RETHINKING NONPROFIT CONSTRUCTION METHODS:

Integrating equitable building practices on international projects

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Abstract

RETHINKING NONPROFIT CONSTRUCTION METHODS:

Integrating equitable building practices on international projects

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Chair of the Supervisory Committee:

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Architecture

In partnership with Seattle-based construction management firm, Construction for Change, this thesis seeks to develop guidelines for the organization's international construction methods; honoring regional culture and context while promoting local economies. The research was completed in response to the current sum of international aid and the increasing rate of impoverished countries. How can development work benefit receiving populations?

ACKNOWLEDGEMENTS

To Construction for Change– Thank you for the chance to volunteer abroad in Togo, Africa. The opportunity expanded my knowledge in the construction field and forever impacted my life for the better.

To Elizabeth and Yassi– Thank you both for the support and guidance on this project. Your continual efforts to create and promote beautiful, ethical, and sustainable designs decisions added a wealth of knowledge to this document. I am grateful for your contribution.

To my family– Thank you for your continual support throughout my academic endeavors. Your endless encouragement enabled me to pursue and complete my higher education.

CONTENTS

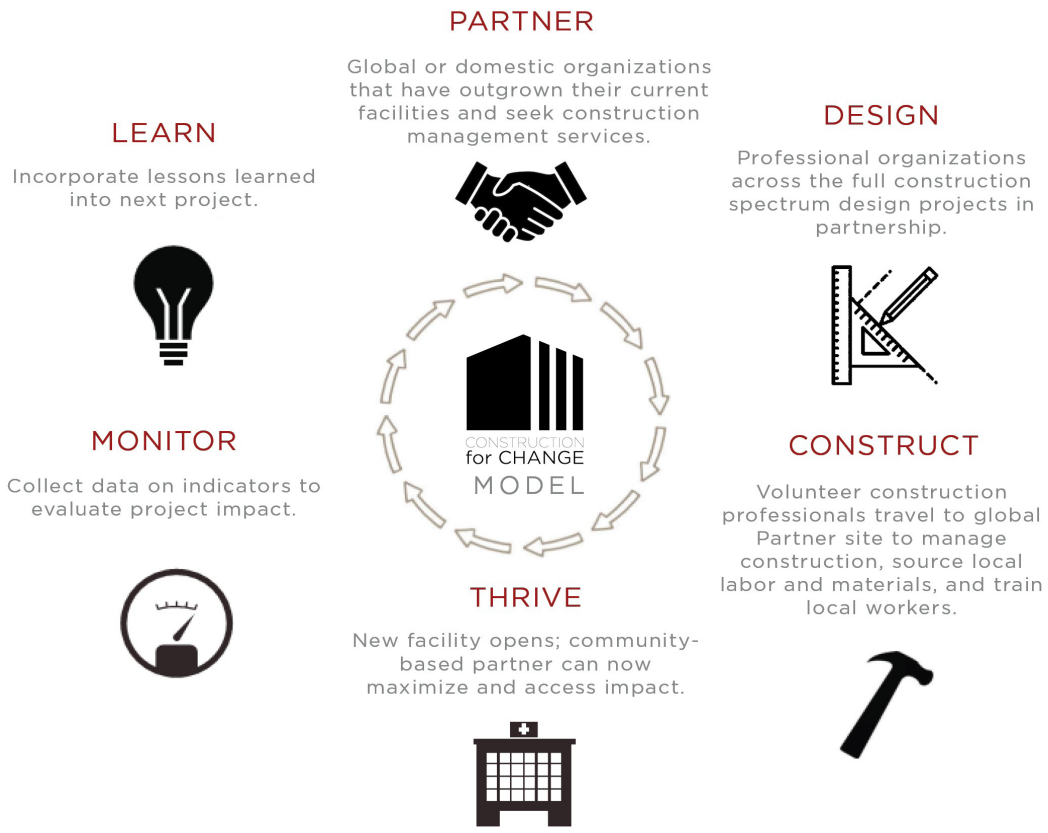

Figure 1: CFC Approach

PREFACE

In 2017 I volunteered with Construction for Change (CFC); a Seattle-based 501 (C)(3) non-profit construction management company that seeks to improve building infrastructure in countries with the greatest need. By partnering with organizations who have outgrown their current facilities or want to expand their services, Construction for Change designs and builds projects to meet client need. They believe building infrastructure has the opportunity to improve the health, education, and/or economic mobility for community members[1].

After developing a partnership with secondary organizations, CFC seeks out professional organizations to develop design strategies. Volunteers are then hired to travel abroad and manage construction.

Construction for Change recognizes the underrepresentation of women and minorities in construction management positions (15% being minorities and 6% being women[2]) and strives to counteract the statistic by providing women an opportunity to work abroad through their Change Fellow program- a project management mentorship program. The position is created for participants under 35-years of age, a student or graduate of a Construction Management, Engineering or Architectural program, or a candidate with prior experience. The opportunity equips fellows with managerial skills and an unparalleled opportunity which may be transferable to jobs upon return.

After a selective interview process Fellows undergo technical, managerial and language training before departure. Fellows are then co-assigned an international project- typically a healthcare facility or school- and work abroad for six to twelve months. Throughout training and volunteering fellows are mentored by industry experts. After project completion buildings are monitored and evaluated to inform future development.

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1 "Our Approach," Construction for Change: Building Infrastructure for Nonprofits, accessed January 31, 2019, https://www.constructionforchange.org/approch/.

2 "Change Fellows," Construction for Change: Building Infrastructure for Nonprofits, accessed April 8, 2019, https://www.constructionforchange.org/change-fellows.

I volunteered as a Change Fellow and was co-assigned a project with an experienced project manager. Together we oversaw the construction of a maternity ward and the renovation of the existing maternity ward into a clinic in Kara, Togo, Africa. Project duration took nine months, starting in December 2016 and finshing mid September 2017. The project was completed in partnership with Construction for Change, 30/30 project; a CFC initiative that seeks to improve access to comprehensive healthcare by building medical facilities worldwide, and Integrate Health, a non-profit working primarily in Togo, that seeks to provide community members with improved health centers and community health workers to end preventable deaths in forgotten communities.[3,4]

The architectural plans for the new maternity ward were given to us by the Togolese Ministry of Health. Since CFC building methodology includes identifying and recruiting local skilled labor, in addition to training interested participants, my partner and I hired a local general contractor to facilitate the construction of both projects in addition to train interested participants.

All projects under Construction for Change seek to be sustainable and ethical by sourcing local materials. For the premise of the projects in Togo, the building materials consisted of concrete block for walls, timber frame for the roof structure, and a metal roof- all locally sourced and manufactured.

During the course of the projects I visited cities and villages. Spanning from the southern coast to the northern border. I witnessed various building techniques and materials spanning from ancient traditions to modern methods, and combinations in between. The experience made me wonder how future CFC projects could be even more responsive to their surrounding environments. With the availability of natural resources present in Togo, how could location and community inform design? Upon my return from Togo, my questioning lead me to join the organizations Sustainability and Accessibility Committee, within their

3 "The 30/30 Project Official Website » About Us," accessed March 15, 2019, http://3030project.org/about-us/.

4 "Who We Are – Integrate Health," accessed March 15, 2019, https://integratehealth.org/who-we-are/.

Community Capacity Team, to assist in the development of sustainable design standards for future projects. This process has led to the formulation of the following document.
Since the architectural plans for each Construction for Change project is either provided by the host country or developed by architects in the States, the following research is not about developing a specific building layout but rather developing sustainable building guidelines for Construction for Change, or similar organizations, to create more locally responsive architecture. For the purpose of this document, the term sustainable encompasses the equity of people and place.

The Sustainability and Accessibility Team has created a list of sustainable design standards. The following nine categories, shown to the right, were developed after vetting various building rating systems and selecting classifications deemed most applicable to CFC's international work. Moving forward, CFC will develop these categories with standards for their foreign projects.

CATEGORIES:

Figure: Icons

For the premise of the following research only two categories will be examined, building materials and social equity, with references to design implementation. These two categorizes were selected based on my experience and witnessing feasible solutions that CFC could implement. Broader issues of development work will frame the basis of the research followed by insight into the history of building materials and social equity. An examination of current international architectural projects and their integration of locality will be reviewed to assess international work. The research will focus on the continent of Africa due to my work experience in Togo and the majority of CFC projects are based in Africa.

CHAPTER 1: INTRODUCTION

THESIS

Considering the complexity of foreign aid distribution and multifaceted non-profit sectors, the following research will examine the built environment through, as previously noted, building materials and social equity. The objective is to develop transferable guidelines that reflect and promote the culture of each (future) CFC project through locally sourced materials and regionally appropriate building strategies while promoting social equity. The guidelines will demonstrate how changes in development work can empower communities and combat the effects of international aid- monetary donations making no significant improvement within communities. The intention is to educate organizations so that assumptions of what countries want are replaced with an understanding of what they can provide.

INTERNATIONAL AID

In 1974 British economist P.T. Bauer wrote an essay in Encounter Magazine questioning the ethics, effectiveness, unintended consequences and the theory behind foreign aid to underdeveloped countries... that has led to "' sometimes brutal consequences, enormous costs, [and] little success...".[5] Multiple authors since then from Judith Tendler's "Foreign Aid" (1976), Timothy Morris's "The Despairing Developer" (1991) to more recent Ben Remalingam's "Aid on the Edge of Chaos: Rethinking International Cooperation in a Complex World" (2015) all reiterate the same critique- that foreign aid creates dependency for countries on the receiving end and detours progression towards independence. Organizations have been criticized for their technical solutions to poverty rather than addressing the underlaying issues. Similarly, organizations are often comprised of foreigners or local elites that provide employment for other elites of a similar status and background rather than empowering local populations to organize[6]

5 "When Criticism Falls on Deaf Ears: The Case of U.S. Foreign Aid," accessed February 22, 2019, http://www.afsa.org/when-criticism-falls-deaf-ears-case-us-foreign-aid.

6 Sally Matthews, "The Role of NGOs in Africa: Are They a Force for Good?," The Conversation, accessed February 21, 2019, http://theconversation.com/the-role-of-ngos-in-africa-are-they-a-force-for-good-76227

