strength compared to standard concrete

**FIBER-REINFORCED CONCRETE**

This system replaces some or all of the cumbersome and labor intensive steel reinforcing bars of standard concrete construction with short strands of fiberglass, carbon, or steel fiber suspended in the concrete mixture.

**PROS**
- Lighter, smaller section panels that can accommodate far more complex shapes and curves
- Allows for mobile and less costly offsite concrete construction
- Fire resistant
- Thermal mass

**CONS**
- Reduced structural strength
- Technical skill required
METAL MESH | GABION WALL

Expandable metal meshes are often used in wall rendering processes and for demarcating property as a barrier. In Haiti they are commonly seen in the form of galvanized steel, stainless steel and aluminum. When structurally constructed to encase stone, the mesh functions as a gabion wall. Gabion walls are commonly used as retaining walls among mountainsides to reduce erosion. Considering the amount of rubble in areas impacted by the earthquake, gabion walls may serve a critical function of defining affordable enclosure.

Pros
- No loss of material through waste
- Mesh can be cut to size without losing stability
- High stability and comparatively low weight
- Variety of forms and perforations
- Ease of handling and transportation
- Speed of construction
- Flexibility
- Permeability to water
- Decrease water velocity
- Protect from soil erosion
- Combined with soil produces vegetation

Cons
- Not a local material
- Difficult to install
- May require large equipment
- Thickness of structure
Steel frame systems are composed of linear building elements such as columns and beams. Combined with bracing elements, they provide stable construction, capable of seismic loads. This frame provides the opportunity of various infill wall systems and non-load bearing room modules. The flexible use of the building is possible within a column grid and the manufacturing process of steel can produce a variety of shapes. Steel frame construction is not commonly used in Haiti due to its cost. A building analysis executed by engineers of Arup concluded that no steel was used in residential housing. The only steel structures observed were industrial facilities and petrol station roofs. These structures did survive the earthquake well.

“EMBEDDED IN ALL THAT CONCRETE ARE COUNTLESS TONS OF STEEL AND IRON, THERE FOR THE TAKING. LONG RODS OF IT, SHORT PLANKS OF IT. SPRAWLING, ARCHING LOOPS OF IT. METAL TWISTED, BUT STILL OF VALUE, STILL SUITABLE TO BE MELTED DOWN IN CHINA OR SOME OTHER FARAWAY LAND WITH THE MONEY AND MEANS TO TURN PIECES OF HAITI INTO SOMETHING NEW. THE METAL IS EVERYWHERE. SO MUCH OF IT THAT PORT-AU-PRINCE SHOULD BE A WONDERLAND FOR THE METAL SCAVENGERS, THE CARIBBEAN CONDUITS FOR AN INTERNATIONAL SCRAP-METAL MARKET.”
Reinforcing steel is imported primarily from the Dominican Republic. It is common among Haitian builders to reuse the reinforcement found on other sites. When these reinforcing bars are stressed, fractured and bent they are unsuitable for building and should be recycled.

**Pros**

- Cost to strength ratio
- Ability to be assembled
- Recyclable
- Large spans with few constructional elements
- Variety of shapes to accommodate load

**Cons**

- May require welding
- Usually requires heavy equipment
- Must be imported and shipped to site
Timber stud frame is made of studs connected with nails that can be quickly erected. The studs provide the structure of the floors and walls. These studs are then braced with cladding of horizontal boards. Timber stud construction is subdivided into platform and balloon frame construction. In platform frames, the structure of the floor rests on top of storey-high studs. The building is erected storey by storey. In balloon frame construction, the vertical timber members of the external walls continue through several stories. The intermediate floors are either directly fixed to the walls by means of attached brackets, or the floor joists or beams rest on transverse members connected at the level of each story to the vertical members.

Timber panel construction systems are subdivided into panel construction, framework construction, block construction, and building with timber modules. Timber panel construction fulfills both structural and partitioning functions. The loads are transferred to the foundations via the panels, where the foundations are often concrete. The joints between the panels are often prefabricated.

The dimensions of the elements and their resultant weight are determined by the selection of transport methods and hoisting equipment. Considering the scarcity of wood in Haiti, it is often not used in construction.

