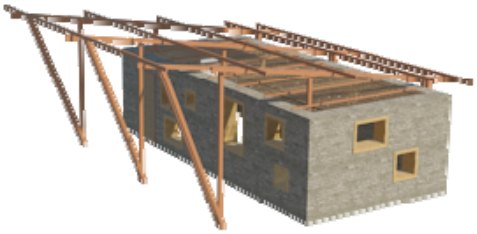
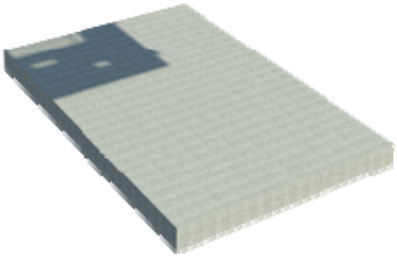
## Nyaung Ywa Community Development Center

First off, I wanted to commend you for spearheading such a great project. I have been fortunate enough to have participated in similar ventures in the design of an orphanage in Ethiopia and a community center in rural Mexico, so I know how challenging such an undertaking can be. Yet it is also extremely rewarding to know you are truly changing the life of someone in need. I hope your journey through this process go as smoothly as possible.

Whether you decide to chose my design or not, I hope this overview is helpful for you; especially in the selection of materials and use of passive sustainable techniques.

### Materials:





Unlike the US and Europe, where labor is expensive and materials tend to be a little cheaper, buying materials in the developing world can be incredibly expensive. Labor in developing countries tends to be cheap and unskilled. This doesn't mean that they can't produce high-quality work, but rather that designs should employ easy-to-build methods which don't require high-tech tools. I highly recommend using locally sourced materials and only using more expensive non-local materials when truly necessary.

In the design of the center, all of the buildings follow a similar construction.

The first element of the design is an elevated platform. This serves two purposes. First, you mentioned that the site is a rice field which is subject to flooding. Elevating the buildings above the flood line is always important. Second, it also increases ventilation. Raising the buildings above the humid ground allows for cooler breezes to enter.

I suggest using a concrete base close to one foot above the ground level (although it could be higher if the flooding rises over that). The whole base does not have to be concrete (which could be expensive). Side walls could be built out of stone and the interior can be filled with dirt or rubble. Then the concrete slab can be poured above that. For structural reasons, I recommend it isn't less than 6 inches thick.

The main walls of the buildings are built out of Compressed Earth Block (CEB). The site being a rice field leads me to believe that the soil is rich in clay, and therefore an excellent building material. Using local dirt would not only greatly reduce construction costs, but it would also use a material that is

extremely sustainable and has a deep connection to its site. CEB is a process which takes soil, water, and a very small amount of cement to create earth bricks. It uses a hydraulic machine that can be either run through electricity, gas, or manual power (there are different models, although I would recommend man-powered). The benefit of this is that you can easily produce a large amount of bricks in a short amount of time, and they are extremely strong and durable. The design would require the purchase of one of these hydraulic machines (I recommend the Hydraform company); they aren't very expensive, but they do add a second benefit to their purchase. Once the project is completed, the center could keep producing bricks to either sell or donate to improve living conditions within the community. As you mentioned the center should be a catalyst within the community, teaching people how to build in a safer and more durable manner.

I recommend that the walls be built around 16 inches wide. This allows for the heat of the sun to penetrate the building a lot more slowly, keeping the building cooler. Having many window openings allows for breezes to easily pass through the building, something crucial in hot/humid climates.

The roof of the building is held up by a simple timber frame construction. Teak and Ironwood are both excellent hardwoods, and both are found locally. If their price is too great, there are also local species of pine and oak that could be used. The structure does not carry a lot of weight, this allows for the construction to use short pieces (easier to find and cheaper) held together by bolts. Posts can be either bolted to the base or cemented into it.

(example of simple wood frame construction, Safe Haven Library, Thailand by TYIN Tegnestue)

For the roof itself, I decided that corrugated aluminum would be the best material. The reason is that even though it is not local, it is easy to find throughout the country. It is also the most durable material available, with a life ranging in about ten to fifteen years depending on care, rather than the few years more natural roof options give. The only detriment to its use is that it can be noisy (when it rains or when birds land on it). It is not a very big problem, but it can be easily solved by covering it with palm leaves or straw.