INTERNATIONAL AID

FINANCIAL FLOWS TO DEVELOPING COUNTRIES 1960 -2017

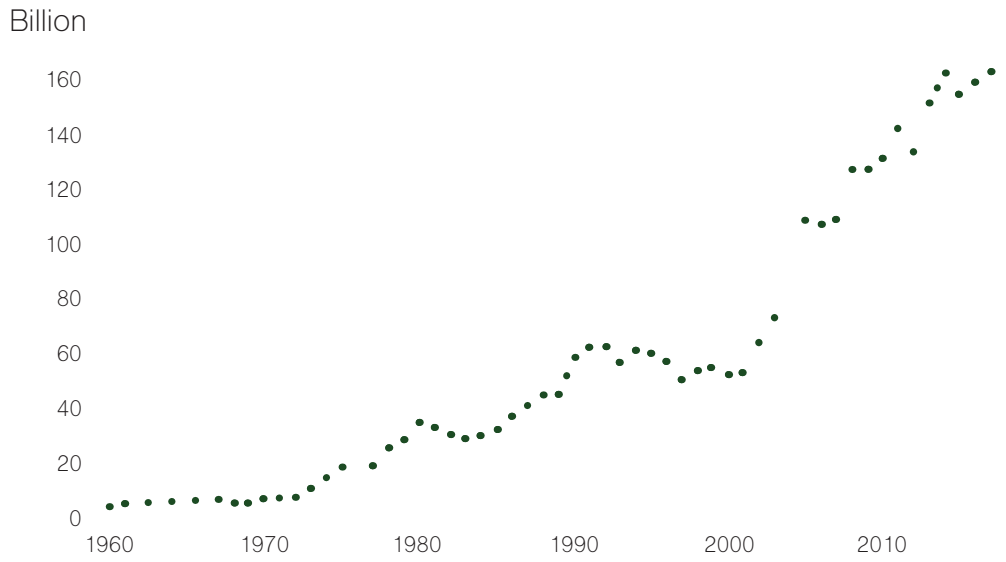

Figure 2

EXTREME POVERTY 2017

BELOW 1.90 INTERNATIONAL DOLLARS A DAY

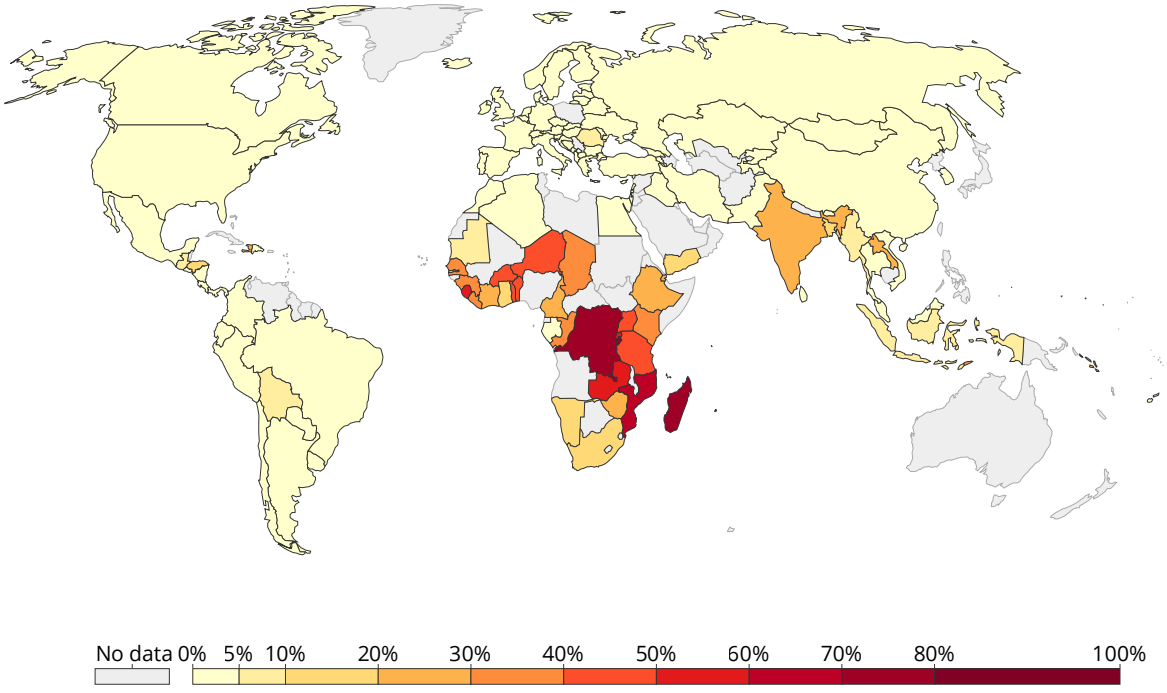

Figure 3

In 1971 $7.7 billion dollars was being exported in assistance and at that time 21 countries were on the United Nations "lease developed nations" list. Almost fifty years later there are now 48 countries on the list even though in 2017 $162 billion dollars was sent out in aid. That is a 21x increase in aid over the last fifty years. With an increase in funds and an increase in poverty, this leads to questioning where the money is going.

One of the continents receiving development aid is Africa. Africa is ranked as the poorest continent in the world. A 2017 report on resource flows in-and-out of the continent revealed that each year Africa loses more money than it receives in aid, investment and remittances. According to Honest accounts 2017 "more than three times the amount Africa [received] was taken out mainly by multinational companies deliberately misreporting the value of their imports or exports to reduce tax"[7]. And with trade, the inequalities are blatantly apparent. "Rich countries preach liberalization of developing countries while practicing protectionism on a massive scale", on average tariffs between rich countries are a quarter of those imposed on poor countries[8]. The consistent impoverishment leads to brain drain in communities as abled individuals seek alternative locations. Poverty also leads to debt servicing, and challenges associated with climate change[9] "The lack of transparency, accountability, safety and the rule of law; the often-bloated public sectors and squeezed small businesses; patriarchy masquerading as religion and culture; high unemployment rates..."[10] all contribute to the continents impoverishment. And while these statements on Africa are simply generalizations, giving a single reasoning for a continent made up of 54 countries is presumptuous, the explanations are more or less a depiction of the multifaceted complexities intertwined within Africa's poverty.

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7 Eliza Anyangwe, "Why Is Africa so Poor? You Asked Google – Here's the Answer," *The Guardian*, June 28, 2017, sec. Opinion, https://www.theguardian.com/commentisfree/2017/jun/28/why-africa-so- poor-google.

8 Gudrun Kochendorfer-Lucius and Boris Pleskovic, *Equity and Development: Berlin Workshop Series 2006* (Herndon, UNITED STATES: World Bank Publications, 2005), http://ebookcentral.proquest.com/lib/washington/detail.action?docID=459544.

9 Anyangwe, "Why Is Africa so Poor?"

10 Anyangwe.

World Bank Economist William Easterly states "[it] is a fantasy to think that the West can change complex societies with very different histories and cultures into some image of itself. The main hope for the poor is for them to be their own searchers, borrowing ideas and technology from the West when it suits them to do so".[11] After all the 'developed' nations of this world arrived at their current state independently– more or less, and were not receiving substantial amounts of foreign aid or assistance; nor were they exploited[12]. However, considering monetary assistance is available, distribution of aid should be benefitting the receiving countries. Facilitating a model for monetary distribution that benefits recipients long term creates opportunities for communities to be empowered and sustained over generations compared to short term gratification. For this scenario Ugandan Journalist Andrew Mwenda states we need to reframe aid "rather then viewing aid as a means to reduce poverty, it should be viewed as a means to create wealth". He goes on to say sending people to school and giving them medicine, does not create wealth. Wealth is a function of income, and income comes from individuals finding a profitable trading opportunity or well–paying job.[13] However, it is not enough for foreign aid organizations to work within a community, see positive results, and then duplicate them for other areas. Every location is unique and requires different solutions.

CONCLUSION

In an attempt to mitigate the effects of international aid the following document seeks to develop construction guidelines that empower local economies and populations through the following methodology. First research provides a background to building materials and social equity and analyzing a case study assist in identifying the use of the two categories on projects. Guidelines are then developed to demonstrate methods of implementation. Finally, the country of Togo will demonstrate guideline application. First by researching the context of the country and then applying the guidelines to Construction for Change's Kara Maternity Ward, as a way to imagine what could be incorporated into organizations future projects.

11 "When Criticism Falls on Deaf Ears: The Case of U.S. Foreign Aid."

12 Dermot McAleese, "Economic Exploitation of the Less Developed Countries: A Survey," *Studies: An Irish Quarterly Review* 62, no. 246 (1973): 139–53.

13 Andrew Mwenda, *Aid for Africa? No Thanks.*, accessed May 27, 2019, https://www.ted.com/talks/andrew_mwenda_takes_a_new_look_at_africa.

CHAPTER 2:
BUILDING MATERIAL AND SOCIAL EQUITY

Building material and social equity hold a strong background historically and in conjunction with development. Finding ways to ethically implement both practices is a discussion that will be further explored in the following chapters. This section provides background information on the terms, setting a context for their use throughout this document, and then analyzes a case study to demonstrate how these two categories may be applied to international projects.

BUILDING MATERIALS

In Africa prior to the nineteenth century traditional building materials– mostly soil based– were primarily used for buildings. Starting in the 1870's colonization began by Europeans and Western practices were imposed; stone became the more common building material.[14][15] While colonization was met with resistance, by the twentieth century most of Africa, with the exception of Ethiopia and Liberia, was colonized by Europe.[16] The driver of colonization was three parts; economic, political and social. In terms of economics, advantages were in raw materials and the creation of new profitable markets. Stripping Africa of its natural resources began a shift from primitive ways of living– with acceptance of traditional materials– to imports and manufacturing of man–made materials. The shift created new markets within Africa for industrialized materials and desire for modern building practices. Even as African countries began to declare their independence in the 1950s and 1960s Western architectural styles remained. In fact, there was an insurgence of hiring international architects to design buildings that expressed the departure from colonial architecture up until the late 1970s[17]. Through personal interviews in Togo, Africa I found modern building materials such as concrete block and metal roofs to be desired over local materials– which are stigmatized with poverty. When talking to locals about foreign development work some individuals

14 "The Colonization of Africa," accessed April 17, 2019, http://exhibitions.nypl.org/africanaage/essay-colonization-of-africa.html.

15 Liora Bigon, "Architecture in French West Africa," in *Encyclopaedia of the History of Science, Technology, and Medicine in Non-Western Cultures*, ed. Helaine Selin (Dordrecht: Springer Netherlands, 2014), 1–11, https://doi.org/10.1007/978-94-007-3934-5_10202-1.

16 "The Colonization of Africa."

17 author/angie-cook, "Graham Foundation Presents New Exhibition Exploring Modernist Architecture in Sub-Saharan Africa," Architect, January 22, 2016, https://www.architectmagazine.com/Design/graham-foundation-presents-new-exhibition-exploring-modernist-architecture-in-sub-saharan-africa_o.

praised outside organizations and their efforts for bringing change, others regarded western architectural styles to be non-conforming and out of context. Interviews with volunteers working in other countries had similar reactions from community members.

Today the complexity of modern building technologies is more often directly tied to waste- relying on non-renewable resources for production. While the systems may be beneficial in their functions to mitigate challenges such as climate, they can also be time intensive and costly compared to traditional methods[18]. It is estimated that currently 2 billion people, which equates to 30 percent of the world's population, still live in homes constructed of Earth[19]. In regions such as the Middle East and North Africa some mud brick buildings present today were constructed over ten thousand years ago and stand nearly ten stories tall[20]. These shelters were derived from local materials; primarily wood, stone and mud, gathered from the surrounding region. Compared to modern building materials, traditional materials offer a number of benefits from cost savings, longevity; lasting for centuries compared to the 49-year average on wood frame buildings[21], and are excellent in passive heating and cooling. Earthen materials such as sun-dried blocks and rammed earth, absorb heat slowly in the afternoons which keeps interiors cool. At night the accumulated heat dissipates slowly keeping interior rooms warm during colder periods.[22]. Earthen construction also consumes less "energy compared to the extreme heat necessary to make cement, the firing process required to make bricks, and the deforestation required to build with wood"[23]. And the material is easily accessible and cost effect. Although more often seen in drier climates, wetter regions such as England have a variety of mud construction.

18 Sandra Piesik, *HABITAT: Vernacular Architecture for a Changing Planet* (New York, NY: Abrams, 2017).

19 "Compressed Earth Block Construction | CEB FAQ," *Dwell Earth* (blog), accessed February 25, 2019, https://dwellearth.com/faq-compressed-earth-block/.2019, https://dwellearth.com/faq-compressed-earth-block/.","plainCitation":""Compressed Earth Block Construction | CEB FAQ," Dwell Earth (blog

20 Hamed Niroumand et al., "Earth Architecture from Ancient until Today," Procedia - Social and Behavioral Sciences, 2nd Cyprus International Conference on Educational Research (CY-ICER 2013), 89 (October 10, 2013): 222–25, https://doi.org/10.1016/j.sbspro.2013.08.838.

21 "Compressed Earth Block Construction | CEB FAQ.""URL":"https://dwellearth.com/faq-compressed-earth-block/","language":"en-US","accessed":{"date-parts":[["2019",2,25]]}}],"schema":"https://github.com/citation-style-language/schema/raw/master/csl-citation.json"}

22 Olumuyiwa Bayode Adegun and Yomi Michael Daisiowa Adedeji, "Review of Economic and Environmental Benefits of Earthen Materials for Housing in Africa," Frontiers of Architectural Research 6, no. 4 (December 1, 2017): 519–28, https://doi.org/10.1016/j.foar.2017.08.003.