Arup observed that timber was commonly used as a roof structure in housing. It was also observed in colombage construction. In colombage construction, wood is used as a frame and walls are filled with brick, cob or plaster. The majority of wood is imported from the Dominican Republic. The Gingerbread district of Port-au-Prince is a historic district consisting of timber framed houses that were built in the late 1800s and early 1900s. These houses feature high ceilings for enhanced ventilation, four-sided roofs to better resistance to hurricane winds and expert carpentry that allows more flexibility in earthquakes. The sophistication of joinery seen in the Gingerbread district was not observed by Arup in recent wood construction.
- **PROS**

  lightweight

  variety of jointing guides an inherent process of assembly

  ability to be combined with alternative materials

  seismic stability

- **CONS**

  Currently not a local material, must be imported

  Susceptible to termite damage

  Technical skill required
Léogâne was originally settled by the Spanish, who ruled until the cession of Haiti to France in 1697.\(^1\) The French built up Leogane, which served as an administrative center to the colony of Saint-Domingue.\(^2\) Although 80-90% of all buildings were destroyed in the earthquake, from an aerial perspective the structure of Leogane can be understood as a series of layers radiating outwards from a dense central. Along the periphery of the city center are less dense settlements all encompassed by arable land.

The core is defined by an orthogonal street grid, with a open plaza near the center. The Mayor’s office (A) is situated on this open plaza and represents Leogane’s
only formal political connection to the capital city. Additionally, this gridded core is composed of standalone residential homes, civic spaces and small businesses. North of the gridded core is an open space that functions as a market (G).

Vehicular access to Leogane from Port au Prince or Jacmel, the two closest and largest cities, is from the south along the national highway. To reach the center of the city, one must travel northwest, bisecting the three school locations. Continuing northwest along this road leads to the coast.

South of this core is the location of three schools that existed prior to the earthquake. While all the schools were destroyed in the earthquake, the Spanish Red Cross has sponsored plans to rebuild two of the three sites (1,2). These proposals have been drafted by two separate architectural firms, one located in the United States and the other in Canada. Within the zone of the three schools is the city’s main public transportation hub, offering transport via buses, tap-taps and motorcycles. Additionally, there is an open, public space that was used for the storage of rubble and has since been cleared. An informal market consisting of street vendors line this highly trafficked area. Each firm has met with the school administrators and documented the site conditions to better understand the needs of the school. Unfortunately, the proposals act as separate entities and do not consider the existing context or address an overall theme.
The concept of a ‘system’ can be understood within nature and built form. Systems exist in the composition of plants out of stems, leaves, roots, flowers, and fruits as well as, the composition of molecules out of elements. The system involved in quilt making illustrates a simple, dynamic process that successfully realizes a complex product. Quilt making begins with a conceptual framework that is understood by those involved in designing and creating the quilt. Once this conceptual framework exists, the patches can be fabricated in any order and assembled (sewn) together in any number of permutations. A simple set of rules about size, theme, color, and pattern, allow small groups or individuals to design and make pieces of an artifact relatively independent of each other. When the pieces are complete, the makers communally function as assemblers to realize the quilt. Elements that were once separate are sewn together forming a new, complex whole. I believe that applying aspects of this methodology are of particular relevance to solving issues in Haiti.

Systems allow far greater freedom with the ability to create any configuration desired, dependent on the relation of parts. I intend to implement and develop a similar process in the construction and evolution of the intervention. Establishing a platform for collaboration will allow those involved with the reconstruction process to remain aware of the overall scope, while knowing their individual role. This forum will allow complex problems to be broken down into more manageable issues that can be solved within a separate time and space. In contrast to quilt making, the assemblage of these solutions may not occur at the same time, rather these ‘patches’ will have the ability to be updated and reprogrammed.

“IN ANY SYSTEM WE MAY DISTINGUISH TWO ASPECTS: CONFIGURATIONS AND STRUCTURE... CONFIGURATIONS RELATE SIMILAR PARTS IN SIMILAR WAYS, MANIFESTING VARIANTS OF THE SYSTEM. RULES OF SELECTION AND RELATION DEFINE WHAT THE VARIANTS HAVE IN COMMON: THIS IS THE SYSTEM’S STRUCTURE.”