I also suggest creating a bamboo ceiling. This is simply bamboo poles tied to wood beams or branches spanning the width of the rooms. The reason for the bamboo is to create a more intimate feeling within the space, while also allowing warmer air to escape through the roof.

I wanted the worship center to be built differently, since it is the most important building in the center and it should have a greater presence. It still sits on a similar base to the other buildings, yet its walls and roof are built differently.

The walls are built out of rammed earth, a technique that uses dirt to build walls. Rammed earth walls are thick and give the worship center a feeling of permanence and importance. Like the compressed earth block, the building will be a similar color to the local soil, giving it a feeling of connection. The technique is really low skill, and all it requires is wood to create the formwork, dirt, water, a little bit of cement (depending on the consistency of the local soil, sometimes none is needed), and someone to stomp on the earth to compress it. This also allows for curved or round building to be built a lot more easily and cheaply than making other materials bend into shape.

(example of rammed earth construction, 10x10 Shelter Challenge by the Nka Foundation)

I suggest that the interior walls of the worship space are covered in plaster. This will allow for murals to be drawn on them depicting the biblical stories you mentioned. It would be ideal if a local artist could draw them, creating one more connection to the community.

The roof of the center is also held up by a similar wood frame construction holding up an aluminum roof. The difference is that above the metal roof, there will be a green roof. This is basically a thin layer of soil with local grasses growing on top of it. This helps insulate the building, reduces rainwater runoff, and also creates a feeling of connecting to nature. Green roofs are often seen as high tech, but they can be easily built using low-skill technology. Plastic tarps or large bags can serve as water-proofing, while bamboo and gravel can create a permeable layer below the soil.

The benefit of using simple construction that the community can be a part of is that it creates a feeling of ownership. Having the community be part of the building processes creates a feeling of pride. Furthermore, if any maintenance is needed, or if something needs to be repaired, the community already knows how to take care of it. And as you stated, the lessons learned in the construction of the center can be used by the community; so the center begins to have a positive effect even before it is even open. This is a very important connection to make.

*Additional notes:*

You mentioned that you heard straw bale was a good material. I would strongly discourage its use in this type of climate. The reason is that the straw bale construction won't be as pristine as the one done in the US and Europe. Straw bale is great if it kept dry, but if it begins to collect moisture, it begins to rot or to grow mold, and this could threaten the structural integrity of the building. Also, if it isn't sealed very well (which is often the case when doing projects in the developing world), it could become a home for insects and small animals.

You also mentioned bottles. Those are great. If there are a lot of glass bottles in the area, I do recommend using them, since they can add sources of light into buildings. Bottles are often used in rammed earth constructions to bring in more light into buildings.

## Sustainable Techniques:

*Natural light and ventilation*:

The project maximizes the number of windows within the buildings to allow for a lot of natural light to come in, and also to maximize airflow. This allows for the whole center to function without the need of power, yet still provide comfortable spaces for learning, worship and living. Operable windows allow cool breezes to enter the building (especially lower openings, since that air tend to be cooler). The open roof allows for the warmer air to escape the building. The thermodynamic difference between the hotter metal roof and the cooler room creates a vacuum that encourages cool air to flow into the spaces.

*Power*:

Although the center is designed to work without electricity, the pitches of the roofs could easily hold solar panels. Also, depending of the amount of wind in the area, simple windmills can be built using recycled materials. Or the center could also connect to local power if it is available.

If this is the case, simple light fixtures can be hung from the bamboo ceilings of the rooms. I would also recommend adding ceiling fans if possible to increase airflow if electrical power becomes consistent.

You mentioned using a generator to power an AC unit for the classrooms. Although generators are great sources of power, I strongly recommend only using them as backups. Most of them are expensive, and use up a lot of gas (which also adds to the cost). If there is money for a generator, I think it would be better used in the clinic (keeping medicines cool). Using fans and having a constant airflow can really make tropical/humid spaces feel more comfortable, even in the hottest months. As foreigners, our range of comfort is a lot different than people who live in the tropics, so even though it might seem to us that an AC is a priority, most people there would see it as an excess. That being said, I suggest that if you do install AC units, you look at the smaller room-size units (Mitsubishi make a really great one); they are a lot more efficient, they are cheaper than the large units, and they are easy to install. Also, hooking up the AC units to solar panels is a great way to by-pass generators.

*Water and Rainwater Harvesting:*

Although it is located in a tropical region, lack of clean water can often become a problem in these types of regions. This is because there is not a good water management culture. The rainy season brings too much, and the dry season can sometimes be long. While in Ethiopia, I tried to implement a lot of water conserving techniques to help people survive the long dry season. Like Myanmar, they have a very long wet season, followed by a mostly dry season. People there also rely very heavily in sustenance farming, so a drought or long dry season can really jeopardize people's lives. The best way to solve this is by storing the excess rainwater of the wet season. Large plastic or metal tanks can be easily found, and gutters can be easily built out of sheet metal to guide water from the roof into these storages. If tanks are not cheap or easily available in the region, they can also be built out of concrete. Collecting as much water as possible for the dry months will greatly increase the crop potential of the center.

Storing water in the soil is also very important. By this I mean, allowing water to seep into the ground and keep a healthy and sustainable water table. This insures that the well is always a reliable source of water. The way to do this is by having permeable surfaces. You mentioned that initially you would have gravel paths and roads, hoping to pave them in the future. I would strongly encourage you to keep the gravel and refrain from paving. Pavement and asphalt don't allow water to seep into the ground, and often add to flooding. If gravel isn't durable, there are permeable pavers that allow water to go through them, yet are durable and strong enough to carry the weight of cars. Along this line of though, you can dig trenches next to the building platforms and fill them in with compacted gravel. This allows for water to penetrate the ground rather than creating large puddles in front of the buildings.

Having a lot of vegetation also helps store water and reduces flooding issues. If you look at the dorm area in my design, I have a central courtyard full of plants. This garden works as a rain-garden. It uses local plants that are adapted to the very wet seasons, but can also handle the dry months without the need of watering. The garden itself becomes a sponge, soaking up and storing water during the wet season, and slowly using it during the dry months. The rain-garden can also host some fruit baring trees, such as citrus, papaya, and mango; all of which thrive in this type of environment.

I have also added a large storage tank above the well. The two reason for this. First, the storage tank can come in as a back-up if for any reason the water-table begins to drop. Second, having an elevated unit allows you to have water pressure without the need of expensive pumps. The storage tank could provide water for sinks throughout the entire site. Water does have to be pumped from the well to the tank, but that can be easily done without the need of electricity. There are man-powered pumps, some of them designed as playground equipment for children to play with. A simple wind powered pump made out recycled materials could also be placed above the tower.


(children-powered water pump in Africa, wind-powered pump build out of recycled barrels in Mexico)

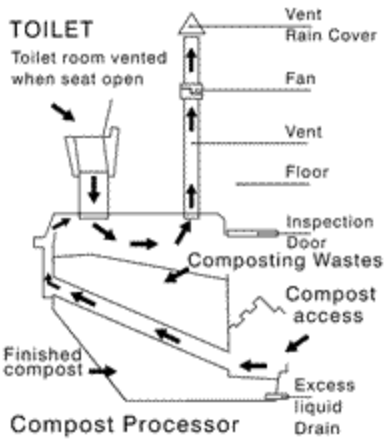
*Local Plants and Food*:

Using local species of plants is very important, since those plants are adapted to the climate, and can survive without the need of extra water or other things like pesticides to ward off local insects. I suggest that all plants used are local, with the exception of food baring plants that are being used in the center (such as corn, beans, rice, and some trees). I would also encourage the use of some great local food-baring plants such as mango, papaya, coconut palms, local species of avocado, local species of Pineapple, local citruses, Jackfruit, Banana, Durian, and local species of Watermelon.

Other plants such as teak trees, bamboo, rubber trees, and ironwood can be planted to be used for future construction and maintenance.

*Waste:*

Dealing with waste is often the toughest part of trying to do a sustainable project in the developing world. The lack of proper sewer systems and low technology can often become an issue for designers. Your suggestion to use Ventilation Improved Pit Toilets is great. Although, I might suggest using composting toilets; the principle is the same, it is a pit toilet that doesn't require water nor local sewer. The main difference is that the waste begins to compost naturally within it, and can later be used as fertilizer for the fields. Similarly to the VIP, the compostable toilet has a vent pipe that prevents odor from overpowering the bathrooms, yet it also includes a second ventilation source which brings oxygen into the pit and encourages the waste to decompose. These systems have openings to allow for composted waste harvested, but also to throw away kitchen and other organic waste. This greatly reduces the trash produced in the center. Once it is harvested, the composted waste can be mixed with manure from the animals, soil and other organic matter such as leaves, grasses or rotten fruits or vegetables. This creates a very rich natural fertilizer. This fertilizer can be used both in the center or sold to local farmer to help them grow crops without having to buy expensive chemical options.