23 "Compressed Earth Block Construction | CEB FAQ.""URL":"https://dwellearth.com/faq-compressed-earth-block/","language":"en-US","accessed":{"date-parts":[["2019",2,25]]}}],"schema":"https://github.com/citation-style-language/schema/raw/master/csl-citation.json"}

Local materials also draw attention to different aspects of a location's natural and cultural history. When outside parties approach African countries and try to instill western ways of thinking the inhabited spaces of the receiving population is threatened by new processes- imported materials with vast supply chains that override cultural norms and traditions such as traditional construction knowledge and associated micro-businesses. While modern methods of construction have a lot of upfront benefits in terms of cost savings and maintenance, there are indirect concerns like social change. It is critical to visualize a hybrid between both modern and traditional methods- what are the contemporary benefits of vernacular techniques? A locally driven agenda is more likely to develop a partnership with communities and facilitate a dialogue between traditional practices and modern methods and preserve ar regions culture.[24]

In order to introduce, reintroduce, or reinterpret regional architecture at a given site the context of location must be taken into consideration. Efforts may be placed on the supply side, technical development improvements or demand side through the creation or stimulation of the market.[25] While a good strategy would be to target both sides of the equation it is typically left to the organization sphere heading the project. Further research into design strategies through the examination of case studies will demonstrate how organizations in development work may gear their efforts to meeting both sides through community engagement and use of local material.

24 Piesik, *HABITAT: Vernacular Architecture for a Changing Planet.*
25 Piesik.

SOCIAL EQUITY

Based on the Oxford English Dictionary (2003 edition) equity concerns impartial justice and fairness. Social equity is thus applying the definition to human beings creating a level playing field for all parties. The World Bank's 2006 World Development Report (WDR) declared individuals should have equal opportunities to pursue a life of their choosing and be spared from extreme deprivations in outcomes[26]. In correlation with international work, equity ties into rights-based development which implies a broad understanding of equity that is not limited to income distribution, and which embraces the provision of health, education, and other basic service. Equity also encompasses land rights, cultural rights, minority rights, and democratic rights.[27]

In applying these definitions to development work policy experts believe economic growth is a vital factor in reducing poverty and injustice.[28] Jeremy Hobbs author of "Rights Based Development" a section of the World Development Report stated "people's rights to a livelihood, to decent social services, to a secure existence, to participation in political life, to respect for their diversity and differences–and to social and cultural innovation–must lie at the heart of public policy and economic planning". These statements reiterate the need to promote and stimulate international economies for regional economic growth. Depending on implantation, development work has the power to support these regional efforts.

26 Tamar Manuelyan Atinc et al., "World Development Report 2006 : Equity and Development" (The World Bank, September 19, 2005), http://documents.worldbank.org/curated/en/435331468127174418/World-development-report-2006-equity-and-development.within and across countries. Part II asks why equity matters, discussing the two channels of impact (the effects of unequal opportunities when markets are imperfect, and the consequences of inequity for the quality of institutions a society develops

27 Kochendorfer-Lucius and Pleskovic, *Equity and Development*.

28 Atinc et al., "World Development Report 2006."within and across countries. Part II asks why equity matters, discussing the two channels of impact (the effects of unequal opportunities when markets are imperfect, and the consequences of inequity for the quality of institutions a society develops

CASE STUDY

The following case study now examines buildng materials and social equity on a completed project to illustrate methods of application.

SHARON DAVIS DESIGN

Sharon Davis, the head architect of Sharon Davis Designs has worked with nonprofit, public and private clients, and has produced a portfolio filled with high-end stateside projects as well as low-tech buildings in developing countries. Vernacular building typologies are seen in her project in Rwanda and Nepal. Sharon's firm strives to expand access to human rights, social justice, economic empowerment and healthy living environments.[29]

The Women's Opportunity Center (WOC) was created for the women of the Kayonza region in Rwanda as a center for economic development and social exchange. The organization utilizing the facility is the Women for Women International (WfWI) who support female survivors of conflict and war.

BUILDING MATERIALS

The layout of the center resembles traditional settlements with curved units that reference local weaving techniques. The fired brick used in construction also reflects the regions history of traditional materials. However, the national building code bans the use of native materials and promotes the use of concrete and concrete masonry block. As a result, the knowledge of traditional building styles is declining such that if local materials are implemented, outside organizations are usually hired to oversee the projects- which makes the construction expensive. For the Women's Opportunity Center Bruce Engel, from the Sharon Davis Design office, organized the brick production line which established a new method for fired brick making. Based on the guidelines from a German development agency, "Village-Level Brickmaking", and with a few adjustments based on location, the bricks exceeded the quality of locally made bricks- verified through compression test- and had a similar strength as concrete. And to accommodate seismic activity the bricks were made with appropriate holes

29 Nina Tory-Henderson, "Rwandan Share Houses," *Arcspace.Com* (blog), accessed March 16, 2019, https://arcspace.com/feature/rwandan-share-houses/.

in them such that when they were stacked rebar was placed within the walls. The result, in conjunction with the curved layout, prevented the use of reinforced concrete. And the length of the brick, which were twice the width of a typical brick, allowed for load bearing walls using alternating courses of headers and running bond stretchers[30]. The locally produced brick helped reduce construction cost.

SOCIAL EQUITY

The Women's Opportunity Center provides opportunity for women to engage in different programs on the campus, the idea is to equip women with transferable skills to be self-sufficient. This is done through both education and job training. Programs include training in financial literacy, agri-business, early childhood development, and health. An additional feature of the facility is the agricultural garden. Subsistence farming is economic driver of the country and the outdoor garden provides training for subsistence farmers to learn about transitioning to larger-scale agriculture. The center promotes socialization through the communal kitchen where women can share a meal or gather in various outdoor seating areas[31]

A key aspect to the design is their incorporation of women, the Women for Women International made their involvement a priority. Traditionally females are not involved in construction practices. As a result men and women were trained as masons, steel workers, and carpenters. And out of the 200 women who were trained in brickmaking, and 30 were later hired to join WOC brick production team.

30 Elizabeth Golden, *Building From Tradition: Local Materials and Methods in Contemporary Architecture* (Routledge, 2018).

31 Golden.

Figures: (clockwise from top) 4 / 5 / 6

CONCLUSION

The result of the campus and quality of brick was recognized by the local government and created a demand for the workers of the WOC- some of which created their own cooperative, Katwico. The brick is also now on the local market as a viable building material. Through design the Sharon Davis Team brought back a traditional building material and practice to a country who had alternatively used concrete. The transition back to mud brought with it a cultural heritage tied in tradition. Similarly, by incorporating women on the project the team was able to empower a population towards equality by giving an opportunity to women they would otherwise not be granted. Both the building material and female empowerment demonstrate how foreign organizations have the ability to positively impact a community towards a more opportunistic future.

Sharon Davis Design has completed several projects within economically impoverished countries. Spanning from Nepal to Kosovo and additional projects in Rwanda. Her work reiterates similar project methodolgy illustrated in the Women's Opportunity Center. By analyzing the firm's approach to international projects, and with an understanding of both building materials and social equity, the following chapter will develop guidelines for Construction for Change's informed by Sharon Davis and similar firms and organizations working internationally.

CHAPTER 3: GUIDELINES

In curating guidelines for Construction for Change I will focus on the two categories from the Sustainability and Accessibility Team's Sustainable Design Standards; building material and social equity. Of the initial nine categories these two were selected due to experience and witnessing feasible solutions. They are also categories I believe Construction for Change could have the biggest impact in.

The following chapter applies guidelines to both categories. The guidelines will be defined and followed by a case study to demonstrate implementation. The case studies vary in location and were selected to illustrate multiple approaches to international work rather than specific examples to be replicated. Every project site should always be evaluated separately, as each site will have different needs. The first section will overview building materials and the second will overview social equity.

BUILDING MATERIALS

FLOW CHART

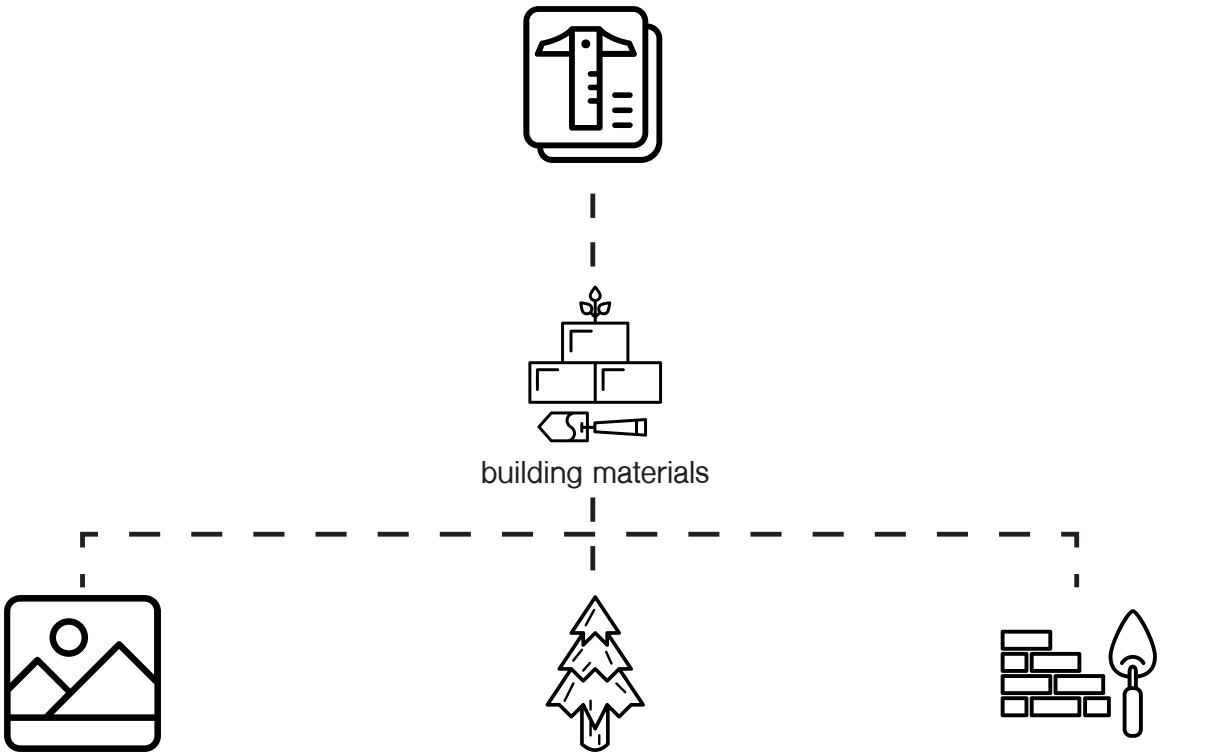


Figure: Icons

SITE CONTEXT

Site context refers to the features of a given area. It can refer to the ground and sky and everything in between. For example, looking at the topography and composition of the site, the vegetation/animals/structures that that fill the space and taking into account the regional climate are all incorporated in site context.

EXAMPLE

BASE, a building foundation in the Philippines, developed a building typology for the construction of quality socialized homes with the use of bamboo as its primary building material. The method was created after the assessment of site context

Bamboo was deemed the most appropriate material in the Philippines due to availability, environmental impact, cost and ability to benefit regional farmers through demand. Traditionally, bamboo was widely used in the region for housing, however today it is now associated with poverty due to the materials lack of structural performance in natural disasters. The material has been demoted to woven mats and flattened panels while concrete and steel are viewed as superior materials, due to stability and strength, and used in construction.

Since bamboo had not been researched as a building material in urban settings and disaster-prone areas, BASE had to conduct research on the material as well as its economic, social, political and environmental implications. Data was gathered through case studies in Latin America and Europe and their forestry practices and interviews with local Filipino builders. Latin America demonstrated the "bahareque" method which used bamboo as the stud framework which is then covered with flattened bamboo and coated in lime or cement plaster. As a result, the building method proved to be structurally sound in earthquakes and was later added to the Colombian building code. Europe demonstrated the systematic use of timber in a way that created a market for the material. The research also concluded that the number of skilled bamboo builders in the Philippines was declining due to the transition to

contemporary materials. The team realized to rebrand bamboo as a viable building material they would have to create a supply chain. Another aspect the team had to consider was financing. Presenting a new building typology would mean homeowners investing in an unverified building system which could prevent individuals from receiving home financing. The BASE team needed to verify the quality of their building processes.