-JOHN HABRAKEN

NETWORK

"IN ANY SYSTEM WE MAY DISTINGUISH TWO ASPECTS: CONFIGURATIONS AND STRUCTURE... CONFIGURATIONS RELATE SIMILAR PARTS IN SIMILAR WAYS, MANIFESTING VARIANTS OF THE SYSTEM. RULES OF SELECTION AND RELATION DEFINE WHAT THE VARIANTS HAVE IN COMMON: THIS IS THE SYSTEM’S STRUCTURE.”

-JOHN HABRAKEN
Programmatically, the existing proposals accommodate for spaces desired by the school administration and consist of classrooms, kitchens, laboratory spaces, libraries and storage. A housing facility is unique to the Saint Rose de Lima (site 1) and a large recreational field is unique to the Lycee Anacaona de Leogane (site 2). The Saint Rose de Lima School had an enrollment capacity of 1,100 females between grades 1-12 prior to the earthquake. The Lycee Anacaona High School has an enrollment capacity of 760 students in grades 7-13 and the Louis Borno School had an enrollment capacity of 338 students in grades 1-6. Due to the sheer amount of students and lack of space and resources, each school operates in two morning and afternoon sessions. My proposed program is meant to facilitate a more campus-like atmosphere, provoking a cross pollination between students and community members. Rather than reproduce program and waste resources, I propose to share certain spaces between each school. The kitchen, cafeteria, library, and large amphitheater spaces will provide for students during school hours and the community when school is not in session. For instance, the amphitheater may function as a space to provide a lecture conducted by a teacher addressed to students during school hours, a space for demonstrations given by a NGO addressed to interested community members during the weekend or a concert venue performed by students for the community. The recreational field will be positioned to accommodate student activity and weekend sporting events that involve the community.

Given the lack of political stability, security is a major concern to Haitians. Civic structures and wealthier residential homes often contain perimeter walls, built of CMU block and occasionally lined with barbed wire or glass. Currently, there are security walls that encompass each site, providing a physical and unfortunate visual barrier between the interior and exterior. I intend to incorporate a more permeable wall, one that accommodates for the externally operating street vendors while providing a visual connection between the public and private. This visual connection will provide a sense of transparency and openness, promoting those on the outside to participate.

The sidewalks and occasionally the street operate as informal markets, consisting of vendors under umbrellas, operating out of mobile carts. An array of goods are sold, ranging from linens to produce and cellular devices. I wish to improve upon this already existing activity by providing space for business incubation. These incubating zones will offer adaptable space and support services. Incubator support services will include office space, financial assistance, and management training linked to the school system. The incubators will be designed for flexibility and supply space which can easily be adapted to meet the needs of many types of
operations. These incubator graduates have the potential to create jobs, revitalize neighborhoods, commercialize new technologies, and strengthen local and national economies. Their close relationship with the school will provide an additional amenity to the students, allowing them to learn and become inspired by the process.

The transportation that exists at the center of the three sites, currently provides the only public access out of Leogane. It is likely that the informal market is a byproduct of the heavy traffic created by those accessing this critical node. While this node inherently attracts the community to the space, I intend to transport students into the outskirts of the city, essentially creating a mobile classroom. This mobile classroom will connect students with those members of Leogane who are unable to reach the city center, facilitating a learning environment that will benefit both parties.
<table>
<thead>
<tr>
<th>Purpose</th>
<th>Street Edge</th>
<th>Connection to adjacent program</th>
<th>Ground plane manipulation</th>
<th>Direct sunlight</th>
<th>Outdoor/Indoor</th>
<th>Outdoor</th>
<th>Indoor</th>
<th>Requires Mechanical System</th>
<th>Connection to Adjacent Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom(s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi Use/Training Area(s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amphitheatre</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Library</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kitchen</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incubator(s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Admin office(s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff office(s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Security</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restroom(s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garden(s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation Hub</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
“The laying of a foundation stone in 1995 and the construction of an infants’ school was the first phase of a plan designed to foster the development of a curriculum integrating modern academic education, Buddhist principles, and the practical and particular needs of this developing area.”

The project is located in a small village, within close proximity to the Himalayas. It is in a not readily accessible area. Climate is extreme and essential services are scarce in
both money and materials. The design professionals have assisted on site with the building construction.