(diagram of composting toilet and image of composted waste, http://www.reuk.co.uk/Introduction-to-Compost-Toilets.htm)

## The Design:

*Plaza*:

One of the main changes from the original design is the creation of an entrance plaza. The concept behind this is to create a welcoming area that invites the community to enter the center. The plaza is defined by the clinic, the worship space, and a shaded seating area; these being the most public elements of the center. The idea is that the plaza becomes the place where the community and the center blend. The shade provided by three trees (I would suggest mango trees since they are tall, bear lots of fruit, and provide lots of shade), and the overhangs of the roofs creates a very comfortable environment.

The plaza can hold several different events. I envision it as the hosting area for a farmer's market, selling the goods produced in the center. It can also be the site for children's plays depicting stories of the bible for the entire community to enjoy. It can host festivals, weddings, and other celebrations. It can also be used as a parking area for when there is a large need for parking. It can also be a safe heaven and playing area for the children of the community. In other words, it is a flexible connection between the center and the rest of the world.

The way I designed it, the plaza is open to the community. A guard house at the entrance makes sure that the place is safe, and there is a vibrant dialogue between the street and what is going on inside. I understand that this openness does not work in all communities, so if it is necessary, a fence with a large gate can easily be designed. As long as a visual connection remains, this permeability between the center and the community can continue to happen.

*Clinic*:

The clinic moved next to the plaza because it should be viewed as a one of the central roles of the center in the community. The concept behind this move is to allow for people to walk in and easily get care. The current design has a small office area for the administrative needs of the clinic, and two patient rooms. Yet, the clinic could be easily expanded if the community's needs grew, or as more

nurses are trained. A section south of the clinic has been left empty, and continuing the same construction methods, 3 more rooms could be added to it.

The clinic rooms are simple. They consist of a bed and a sink. All of the storage is located in the hallway outside of the rooms. The hallways cabinets could be locked and keep all of the materials and medicines the nurses needed for the care of the patients.

To the north of the clinic, the roof overhangs and covers a small workshop area. This area functions as part of the vocational training that you mentioned, it could hold tools, saws, and other construction equipment; it is also where the compressed earth block machine would be at. The space at the moment is just covered by the roof, and doesn't have any walls surrounding it; but if in the future they wanted to enclose it, it could be done easily. The workshop also has a separate gate facing the street. This allows for building materials to come in and out without disrupting any events that could be taking place at the plaza.

*Caretaker's Residence*:

The house has been separated into 3 sections; the living space (kitchen/dinning/living areas), the bedrooms, and the bathroom. This move maximizes the amount of air flow into the spaces. In hot/humid climates, having a large building often leads to certain sections not getting air circulation and therefore being uncomfortable. In this version, the three spaces surround a garden, which would help bring in cooler breezes. The more public part of the house is closer to the plaza, while the bedrooms are in more secluded. The design is very simple, with mostly open interior spaces. There are only two interior walls; one between the bedrooms and the other separating the toilet from the rest of the bathroom. The bathroom has space for a small tub or shower, which could be added if the caretaker desired it.

Another addition to the original program is a large storage area that is attached to the main living space. This space stores any tools, machines, and other things that would be needed to keep the center running. The storage area is rather large, so there should be plenty of room for any of the needs of the center.

*Worship Space*:

The Worship Center is the heart of the project. Not only is it the anchor for the plaza, but its difference in height and material from the rest of the buildings makes it prominent. Its thick rammed earth walls give a feeling of permanence and strength; while its green roof should cause a lot of interest to the members of the community. Another benefit of the thick earth walls is that it ensures that the worship area will be very quiet. This is a space that should be open at all times, in which people can come in and pray or meditate any time the center is open. Therefore, having a peaceful ambiance even when the rest of the center is loud is crucial. The design is formed by two circles, a smaller one holding the worship hall, and a large incomplete one holding an administrative/counseling office, a storage area, and a hallway that acts as a threshold between the outside and the worship space. The concept is that the hallway becomes a decompressing area from the hectic exterior, allowing people to take a moment before entering the sacred space.

The walls of the worship hall are to be covered with white plaster, and with murals depicting bible stories drawn upon them. Ideally, the murals should be painted by a local artist in order to create a deeper connection with the community.

The roof of the center also creates a covered porch on its north side. The porch faces the plaza, so it could be used during ceremonies. I also envision it as a gathering space for the community before and after church events. Benches would be placed along the walls and it could be an area for people to talk and reflect about what they just learned.

*Classrooms and Library*:

The classrooms were separated from the worship space. This was done since as the center grows, more and more classes would begin to take place. This could end up being disruptive for the calmer worship space. Instead, the classrooms face the faith garden. The design has two classrooms separated by an outdoors teaching area. The outdoor area could be used to educate about farming and other outdoor activities, or simply used for any class when the weather is nice.

The classrooms are simple boxes with many window openings to allow for a lot of natural light to enter. This permits the classrooms to be great learning spaces even if electricity is not available. The openings also allow for plenty of ventilation; so even a room full of students should still be comfortable.

Just south of the faith garden, in between the worship space and the classrooms, a new program was added. Reading through the information you provided, I kept thinking that a small library would be a great addition. This room could hold the books you mentioned, as well as religious text, general educational material, and any other readings the center would like to provide. Like the worship center, this room is a place that is always open to the community. Anyone can come and read. The room also has a large table, which could be used for meetings for the administrators and caretakers of the center, or even for community meetings.

*Kitchen/Dining Hall*:

The kitchen and dining area have been combined in this design. The reason for this is that both programs are dependent on each other, combining them allows for them to be easily accessible and more efficient. The space is simple, a very large room with a kitchen and a large open space with tables. The room has many window openings, allowing for great use of natural light and ventilation. The dining area can also be used as a hangout area for the people living in the dorms. Games could be played at the tables, and if electricity became available, a tv could be added to this space. The roof of the hall slopes south, which is ideal for the installation of solar panels.

*Dorms*:

The dorms are separated into three buildings facing an interior courtyard. The courtyard is a rain-garden, capturing and storing the water coming down from the dorm's roofs. The south and west buildings are the women's rooms, while the east building hosts the men's rooms. The rooms are simple; they have enough space for two beds, storage, and a desk.

*Bathrooms*:

The bathrooms are held in a simple building next to the dorms. A bamboo screen creates greater privacy and a sense of separation. The design breaks up the building into three spaces; four toilet rooms, two large sinks, and three enclosed shower rooms. The concept behind this is to allow for the space to easily host many uses without having people crowding in a small area. The ample sink area is composed of a covered breezeway; here people can easily come and wash their hands or teeth without having to interact with other bathroom uses. Both the shower rooms and toilet rooms allow for greater privacy. Floor drains in each of these rooms allow for easy cleaning.

*Laundry/Well*:

The well area incorporates two additional programs. The first is a water tower. The reason for this is to provide water pressure In order to run sink and other plumbing fixtures throughout the site. Yet, it also acts as a large water reservoir during the dry months. It can be filled during the wet season, and slowly used to meet the centers needs if water becomes scarce. Having water separate from the well also facilitates measures to make it potable, such as adding chlorine and fluoride to the tank.

The second additional program is a laundry area. This is a very simple concrete slab over a stone base. The water to do laundry comes directly from the well, while the water drains into the courtyard garden for the caretaker's residence.

Fences:

You mentioned you want a 6 foot tall fence throughout the entire perimeter. I suggest that it should be built out of local stone, if there is a great quantity of stone available. Otherwise, it can also be built out of the compressed earth bricks already being used in the construction of the center. However, a concrete foundation should be built to make sure the wall is structurally sound.

Fences like these can be rather expensive though, since they can use up a lot of materials. I strongly suggest the front portion of the project has a solid wall, as well as the areas around the buildings; but using a living fence can be a good way to secure the property at a lesser cost. In many developing countries, people plant cacti or other harsh plants next to barbed wire fences to keep their properties safe. The combination of barbed wire and tall fence post cacti is impenetrable without suffering some serious injuries.

Bamboo can also be used to create a very dense and tall fence. You would still have a barbed wire fence within the bamboo to keep people from trying to get in, but the thickness and density is enough to keep people out.


(cacti fence in Antigua by Ann Phelan, bamboo fence at Katzura Palace in Japan. )