As a result of the case studies the BASE team developed a process for improving and verifying the performance of bamboo systems, upgrading the material supply chain, as well as strengthening connections with affordable housing stakeholders[32]. The team created the "cement bamboo frame" (CBF) which was based on the "bahareque" system and incorporated fire and typhoon resistant elements. The construction methodology, with the plaster finish, allowed the buildings to look like the regional concrete block homes which prevented the outcome to look of lesser quality. The plaster also aided in durability and fire resistance.

The bamboo type used in construction was a result of testing at the Research Institute of the Philippines which solidified strength, quality, and treatment methods for native bamboo species. Structural performance was further verified through full-scale prototypes and digital testing. The new found knowledge was taken to local farmers to educate them on the growing, harvesting and curing process of the correct species. The result assisted farmers in cultivating structural-grade bamboo for the new housing market.

Three building typologies ended up being produced; a single-story stand-alone bungalow, single-story row houses, and a two-story duplex. All typologies use a traditional concrete foundation in conjunction with the CBF wall assembly. An additional feature was prefabrication which allowed the walls to be constructed under cover and detoured from weather setbacks.

32 Golden, Building From Tradition: Local Materials and Methods in Contemporary Architecture.

Figure 7: BASE Housing

Figure 8: Wattle and Daub building technique. Similar to BASE methodology except BASE uses Bamboo over timber framing.

By identifying the site context Base was able to conduct research and reinterpret the use of bamboo in a new way that created standardization in production and benefitted bamboo farmers and local craftsman with a new, in demand, skillset. Since the initial housing was implemented new housing projects have utilized the same building system. BASE continues to work with other non-profit organizations implementing affordable housing and/or housing for disaster relief.

The BASE foundation illustrates the use of traditional material in a modernized way such that the building outcome reflects current building practices. The ability to produce a building that conforms to its surroundings relieves the stigma on traditional materials as a “poor mans” material. BASE also demonstrates how research can breed new ideas on building practices and how to develop buildings that are not only supporting local populations and using renewable resources but producing structures that are up-to-code. Since the foundations initial homes were constructed the building practice has been replicated in the surrounding cities.

IDENTIFY LOCAL RESOURCES

Local resources are both the natural and unnatural materials accessible within a given distance. Natural materials comprise of earth-based products such as soil, rocks and trees, while unnatural local resources may be cement produced at a local factory utilizing locally derived material.

Incorporating local resources on a project helps to stimulate the local economy and sometimes even creates new markets if a new building practice is implemented. Local resources also help to promote a sense of place.

EXAMPLE

The country of Afghanistan is striving to promote female contribution and inclusion in their society. With the creation of the Gohar Khatoon School, located in Mazar-i-Sharif, the fourth largest city, the school has been integrated into the national education system and educates 3,000 students each day from kindergarten through grade twelve.

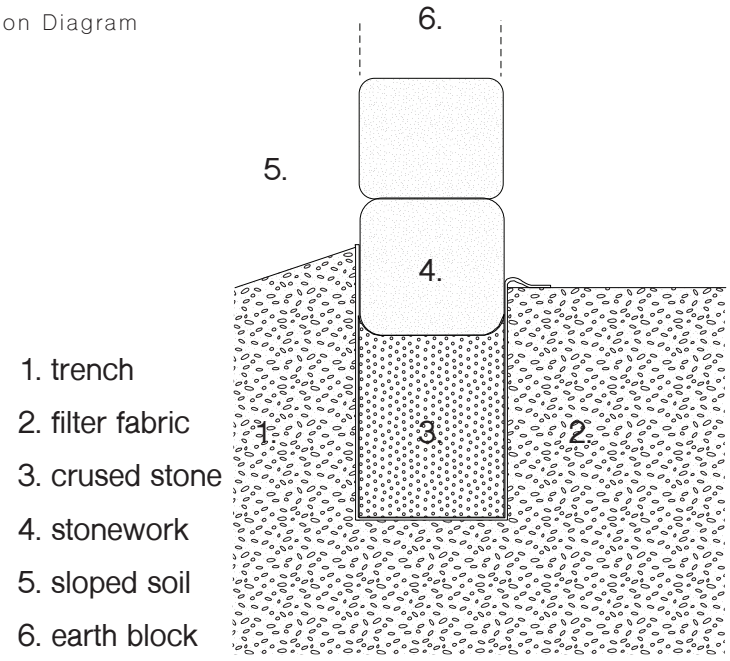
The project was a collaborative effort between Seattle-based architect Robert Hull, and the Department of Architecture at the University of Washington Seattle, the school staff and the Balkh Ministry of Health.

The photograph is a depiction of a rubble trench foundation which utilizes stone and a portion of cement as a binder. This methodology helps to reduce the amount of cement typically used in traditional foundations. Stone is also a local resource that is widely available. The size of the rock and height of the foundation is larger than traditional stone foundations due to the site being in a seismic zone.

The building process includes digging a trench for the foundation and tamping it for compaction. Adding a protective barrier such as a tarp on the walls of the trench. This acts as a protective barrier and thermal break from the soil and gravel infill such that drainage

Figure: 9 (Above) Gohar Khatoon Girls School Foundation

Figure: 10 (Bottom) Rubble Trench Foundation Diagram



1. trench
2. filter fabric
3. crused stone
4. stonework
5. sloped soil
6. earth block

is properly mitigated. Then adding the gravel infill with 4 inches of stone before laying in a perforated pipe for continuous drainage and topping the trench off with additional stone. For the last step formwork is placed on top of the trench. For a grade beam or slab-on-grade perimeter steel reinforcement is required. After the form is poured and dried the formwork can be removed.

The school's physical development included students, staff, and community members through visioning sessions and incorporation into the construction process. Female-only artwork competitions were held, and winners had their artwork displayed as murals on the interior of the school. The competition was completed in response to the end of the Taliban rule which had banned most forms of artwork.

The exterior façade reflects the regions history of masonry construction with red, yellow, and turquoise windows made by local craftsmen and reference the city's famed blue mosque. While some elements were imported a significant portion of the construction materials were local.

School is one of the only times most women are allowed to socialize outside their home's so the school was equipped to promote traditional outdoor activities for fitness as well as seating and gathering areas for interaction. The campus layout also allows for educational gardening, a tradition in Persian culture. Outdoor green space is decreasing in the area due to urbanization so providing greenspace through fresh air, plants and trees was a goal of the project.

In terms of heating and cooling the building uses passive strategies through a central hallway in the middle of the building that draws air in from the exterior of the building and into the hallway. The strategy allows the hallway to be heated during the winter months and keep the interior warm. Cooling in the summer months is achieved with cross and stack ventilation.

TRADITIONAL BUILDING PRACTICES

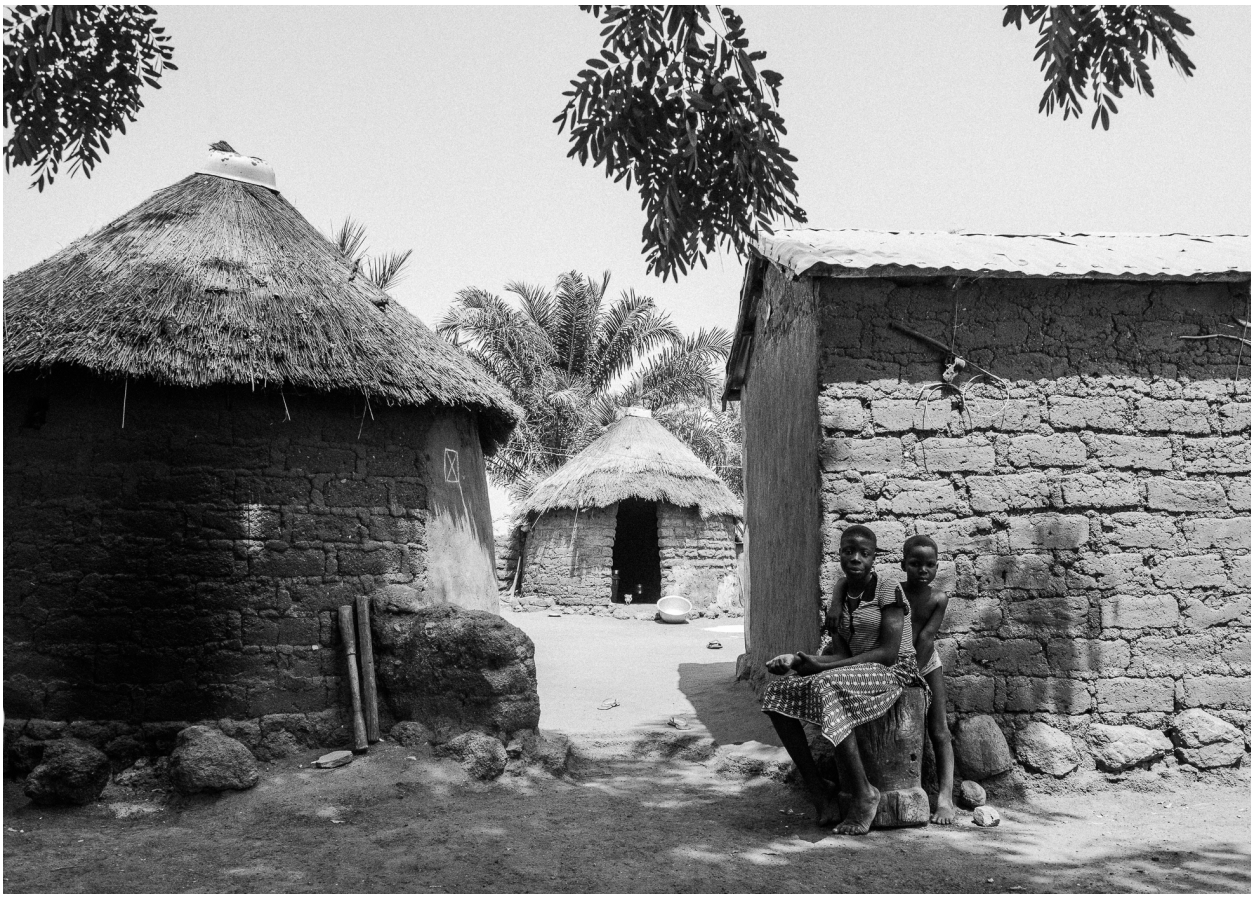
Traditional building practices refers to the cultural practices of a region that are customarily performed. In regard to building practices this refers to both materials and methods traditionally utilized.

Traditional building practices also reflect the cultural heritage of the region and are an important component to incorporate on a project to promote the local population.

EXAMPLE

The traditional building material in Togo, Africa and other parts of Africa include earth block; comprised of mud and water, mortar; also mud based, thatch; for roofing and foundation comprised of stone. The photograph on the following page, figure 11, depicts tradtional housing in Togo, Africa.

Also illustrated on the following pages is a description of a few traditional construction processes and modern methods using natural materials. As noted in the introduction, it is critical to visualize a hybrid between both modern and traditional methods- what are the contemporary benefits of vernacular techniques? A locally driven agenda is more likely to develop a partnership with communities and facilitate a dialogue between traditional practices and modern methods. Construction projects are not about imposing western ways of building but working within the context of each project to support the local community.



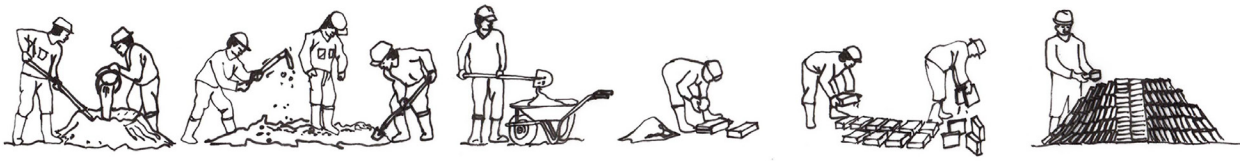
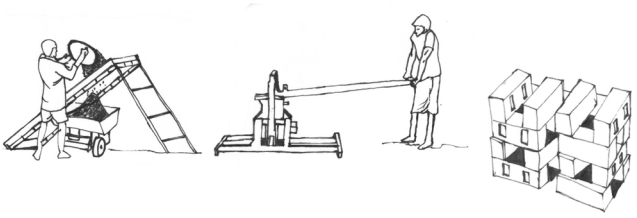


Figure 11: (top) Traditional Togolese Housing

Figure 12: (middle) Mud block Building Methodology

Figure 13: (bottom) Compressed Earth Block

Figure 14: Compressed Earth Block Building Methodology



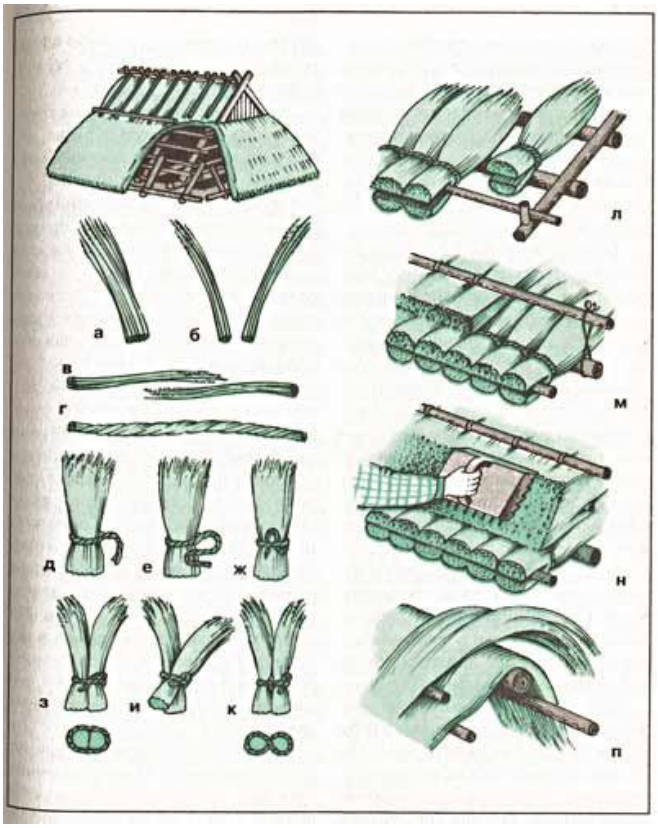


Figure 15: (left) Thatch Building Methodology

Figure 16: (right) Thatch Roof Under Construction

Illustrated in figure 12 is a traditional process of making earthblock. Material is gathered and mixed, placed into formwork and left to dry.

A superior methodology to traditional mud brick is fired brick and compressed earth brick (CEB), succeeded by cement stabilized eath block (CSEB). These methodologies have been proven to increase the structural strength of earth blocks.

Fired brick is made by placing mud brick in a kiln such that the bricks lose their moisture and become permanently solid.

CEB and CSEB entail the same methodology with the exception of cement. Cement is the extra additive that separates the two processes. The added material is used for structural stability and, depending on location, is required to meet code. This process is illustrated in figure 14. A mechanical press is needed in this process to compress the block.

Straw bale is a traditional roofing method used in various parts of the world from dry, hot regions of Africa to more cooler and wetter regions such as England. Thatch roofs can last 40-50 years which is comparable to most roofs. The roof ridge should be replaced every 8-10 years. Thatch roofs are created by first creating an appropriate roof structure to attach the thatch too. Thatch is a combination of living and dead organic material- typically reeds and grasses, that are cut down and tied into tight bundles. The bundles are then woven into the existing roof structure. Exposed edges of the thatch bundles may be trimmed for aesthetics.

SOCIAL EQUITY

FLOW CHART

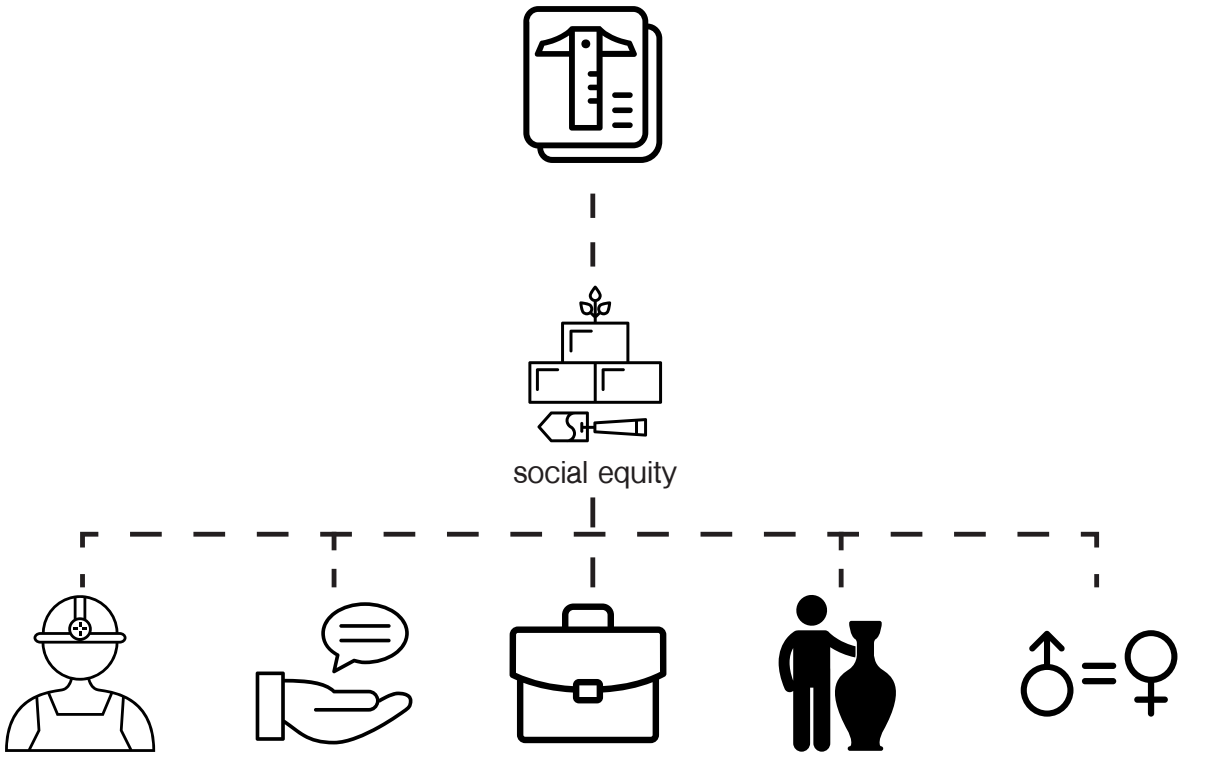


Figure: Icons

IDENTIFY LOCAL LABOR

Local labor refers to abled persons (adults) capable of performing necessary building-related tasks. Local labor may hold different connotations depending on project type which require different skillsets. The term also incorporates identifying both trained and untrained local populations and viewing them as a potential.

EXAMPLE

The proposed Opera Village in Burkina Faso was a reference to German film and theater director Christopher Schlingensief's Opera House for Africa which would act as a gathering space for local and international artist. While Burkinabe architect Francis Kéré was hired as the project architect the project was never brought to fruition due to a flood in 2009 which left thousands of families homeless and a pressing need for housing.

Since the original site was destroyed the government donated a five-hectare piece of land 30 kilometers northeast of the Capitol, Ouagadougou, near the village of Laongo. The bowl-shaped form of the site reinforces the program with orientation around a central gathering space. Additional program includes a school, cafeteria, sound studio, offices, clinic, residences and an 800-meter facility for medical, obstetric and dental care. Later development will include a performance theater.

The layout of the site references the traditional cellular form of Burkinabe Compounds which expand and contract based on needs of the inhabitants. In the case of the clinic the layout is organized in clusters around inner courtyards. The courtyards enable ventilation to adjoining rooms; examinations rooms, inpatient wards and offices and allows patients and families to gather in enclosed, ventilated, spaces. The courtyards help to mitigate the temperature of the region which fluctuates to highs of 50 degrees Celsius.

Akin to most of Kéré's work the project incorporates local material and labor. With the exception of cement and metal used for the roof, window frames, and reinforcement on the

Figure 17: (top) Opera Village Construction Crew Members

Figure 18: (bottom) Opera Village

Opera Village the remainder of the building materials were native. And while Kêrê strives to incorporate tradition to retain cultural heritage, he also understands contemporary need. Therefore, in keeping with the tradition of earth block, he upgraded to Compressed Earth Block (CEB) which is formed in a mechanical press. The regional soil used was laterite, a reddish soil that hardens when exposed to the air. By making bricks onsite the team was able to avoid purchasing them and train the construction crew with a new building methodology. The soil was also used in the walkways around the village. Large pieces of soil were cut fresh from the ground and laid to form pathways which then hardened to create walkable surfaces.

Involving the community in the project created an opportunity for training. The construction industry in Burkina Faso currently lacks skilled labor and implementing new building techniques created a new market for the recently trained crew members. The German non-profit Grünhelme oversaw the construction of the clinic and reached out to neighboring villages to ask for assistance. In response about 80 individuals from five neighboring villages participated. Workers were paid adequately for their work and received training in carpentry, metalwork and bricklaying. Upon completion the construction crew received a letter of completion. The certificate verified their knowledge and acts as a recommendation to future employers. Kêré believes in having community members build their own infrastructure such that they can take ownership over their work and likewise replicate their skills.[33]

Due to the continued loss of indigenous architectural traditions Francis Kéré often times creates 1:1 mock ups on site to experiment with new building techniques and material. The opportunity allows local populations to be trained and equipped with new construction skills and allows the community to witness and be informed about the benefits of new building methodologies. Kéré Architecture's methodology is a reflection of their commitment to architecture that is reflective of its context for the benefit of local populations.

33 Golden, Building From Tradition: Local Materials and Methods in Contemporary Architecture.

LOCAL INPUT

Local input incorporates community members in decision making processes concerning design and construction.

EXAMPLE

Esperanza Series is a project series completed in Puerto Cabuyal in the Manabi Province of Ecuador by architect Al Borde; it includes three building projects: The Nueva Esperanza; a school, Esperanza Dos; an addition to the school, and La Ultima Esperanza (Last Hope); an additional building. The design and construction of the buildings were a reflection of project location. The community of 150 people is located along the Ecuadoran coast 30 kilometers from other populations.

The Cabuyal community is untraditional in the sense that bartering remains the main source of exchange. Due to limited financial resources the first two buildings were constructed with budget constraints of $200-$700 per building. Al Borde was able to keep the budget low by utilizing local natural resources and volunteers for the construction process. The budget also meant the architect had to relinquish conventional construction methods and develop plans that could be implemented by unskilled labor.

In response to the constraints of the design the building utilized traditional building practices- materials and techniques- but altered the construction methodology. A versatile design that could be modified for communal need. Esperanza Dos is a series of tripod modules formed with laced wooden poles. When the modules are connected the structure becomes structurally reinforced. Split bamboo lath was nailed over the triangular forms and assist in structural stability and the support of the thatch roof.

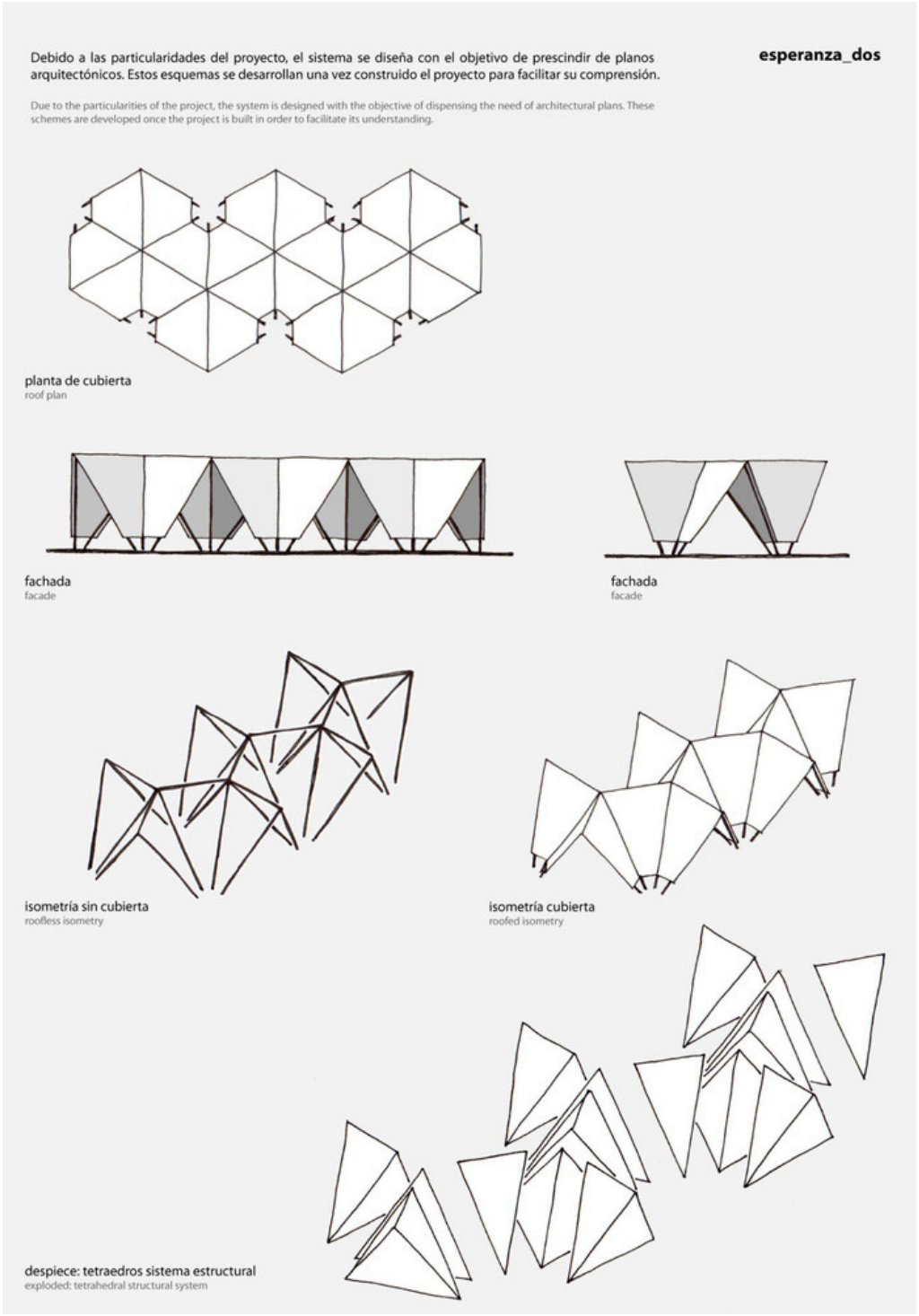


Figure 19: Al Borde Construction Methodology

Figure 20: Community Workshop

Figure 21: Esperanza Dos

Rather than traditional construction documents the architecture firm used physical models to convey building strategies to construction volunteers. The construction process was fluid and organic. There was no set time frame for project completion but was completed efficiently due to commitment. The community volunteers organized themselves in the construction process, and as individuals succeed in a task, they began to train others.

After project completion of Esperanza Dos the building began to be manipulated by the community to accommodate need. New surrounding buildings also began to mimic the construction methods of Al Borde's designs. The architecture firm realized the opportunity for community members to be their own designers such that when the community invited the firm back to design public amenities, the firm decided to train the community in the design process.

In the final project Al Borde led community workshops for the design of the La Ultima Esperanza, or Last Hope. The courses were a series of monthly four-day design workshops which were attended by 16 individuals ranging in ages from 14-72. Instruction was catered to participant abilities. The result of the workshop highlighted community awareness of locality and assistance was only needed in design guidance. Due to the remoteness of the Cubuyal people strategies and designs were locally inspired without outside influence.

While the first two projects by Al Borde were designed by the architects, all projects accepted community input. Even the initial two structures remained relatively open ended in the construction process to include community resolution. The projects allowed community members to be their own designers and create buildings and systems that reflect their culture and context. While architects can strive to implement the same strategies. Residents remain the most knowledgeable of context.

IDENTIFY LOCAL TRADE

Local trade involves local products produced and sold. The term can refer to existing models or identifying opportunities for new trade potential.

EXAMPLE

After the 2010 earthquake in Haiti that destroyed the regions tuberculosis hospital, Dr. Jean Pape reached out to architectural firm Mass Design Group to design a new facility. However, after a cholera epidemic broke out following the natural disaster plans changed and the need for a permanent facility to treat cholera patients was issued. Prior to the new facility patients were being treated in tents, and the lack of sanitation continued to spread the disease.

In partnership with Les Centres GHESKIO, Mass Design Group designed a 7,500 square foot facility which treats the regions 60,000 people. The facility is able to treat 100 patients at a time which includes thirty-five mild cases and sixty-five severe cases. The building was created using compressed stabilized earth blocks (CSEBs)[34]. The remainder of the materials were fabricated in-house or locally sourced. The use of the block allows CO2 emissions to be cut in half compared to traditional concrete-based construction. The process also creates jobs because 10-12 men are required to operate the mechanical press to make the blocks.

Local construction workers were used in the building process. The building structure uses reinforced concrete and a steel structure to create an earthquake proof facility with an additional 3 foot above-grade slab to mitigate flooding. The elevated slab also accommodates the cistern placed under the building to collect rainwater from the gutter and roof. The water is treated on site and is then used for nursing and cleaning. To avoid ground contamination the cistern only punctures the ground by 6 inches. The system was developed by California-based Fall Creek Engineering to develop a wastewater decontamination system, unlike a traditional 3 chamber anaerobic biodigester the GHESKIO system uses four. Annually the system treats up to 250,000 gallons of wastewater.

34 "GHESKIO Cholera Treatment Center -." n.d. World-Architects. Accessed May 29, 2019. https://www.world-architects.com/en/architecture-news/reviews/gheskio-cholera-treatment-center.

Local craftsmen were incorporated on this project as well construction crews. In the case of the perforated façade Mass Design Group created the design and had metal sheets digitally plotted. Local craftsmen then took the sheet and used the template to create the punctured opens. The design aids in the building natural daylighting and ventilation.

Figure 22: Haitian Craftsmen

Figure 23: GHESKIO Cholera Treatment Center

REGIONAL HANDICRAFT

Regional handicraft includes local artisanal craft and/or products. In terms of building material it refers to viewing untraditional building practices (artisanal craft) as potential application to the design and construction process.

Looking for unique ways to add to projects has the potential to reflect and promote regional culture and traditions.

EXAMPLE

The library was built after the construction of the Gando Primary School. Due to the success of the primary school- which resulted in an influx of students, an extension and library were made possible. The library acts as a connection between the initial school and extension providing protection from dusty exterior conditions. The library not only acts as a resource for the school but for the surrounding community.

The layout of the building is elliptical which offsets the layout from the neighboring rectilinear buildings. The walls are made of compressed earth block which utilized local clay. The design references traditional building types amongst the villages. Like all of Kere's international projects he employed the local population for construction.

The ceiling of the library incorporates locally made clay pots. Clay pottery is a regional handicraft of the region and adding this component to the building supported local artisans. The pots were cut in half and placed in the ceiling as light shafts and passive ventilation. A corrugated metal roof sits atop the ceiling to protect from sun and rain. As the metal roofs is heated by the sun the stack effect is created and cool air is pulled through the windows of the building and out the ceilings openings creating a passive cooling system.

An additional feature is the use of eucalyptus. Eucalyptus is typically viewed as a weed in the country and used for firewood since it dries out the soil and doesn't provide any sun protection. But the plant works well as a building material. The plant is able to be manipulated and in the case of the Gando School creates alcoves to protect individuals from the sun.

Figure 24: Women of Burkina Faso with Traditional Handicraft

Figure 25: Gando School Library Interior

Figure 26: Gando School Library Roof Under Construction

PROMOTE GENDER EQUALITY

While gender equality is practiced and promoted in western cultures, there are regions of the world where occupational gender separation is socially acceptable by both parties. Gender equality in the construction process should be evaluated on an individual project basis. In cases where women are unable to participate in construction finding ways to integrate them into the design process should be sought out.

EXAMPLE

The Butaro District Hospital was the first project completed by Mass Design Group. The four Harvard graduates lived on site for months at a time to develop the site through trial and error. As Alan Ricks noted the term 'architect' did not even exist at the time and no one was specifically using design to address healthcare. The graduates had to prove to the local community, through design interventions, how design could improve staff experience- resulting in longer retention rates, improve health outcomes, reduce infection rates, and improve recovery times by having views to nature, and improve patient retention. Similarly, the team had to demonstrate how the project could be affordably built and benefit the community through developing equitable building processes.

After researching and examining the availability of local resources building practices included volcanic rock. Traditionally not used due to lack of trained stonemasons. Mass Design Group hired local craftsmen to experiment with the rock to configure a functional wall. Craftsmen were also employed to use local wood to construct windows frames, doors and door frames. Landscape features included trees and shrubs to stabilize the hillside and additional seating to promote outdoor leisure and reduce the chance of airborne diseases. Semipermeable surfaces were implemented for a similar reason- to avoid pools of water which breed vector borne diseases.

Mass Design Groups integration of women in construction broke traditional gender roles. Anna-Marie Nyiranshimiyimana, who goes by the name of Kankwanzi- meaning “rising star that refuses to conform to society’s expectations”, is now a Master Mason thanks to the employment on the site. She detailed her work experience in a personal interview with Mass. Growing up she was told that women do not build and were limited in skills. The opportunity created by Mass enabled her to become a mason and inspired 200 women to join the project . Anna-Marie is now foraging a path for generations of women to come to reach beyond traditional gender roles. Kankwanzi says “[Women] bring great value to construction sites. They are better implementers and more equipped to budget time and resources…hiring [women[supports the whole family”[35].

The result of the Butaro District Hospital gave the regions their first hospital. Prior to the campus there was one doctor for the areas 350,000 inhabitants. Additional benefits led to training and employment of 3,500 people during construction. The stonemason’s configuration of the volcanic rock lead to the Cooperative of Technicians and Constructor of Rwinkwavu, which now train workers in community-based construction and are highly sought after in other parts of the country. Likewise, the hospital currently provides training to 1,500 volunteers who offer basic health services on site in rural regions. The establishment of the Butaro Hospital set new standards for hospital buildings in Rwanda.

Due to efforts made by Mass Design Group the field of design for social impact is gaining momentum and their conscientious efforts have produced buildings that integrate into site context. The group is also mindful to assess the impact of their work on social structures; being cautious to avoid creating innovative designs that would override indigenous culture.

35 Latest News | Page 2 of 8,” UGHE, accessed May 16, 2019, https://ughe.org/news/.

Figure 27: Anne Marie

Figure 28: Butaro Hospital Volcanic Rock Wall

Figure 29: Butaro Hospital Campus

There has been push back from communities within architecture that the groups designs disrupt traditional forms of architecture with western methods. Matika Shiori-Clark responded to similar comments made about the Butaro Hospital saying "placing an entirely un-contextual building in a place like rural Rwanda without thought to the community and its culture is irresponsible. But blindly recreating what is found in a community, even if that model doesn't serve the health and livelihood of its members, is equally irresponsible. We are paralyzed as a field if we are afraid to use our design skills to move beyond the strictly vernacular"36. The creation of Mass Design Groups themes are therefore a tool to guide and mitigate western principles with African Vernacular. The group extends their reach with the creation of the African Design Center's, being intentional about training the next generation and instilling a form of self-sufficiency as a continent. Statistically the impact is clear, creating buildings that respond to a vernacular context has created healthier spaces. Incorporating local populations in the process of construction has initial and long-lasting benefits for community members. As the group continually self asses, they continue to appropriately evolve and adapt their human centered design approach.

36 "How to Balance Local Traditions and New Solutions in Public-Interest Design |ArchDaily," accessed February 25, 2019, https://www.archdaily.com/342838/how-to-balance-local-traditions-and-new-solutions-in-public-interest-design.

CONCLUSION

Demonstrated in the prior case studies, when foreign organizations return control over construction methods individuals become empowered through economic opportunity. Training local populations with new skillsets creates new markets for employment that can be sustained after project completion. As Matika Shiori-Clark stated there must be a balance between traditional and modern design practices, neither one is wrong, but neither one is correct. Whether creating new markets for structural grade bamboo in the Philippines, inventing new markets for volcanic rock in Rwanda, or modernizing building practices in Burkina Faso referencing past tradition in combination with modern techniques can promote cultural heritage but also meet building code regulations. Representing traditional materials in a modernized way can also reset the ideology of modern and new being tied with concrete block and industrial manufacturing to back to incorporating local materials.

Investing in local systems also promotes autonomy which in turn promotes social equity. Mass Design Group promoted gender equality and gave women in Rwanda an opportunity that was typically denied and granted them the opportunity to find work even after project completion. And the Base foundation created new markets for specific bamboo types which provided local tree farmers with a new income. The same is true in construction. The case studies illustrated that creating new building typologies granted local populations with a new skillset. And educating local communities on a transferable skillset can empower generations to come.

Above all else, incorporating the community into design and construction decision making is critical. Community members are the most knowledgeable about their surroundings and incorporating them into the design decisions enables projects to be the most reflective of context and culture.

CHAPTER 4: TOGO

The next two chapters demonstrate how project managers of Construction for Change could apply the guidelines. I will be using the project I worked on in Togo, Africa as an example. The context of Togo will be researched to demonstrate site analysis and then a demonstration of guideline application is illustrated.

CONTEXT

Togo, Africa is located West Africa along the Golf of Guinea, and lies between Ghana to the west, Benin to the east, and Burkina Faso to the north. It is a sliver of a country roughly 100 miles wide and 360 miles long. Togo is continually ranked as one of the most improvised countries in the world, currently listed as the 11th with 7.8 million people [37]. It is divided into five regions, maritime, the southernmost region along the coast, followed by Plateaux, Centrale, Kara, and Savanes.

The climate in Togo is tropical with the northern and southern regions experiencing different extremes in temperature over the year. The northern part of the country is closer to the equator and thus experiences hotter temperatures with only one rainy season, mid-April through June. While the south has an additional rainy season mid-September through October.[38]. Winter through spring brings about harmattan, a northeasterly trade wind that comes off the Sahara Desert and ladens the areas with dust. During the dust season temperatures rise to 100-110 degrees Fahrenheit with nights ranging from 80-90 degrees. Rainy season cools down to 60 degrees with transitional seasons in the 80s.
Tropical forests are located near the southern coast with mangrove and reed swamps. Moving north the topography changes to lush tropical forest and then back to dry and arid regions at the northern end. Staple crops include corn, cassava, rice, yams, millet, and peanuts.

37 "Poorest Countries in the World 2018: 25 Nations with the Least Wealth," accessed February 12, 2019, https://www.usatoday.com/story/money/2018/11/29/poorest-countries-world-2018/38429473/.

38 "Togo | Location, History, Population, & Facts," Encyclopedia Britannica, accessed February 12, 2019, https://www.britannica.com/place/Togo.

Figure 30: World Map: Togo

Mining and quarrying are the dominate industries within Togo, with phosphate being the major mineral resource and leading export [39]. Other dominate resources are limestone and marble. Three-fifths of the electricity in Togo is hydroelectric with remaining portions of energy coming from petroleum and neighboring countries. The country allows import products from other countries which consist of items such as mineral fuels, food, construction materials, machinery and transport equipment- to name a few.

39 "Togo | Location, History, Population, & Facts."

BUILDING MATERIALS

Housing in Togo transitions from contemporary to historic when moving from the south going north. In urban areas near the coast; near Lomé, the capitol city, concrete block is used in construction. Compounds are a common building typology. Individuals units with a shared courtyard and surrounded by a wall and single entrance. In more rural areas near the coast homes are also made of local materials; clay, timber, coconut / palm branches for the walls and thatched roofs[40]. Moving north, and into rural areas, thatched rectangular huts are gathered around trees in clusters and surrounded by a fence. The traditional housing is the northern part of the country is comprised of circular huts made of adobe or stone laid out in a circulation formation and enclosed by earthen walls. The clusters typically house families. The earth-based homes use laterite, a reddish soil, that comprises both cohesive (silt and clay) and cohesionless (sands and gravels) soil fraction, it contains sesquioxides and clay minerals which aid in the natural binding process and work well in the presence of chemical binders[41].

40 "Togo | Location, History, Population, & Facts."

41 C. A. Oyelami and J. L. Van Rooy, "A Review of the Use of Lateritic Soils in the Construction/ Development of Sustainable Housing in Africa: A Geological Perspective," *Journal of African Earth Sciences* 119 (July 1, 2016): 226–37, https://doi.org/10.1016/j.jafrearsci.2016.03.018.

Figure 31: Traditional Rectangular Hut

Figure 32: Traditional Circular Hut

Figure 33: Modern Building Methodology in Togo

SOCIAL EQUITY

Social equity, while visibly divided between gender in Togo, is progressing towards equal opportunity through shifts in the outlook by the coming generation. The transition away from historical gender division is partly due to education, through programs such as Peace Corps, and access to social media[42]. In some cases, poverty has also overridden gender roles. [43] Need is fulfilled by available individuals. More so, assets, access to credit and employment are the three main factors for gender inequality.[44]

In urban areas gender roles are slightly more fluid compared to rural areas. In an interview with a local Togolese I was told women are free to achieve the same trades as their male counter parts. However, through observation of my time in Togo, and talks with local Peace Corps volunteer's cultural norms appear to keep gender occupation divided. More often females took on the roles as homemakers and occupation of selling goods; agricultural products, household goods and fabrics, in the market, or are seamstresses. While men were more often seen at work in the fields, mechanics and welders, fishermen near the coast, construction workers, or 'zed', taxi, drivers. And while Universities throughout the city give equal opportunity to their academics, the access to higher education is not achievable for most due to lack of primary education and cost of higher education.

42 Kendra Davis, Interview on Togo with former Peace Corps volunteer, n.d.

43 Roger Esso-Domna ATANA, April 29, 2019.

44 Akoété Ega Agbodji Yélé Maweki Batana Dénis Ouedraogo, *Gender Inequality in Multidimensional Welfare Deprivation in West Africa: The Case of Burkina Faso and Togo*, Policy Research Working Papers (The World Bank, 2013), https://doi.org/10.1596/1813-9450-6522.5,16]]}}}],"schema":"https://github.com/citation-style-language/schema/raw/master/csl-citation.json"}

CHAPTER 5: TOGO REDESIGN

This chapter applies the developed guidelines to the Kara Maternity Ward in Kara, Togo, Africa as a way to demonstrate guideline application. The plans, like most Construction for Change projects, were provided by the countries Ministry of Health. The following example does not redesign the building but applies building strategies that are locally responsive to building context, utilizing local resources and empowering local populations in the process while maintaining the country's design intent.

SITE LOCATION AND ANALYSIS

I was located in Kara City in the Kara Province. It is the third largest city of the country with a population around 100,000 people. The city has a central urban center which is surrounded by farmland and forest. Agricultural production is the main economic driver[45] and the Kara River acts as the main water source to the region. While the city receives electricity, moving out into the village's electricity becomes less accessible.

The Kara Maternity Ward, the project I oversaw while working in the country in 2017, is located in the Adabawere neighborhood. It is located a ¼ of a mile from Integrate Health's headquarters and a ten-minute car ride to the city center. The maternity is 90 feet in length, 65 feet wide and 25 feet high at the top of roof pitch. Three outdoor latrines were included in the plan with three adjoining showers. The maternity ward is positioned on the site such that the entrance faces west and is perpendicular to the adjacent clinic. The site is 200 ft long and 150 ft wide.

The maternity ward was constructed using concrete block reinforced with rebar for the foundation and walls. Local timber was used for the roof structure and topped with a metal roof. Accessories such as metal doors and glass shutter windows were used for the exterior of the building with interior doors being made of wood and interior windows replaced with breeze block for ventilation between areas. The delivery room was the only unit with electric air conditioning while the remainder of the rooms had ceiling fans.

45 "2019 World Population by Country," accessed March 15, 2019, http://worldpopulationreview.com/.

Figure 34: Togo Map

Figure 35: Kara City

Figure 36: Project Site

BUILDING MATERIALS + SOCIAL EQUITY APPLIED

The following text applies the developed guidelines to the project my partner and I completed in Togo, Africa. In the case of my project in Togo, the plans were given to my partner and me by the countries Ministry of Health. We did not change the design except for a slight alteration to the roof due to technical issues. When future project managers of Construction for Change travel abroad they too will encounter a similar scenario. By analyzing the context of a site and having guidelines such as those proposed in this document, they may be able to suggest changes to a project that reflect and promote the local community.

The applied guidelines are meant to be ideas for how Construction for Change or other organizations can assess similar international sites before project implementation- being guided and informed by context. These guidelines could inform the entirety of a design (if given the opportunity) or aspects of the design to create locally responsive infrastructure.

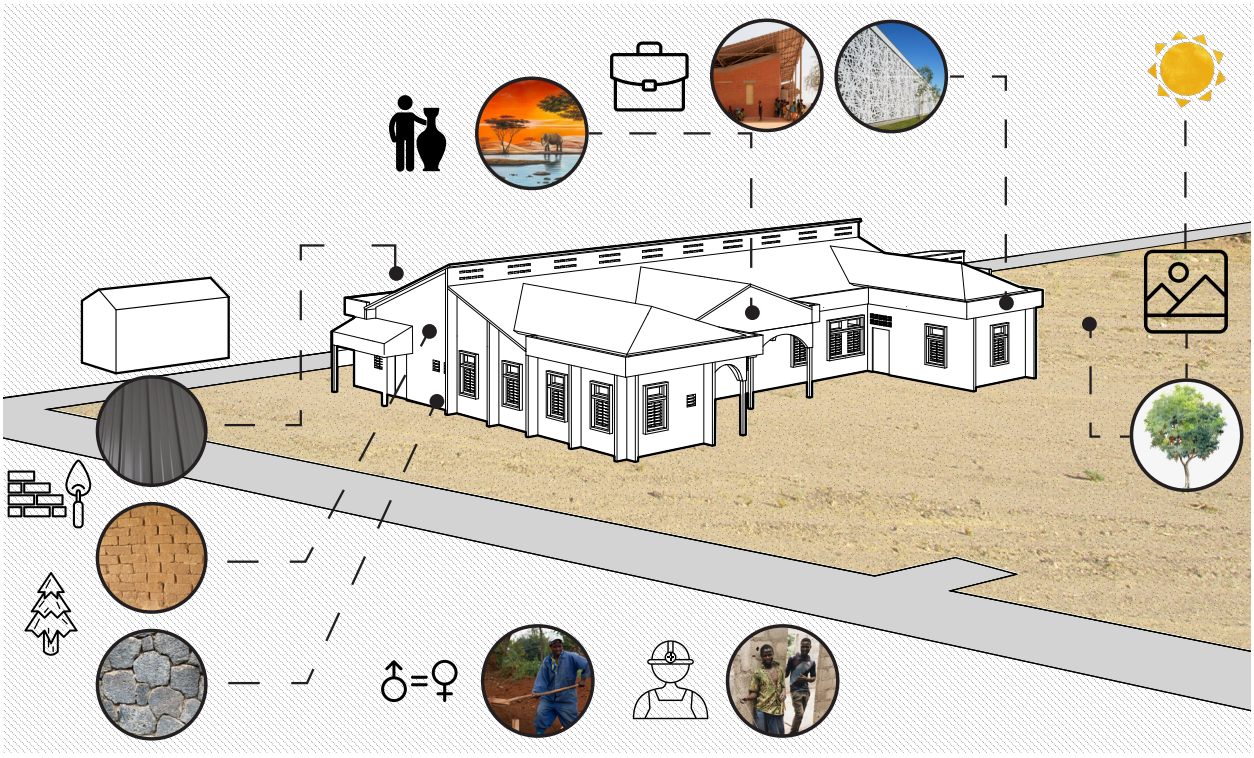


Figure 37: Construction Methods Applied

BUILDING MATERIALS: KARA, TOGO

IDENTIFY SITE CONTEXT

Knowing that deforestation is a prevalent concern in Togo means timber should be avoided on construction projects and replaced with more abundant resources to preserve the natural environment. The site context research also shows that Togo is a flat dry region where temperatures rise over100 degrees Fahrenheit during the hot seasons while still experiencing lower temperatures, 60-70s, and rain in the cooler seasons. In responding to climate, shading devices would be one building adaptation solution. Typically, families wait outside as their family members are being seen by a doctor. Providing a shaded area for family members to gather keeps them out of the sun.

IDENTIFY TRADITIONAL BUILDING PRACTICES

In Kara building practices include cement block in the immediate city context but transfers to mud block homes when dispersing out into the nearby villages. In applying a building methodology to the Maternity Ward, I would propose earth block made and a stone foundation. Both practices are widely used throughout the country. I would not change the metal roof used in the construction of the Maternity Ward because it is locally made, inexpensive and durable.

IDENTIFY LOCAL RESOURCES

Laterite is a locally derived soil in Togo, also available in other tropical and subtropical regions where the climate is humid. Reddish in color and clay like, hardening when exposed to air. It is formed under high temperatures and heavy rainfall with alternating wet and dry periods. The changing weather patterns results in the leaching of soil with oxides of iron and aluminum left behind which make the material suitable for building materials due to strength. Stone is another natural material that may be found locally, varying in sizes.

SOCIAL EQUITY: KARA, TOGO

IDENTIFY LOCAL LABOR

Similar to the construction of the Maternity Ward, in redesigning the process I would have remained similar to the original construction methodology which incorporated both trained and untrained participants on the project and provided opportunity to train the construction crew. Both men and women in Togo are able to be incorporated in the project but women were not integrated in the original project. Therefore I would create opportunity to incorporate any interested person.

IDENTIFY LOCAL TRADE

Metalwork is a predominantly male profession in Togo and is widespread throughout the country. Metal workers make anything from architectural elements to repairing furnishing, or bike parts. In applying their craft to Togo one example of implementation would be from Kéré Architecture and their development of a metal trussed roof. While a metal roof was placed on the existing Kara Maternity Ward, an interior timber frame was used. A problem with timber is the promotion and continuation of deforestation and susceptibility to termites- highly prevalent in Togo. While the framing for the existing facility was coated in a protective solution to prevent termites, a metal roof structure offers an alternative long-term solution that also promotes local labor. It is for the same reason that thatch would not be used due to its susceptibility to bugs.

While working in Togo, my coworker and I were even given a tour of a local German-designed hospital that had a similar elevated metal roof and structure to that of Kéré Architecture's Gando School. We were told the roof exemplified a building that was working efficiently and praised by the community for its integrity as a structure. The reason was two-fold. One, the metal roof was elevated from the building and aided in air circulation; with hot air rising it left the ground floor cooler, and two, due to the elevated and open roof structure bats were no longer gathered in the attic because it was now exposed to sunlight.

Implementing a metal roof on a redesigned maternity is nothing new but adding a metal structure to the roof can aid the structural form of the roof mitigating problems of pest and ventilation. Another benefit is the alternative roof structure is already accepted in the community which means recreating the structure would not impose a foreign methodology.

Another way to apply metalwork is in ornamentation of the building. The design could thus reflect local culture and craft and would be more site specific. One idea would be to use metal workers to make perforated screens that not only reflect a local decorative pattern but functionally could be attached to the siding of the maternity ward and used as grow screen for vegetation. Due to the high temperatures extra shading could aid in mitigating temperatures.

IDENTIFY REGIONAL HANDICRAFT

In the Kara region there are a number of local artists. Incorporating them in the building process could have created a maternity that was more culturally reflective. One example would have to incorporate local painters to create interior or exterior murals for the enjoyment of the occupants and add additional detail to the building. Holding an open community artwork contest would engagement local students and artist in the construction process. A demographic not typically incorporated in construction.

GENDER EQUALITY

Women are traditionally not incorporated into the construction process in Togo. It is defined as a male task. However, with the coming generation and a shift towards acceptance in gender neutral roles and likewise the ability for outside organizations to influence building methodology, incorporating local women on future projects would enable female empowerment and economic opportunity for interested individuals. Identifying construction interest and current skillset would aid in the placement and training of female employees.

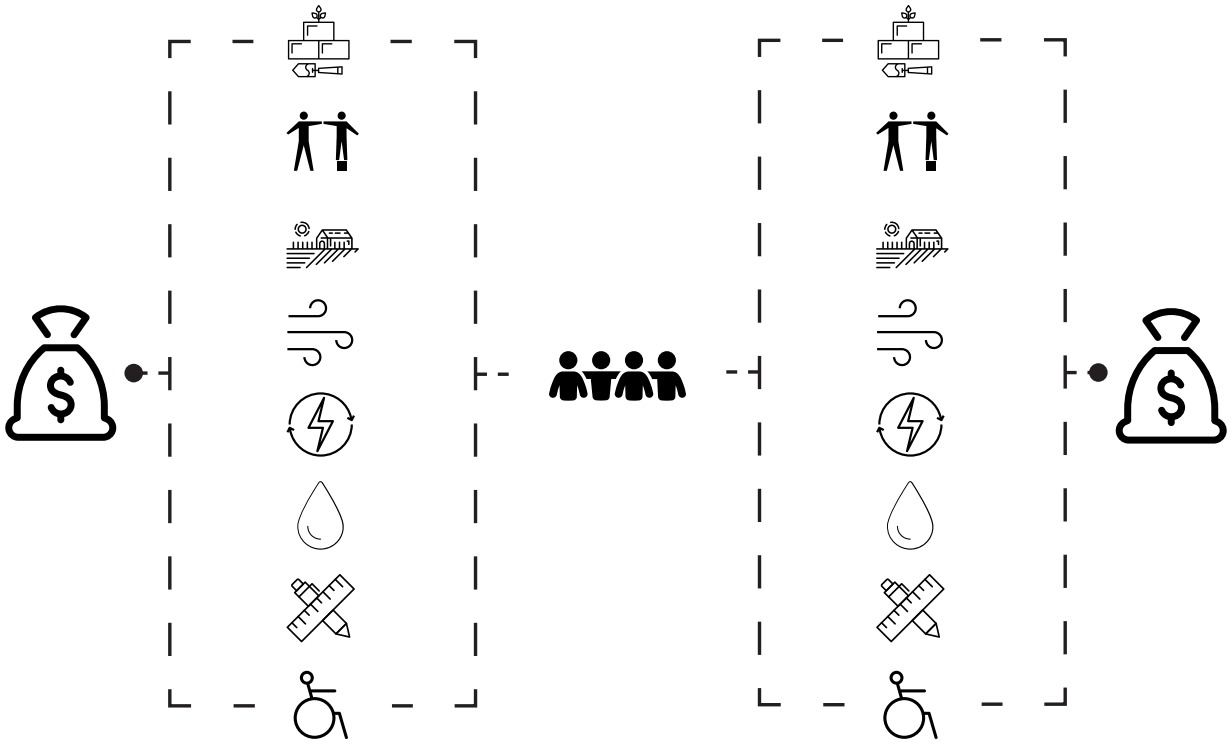


Figure: Icons

CHAPTER 6:
CONCLUSIONS AND RECOMMENDATIONS

As stated in the beginning Andrew Mwenda noted aid should not be used to reduce poverty but create wealth. The diagram, illustrate on the previous page, demonstrates that methodology using the CFC construction methods as an example. It highlights the larger intention of this packet which is to showcase how international aid can directly affect community members longterm. If international funds were spent on programs and initiatives that directly impacted local populations and could then be replicated by that population to produce money for their economy, then a more impactful system would be imparted compared to traditional systems that treat immediate issues with no long-term agenda and / or increase a country's debt.

By providing guidance on materials and social equity a dialogue between international organizations and local populations may facilitate the design and construction of buildings that are respectful to the receiving cultures, while promoting the livelihood of local populations. Such that after project completion and aid organizations return to their country of origin, foreign populations may continually reap the benefit of change that took place in their community.

In regard to the practicality of implementing traditional building styles two methodologies may assist in guiding monetary funds; supply and demand.

On the supply side additional finance may be made available to communities working with traditional methods, or training may be provided to ensure that techniques previously transferred orally and by apprenticeship systems are protected or spread more widely. In addition, there may be potential to raise the measurable quality of the local construction-skills base by qualifying or 'credentializing' traditional built-environment-related skills. The expectation underlying this approach is that a broader distribution of traditional skills will lead to a greater uptake of these skills (either as they are or reinterpreted). Focusing exclusively on this approach risks failure if the process does not adequately address the reasons why new techniques or materials are being selected in favor of the old, or if the complex societal traditions that used to accompany and support their deployment are not considered alongside the technical issues.

A demand-side approach (more likely to be selected by a group oriented towards economic development) will draw upon economic levers to 'pull through' the preferred techniques in one way or another. If the protection and promotion of a vernacular environment are known to hold long-term economic benefit in terms of increasing visitor numbers to a town or city, then tax breaks, micro-credit or grants may be offered to those developing buildings in that style. Spending public money or community-raised finance, in this way could be justified on the basis that it will invigorate the local economy through attracting more and higher-spending visitors as well as retain more of the development spending and revenue in the local community, because both materials and labor will be locally sourced. In locations where the local economy is not likely to be directly stimulated by a more attractive environment, then more innovative ways of raising demand will need to be sought- communities may be offered financing or insurance products that remove the perceived barriers to uptake, for example. In some cases, educational or advertising campaigns may be sufficient to raise the perceived value of traditional-based products. The costs of these programs, though light, could be offset by the increase in the external or long-term benefits to the community of switching back – or more likely, switching to an optimized hybrid approach – so long as the recovery of these cost can be successfully negotiated between the relevant parties. In all cases, and whatever the balance of supply – and demand- side activities, the shape and efficiency of the underlying market should be understood and acknowledged. Most markets are highly imperfect owing to a low availability or equity of information or high barriers to communications and transport (which may introduce distorting transaction costs), and these imperfections can often give an advantage to the sorts of large organizations that manage supply chains for modern methods and construction[46].

46 Piesik, *HABITAT: Vernacular Architecture for a Changing Planet.*

By creating a market for regional material systems non-profit organizations are able to empower communities by utilizing monetary funds and distributing them indirectly to create new markets. Helping local populations visualize the potential of local resources empowers communities to be cognizant of surrounding resource potential and self-sufficient through the development of new markets through the development of new transferable skills.

This research is meant to demonstrate ways non-profit organizations can research and be informed by project context before developing a design. Prior site analysis can create feedback loops for organizations to more appropriately implement projects. In some cases, architectural plans are given by the host country, as in the scenario of the Kara Maternity Ward. Having guidelines in place that can be applied to pre-existing designs helps respect design proposal but also supports the local economy and environment by making sure building design is responsive to context. In some cases, architects local or foreign may have the opportunity to create new architectural plans. In that case the information provided in this document could aid in the development of new site-specific layouts.

This document acts as initial research for developing international building guidelines for construction projects. Moving forward with this research I would develop the remainder of the seven building categories. Referenced in the attached appendix is a demonstration of a potential project manager packet. The packet illustrates a tangible document that could be given to future Construction for Change project managers to assist in their site analysis and construction methods.

FIGURES

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