Water is a limited resource and has been a major influence in shaping development. A solar powered pump extracts ground water, which is distributed to a tank at the northern boundary of the site. The main water supply is routed along the north-south axis of development. The system reuses water for irrigation and directs the small amount of rainfall to planted areas. This distribution system forms the spine of the development and defines a series of sites for the home-farm gardens, residential accommodation and the school itself.

The complex is planned along the north-south axis and faces south. The master plan is based on the traditional nine-square grid of the mandala surrounded by a series of concentric circles, largely correlating to Buddhist teachings. Each of the four corners of the figure is the site of a new school building. The outer rings are formed by low walls and willow trees. At the center forms the basis for a central temple and assembly courtyard.

Composting toilets use solar powered stacks. Solar energy is collected in black, south-facing walls; it heats a duct that draws air through the latrines and expels it up through the duct, above roof level.

Solar panels utilize Ladakh’s consistent exposure to direct sun and feed battery packs to provide basic daylight hours, power the water supply, school equipment and computers. The design generates its own energy and exports no waste.

Developer: Hand in Hand for Haiti
Location: Saint Marc, Haiti
Year: projected opening January 2011, expected completion 2015
Architect/Engineer: Architecture and Development (firm in PAP)
Contractor: Atlus Page Kirkland

Goal: Design and build a hurricane-proof, anti-seismic, sustainable school complex, offering accessible education from pre-school to secondary school, in flood-free zones of Haiti in an area of great need. The project will be built in phases and is expected to accommodate 750 students by 2015, from pre-school to secondary school and has been endorsed by the Haitian Minister of Education, Joel Desrosiers Jean-Pierre.

Program: classrooms, workshops, computer facilities, science laboratories and studios, medical clinic, cafeteria, kitchen, basketball and volleyball courts, and residential accommodation
What parameters influenced the choice of site?

- St. Marc is within driving distance from PAP
- Given it's proximity to PAP, St. Marc was flooded with refugees from the earthquake, and thus an amazing amount of children with no school
- St. Marc has its own easily accessible port, so importation of building materials will be much easier
- St. Marc has a tremendous potential for tourism in the future, and as our school will be teaching 3 languages (English, French and Creole), so the proximity to what could be a great tourism area would be a good fit
- St. Marc and its prominent business men have a vision for the area, they have identified agricultural areas, residential areas, industrial areas and even an international airport so growth is more likely here than in other areas.

What issues have been encountered?

- The single most pressing issue has been locating water; we have dug 75mts. Down and still have not been able to locate water
- Our site is at the base of a sloping hill and has fairly deep ravines on either side, water management needed serious consideration

What materials does the project incorporate?

- We are aiming to use as many locally available materials as possible
- Having said that there are not many materials available on island
- The project is mainly constructed with timber and concrete, we will make the concrete blocks on site and will need to import the timber
- The roofs are standard metal structures

What are the sustainable features?

- We will be looking at incorporating water catchment systems, 1 per building
- We have not installed air conditioning in all of the buildings, yet are relying on cross-ventilation and have designed accordingly
- We are looking for solar options, connected to inverters to those buildings which only have lighting
- If we install a well and need to pump water, we will install a solar pump
- We intend to shape the land so that we can take advantage of the heavy rains and create a man-made lake, the earth in the region has a very high clay content and can easily hold the water without a sealant. We may introduce tilapia and other organisms to help create a new eco-center on site
- We are installing dual-flush WC’s
- Where possible we use T-5 fluorescent and/or LED light fittings

An area of interest is the availability of skilled labor within Haiti. If you could provide more detail concerning the relationship between APK and the local contractor, that would be great.

- Skilled labor as you can imagine is hard to come by in Haiti but there are some crews that we have found that seem to have capability. We are trying to engage local labor as much as possible in order to help give back to the local community.
- APK has no relationship with the local contractors other than potentially have worked together on projects previously. We are following a standard bid process for each of the various work packages.


http://www.thedialogue.org/page.cfm?pageID=32&pubID=1605

Wolfgang Lauber, Tropical Architecture (Munich: Prestel, 2005) 9

World Food Programme, Earthquake in Haiti: External Situation Report, March 6, 2010. As of July 14, 2010:
