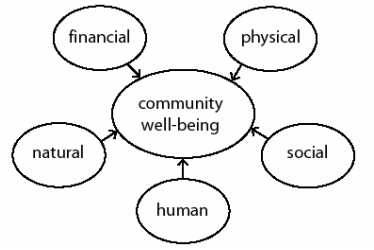
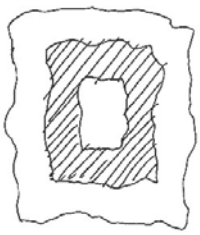
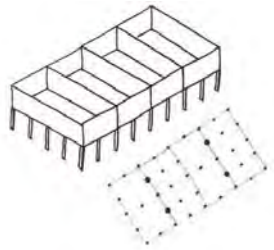
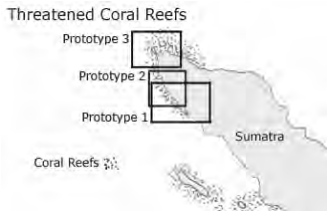
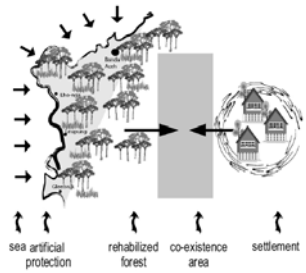
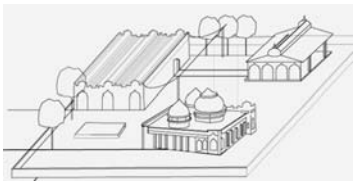






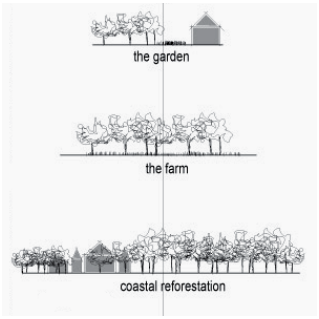






>>DESIGN RESCUE>

Adaptive Prototypes for Sustainable Post-Tsunami Recovery in Aceh



Department of Landscape Architecture, University of Washington, 2005

In Winter 2005, Landscape Architecture students at University of Washington developed a set of pamphlets to envision a long-term, community-based recovery and rebuilding process focusing on conditions in Aceh, the epicenter of a series of earthquakes that triggered the devastating tsunami in South Asia in December 2004. Individually tailored to address a set of local issues and conditions, the pamphlets include prototypical designs that are to be adapted to specific characteristics on the ground and to enable impacted communities to take actions. Together, each design also supports each other to address diverse needs in the communities and the interrelated nature of the recovery and rebuilding efforts. We welcome local communities and aid organizations to build on and improvise these designs. We also welcome your feedback to improve upon the designs.

For more information and to download the pamphlets, please visit http://courses.washington.edu/larescue/.

Studio Instructor: Jeff Hou, Ph.D. | Students: Sandra Buitron-Delgado, Allisa Carlson, Sarah Durkee, Devin Golob, Erin Jacobs, Xin Jin, Grace Li, Jennifer Low, Krystal Lowber, Erika Matthias, Vince Nguyen, Darby Ringer, Travis Scrivner, Brenda Snyder, Ryan Storkman, Tera Tarbet, Kara Weaver.

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Enabling Framework

This framework helps enable its user to restore the health of his or her community. A community first uses a set of considerations to assess their existing and future needs and resources. They can then decide on programs and technologies that best satisfy projected needs and overlap to maximize benefit from available resources. The approach allows a community to implement programs with an understanding of how they will adapt and interact over time.

community-based framework +
assessing needs and resources +
generating solutions +
implementing over time +

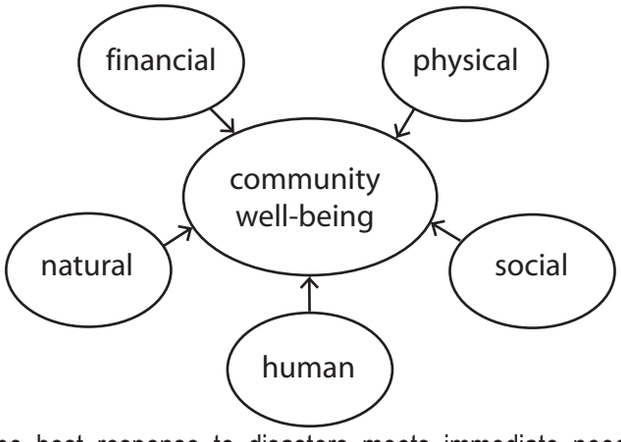
Sustainable development and rebuilding efforts are most successful when they are deeply rooted in the community. A top-down rebuilding approach fails to recognize the resources that people have at their disposal, including their traditional practices and skills. Projects that include true participation from community members are most likely to be culturally appropriate, effective in the long term and take full advantage of local knowledge and resources.

Guiding Principles:
- Recognize the community as the expert
- Overlap uses and functions over time/space
- Recycle system inputs as many times as possible
- Maintain a long-term vision

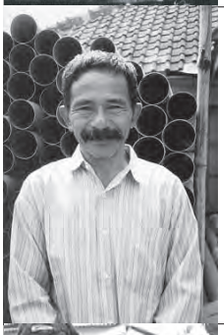
Framework for Communtiy Rebuilding by Identifying and Connecting Needs and Resources

Improving community well-being is the central goal of the rebuilding process. Disaster relief can provide for immediate needs, but long-term well-being depends on a more holistic approach that looks at many different aspects of people's lives.

The 'livelihoods' model (used by many international community development agencies) helps make it easier to understand the multiple factors that influence people's ability to support themselves and their families. This model describes five categories of resources - *natural, physical, social, human and financial* - that combine to form a livelihood. Strong, healthy livelihoods draw from each of the five categories and make it easier for people to recover from traumas like natural disasters.



The best response to disasters meets immediate needs without compromising long-term well-being. Creative, innovative solutions are generated by recognizing connections between seemingly separate needs like food, water and shelter. The goal of this framework is to make it easier for people to see the connections between different parts of their lives so they can best take advantage of their resources and plan for the future.

	resource	*description*
	natural	the natural resources that are available in a given context: land, forests, marine/wild resources, water, protection from storms and erosion
	physical	the basic infrastructure and tools needed to support livelihoods: affordable transport, secure shelter, adequate water supplies and sanitation, access to information
	social	the social and cultural resources that foster mutual support in communities: networks and connections, memberships of groups, relationships of trust
	human	an individual's capacity to work: knowledge, skills, physical ability to labor, good health
	financial	monetary inputs and means: small scale loans, monetary relief aid

financial human social physical natural

Enabling Framework

How to Apply the Framework

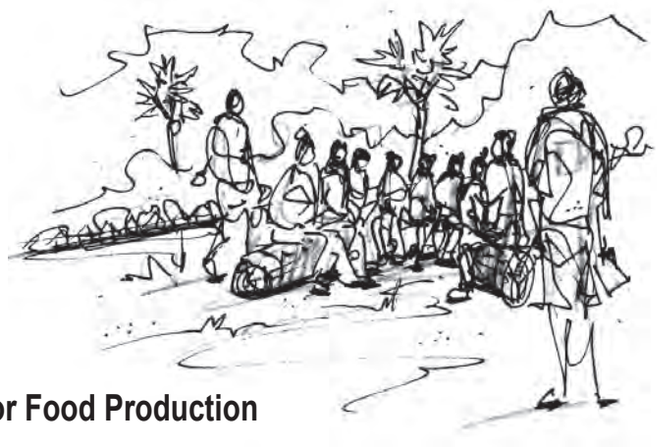
Assess → Select → Implement → Reassess

The following exmple shows how a community might go through the four steps of this framework . The example is simplified to illustrate the process, but ideally the approach should simultaneously address all the needs and resources of the community.

Assess → Select → Implement → Reassess

The first step in community rebuilding is to assess a community's needs and resources, both immediate and long-term. Communities can ask themselves simple questions to help clarify what they already have and what they need. Some example questions include:

Q: What do we need most right now?
Q: What tools and resources are immediately available?
Q: How can we apply our skills to meet current needs?



Example: Assessing a Community's Capacity for Food Production

Q:What are the community's most immediate needs?

A: We need better shelter to protect us from the rain. We have tents from the aid agency but they won't hold up long under monsoon conditions. We need a steady supply of food and pots and fuel to cook it. We've been getting food aid delivered, but we're worried about what we'll eat when the deliveries stop.

needs → - shelter - food - fuel - cooking utensils

existing resources → - aid supplies - fuel from debris

Q: How did you support yourselves before? Where did your food come from?

A: We grew some food in the gardens near our homes and in a community garden, but these have been damaged by debris and saltwater. The camp where we have been moved is far from our homes, so we can't get to the gardens to salvage what might be left or plant new crops for the next season.

needs → - transportation

existing resources → - existing gardens - salvaged food - knowledge

Q: What about the gardens? What would you need to start replanting?

A: We need land first. Our situation right now is so temporary that we don't know if we'll even be here to harvest what we plant. To plant a new garden we would need to find a place with decent soil that hasn't been damaged by the tsunami. We would also need seeds or plants to start a new garden and tools to work the land.

needs → - land for gardens - soil rehabilitation - seeds - plants - tools

existing resources → - seeds - plants

financial human social physical natural

Enabling Framework

Assess → **Select** → Implement → Reassess

Once the community has identified needs and resources, it can prioritize them and select programs and technologies that fit its situation. The projects generated by this studio and the toolkit on our website offer adaptable solutions that may inspire new ideas that will work for the community. The goal of this approach is to generate innovative, context-appropriate solutions. The following shows the selection of existing technologies that could be applied and adapted to a particular situation.

Toolkit: Selecting Technologies for Community Food Production

natural agroforestry, soil desalinization, community gardens, coral reef rejuvenation, home gardens, composting, natural disaster buffers, seed banks, plant nurseries

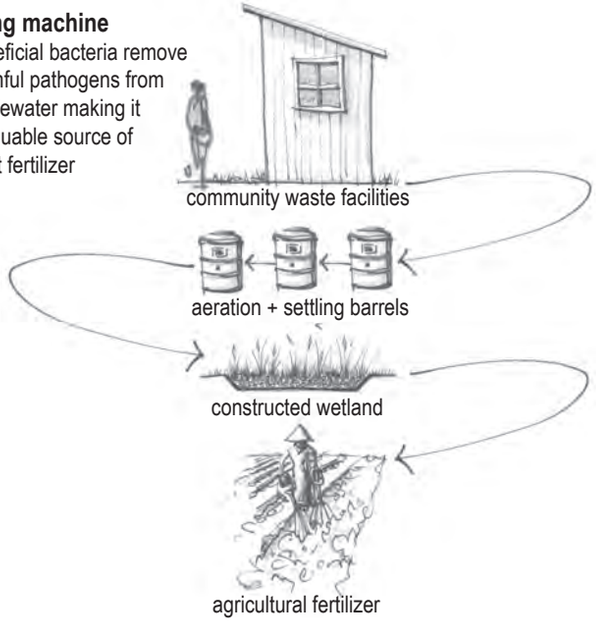
social community centers, community gardens, religion, rituals and festivals, community meeting spaces, traditions, family planning

human training programs, schools, crafts and trades, expertise, physical and mental health, access to information, libraries

physical training facilities, water treatment, water collection, waste management, transportation, tools, materials, energy, shelter, shared facilities

financial savings, lending programs, tourism, outside aid, export of goods and services, co-ops

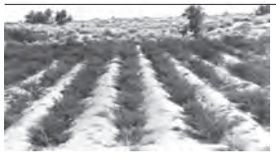
living machine
Beneficial bacteria remove harmful pathogens from wastewater making it a valuable source of plant fertilizer



Example Technologies

temporary gardens
Temporary gardens can be planted to supplement or replace the food aid that is delivered to displaced or temporarily housed communities. These gardens could help to establish a sense of ownership and permanence, as well as supply food.

seed collection
Seeds from local sources can be scavenged and collected to preserve the native plant genome, producing plants that are adapted to the existing environmental conditions.



soil rehabilitation
Different methods of soil desalinization could be employed at an early stage to prepare the land for future gardening and agriculture.

seed banks
To continue the stock of indiginous plant sources seed banks can be established from the yeilds of harvests and/or collected from local sources . These seeds can assist the economic self-sufficiency of the village and can be traded with neighboring communities.

composting
Organic debris left by the tsunami can be composted to feed the temporary gardens. Later, the waste from these gardens could be composted and used in the community garden, helping to further remediate the soil.

sustainable garden center
Training programs could be impelemented to encourage sustainable gardening practices. Tools, seeds and equipment could be loaned to help individuals in a community establish their gardens.

water collection
Collecting water from rooftops and other impervious surfaces could help to preserve this limited resource. Water that is used for washing or cooking could also be reused to water food gardens.

Enabling Framework

Assess → Select → **Implement** → Reassess

Selected programs and technologies are implemented and adapted over the long term.

Assess → Select → Implement → **Reassess**

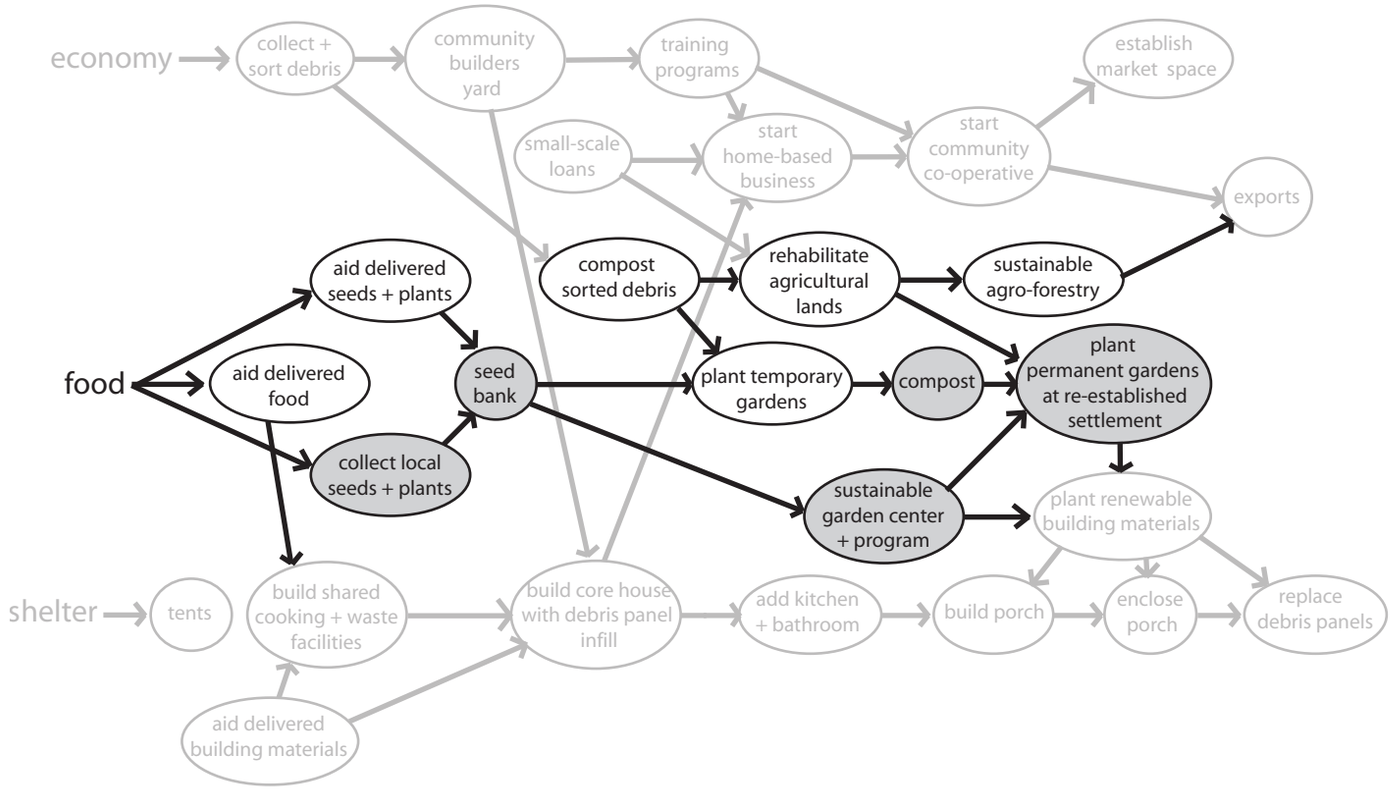
After the first set of solutions has been put into action these steps are repeated to evaluate their level of success and inform new ideas that continue to improve the community's well-being.

Example: Implementing Community Food Production Over Time

The line of pictures below shows how some of the food-related technologies, selected from the toolkit in step two, relate to each other over time. The more complex flow chart gives an idea of how they relate to different needs such as shelter and economic self-sufficiency. This gives an indication of how a community might best use resources to meet many of its needs over the long term.

seed collection → seed bank → compost → training center → garden

Example: Exploring Complex Connections Over Time



SeKarang! Save the Coral Reef!

Coral reefs in Indonesia are being destroyed by various human activities. In this pamphlet three reasons for degradation will be examined. Following each reason, a design prototype will look at different ways Indonesians can combat these destructive activities to protect their environment and live more sustainably.

Cora Reefs +
Destructive Fishing +
Sedimentation and Pollution +
Overfishing +

financial

human

social

physical

natural

Coral Facts: Why are Coral Reefs Valuable?

+Serve as shelter for tens of thousands of non-fish species.
+Protect an estimated 15% of all beaches and coastlines from storms and erosion by reducing the action of ocean waves.
+Contain many new or still unexplored materials that may represent medical breakthroughs and are currently a source for many pharmaceutical compounds.
+Are made of polyps that remove carbon dioxide from the atmosphere as part of the carbon cycle.
+Serve as tourist attractions and building materials in many parts of the world.

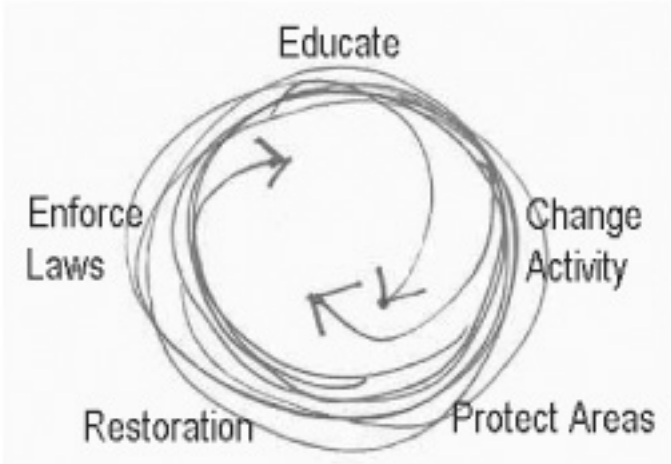


Diagram showing the action and process needed to make a change.

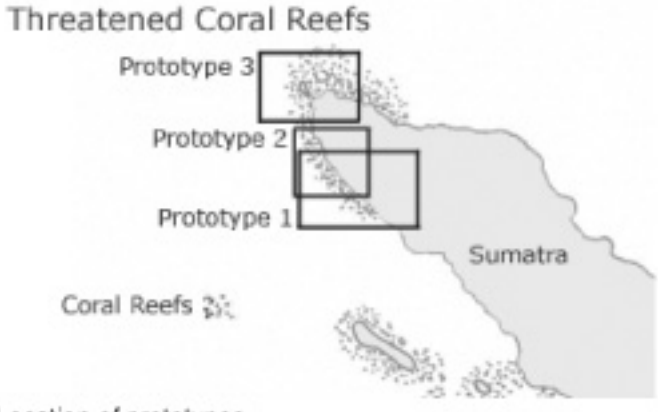
Blast fishing, in particular, is having an extremely detrimental effect across the country. Although illegal since 1985, few places have escaped it, even in protected areas.

Coral Reefs in Indonesia:

Indonesia has a vast array of coral reefs, many completely unknown. Several human activities are destroying these coral reefs. Stresses can be chronic, such as routine discharge of sewage, frequent sedimentation, and long-term overfishing at unsustainable levels. They can also be acute, as in the case of blast fishing or a month of unusually warm water temperatures.

Prototype:

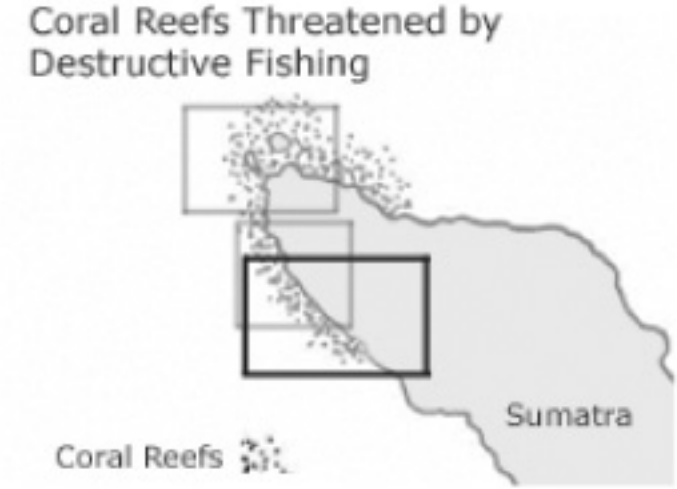
Three different problems that cause damage to coral reefs are presented. Each problem has a designed prototype to resolve the problem. Using "At Risk Maps" of coral reefs in Indonesia, I located a site where each problem likely occurs. The following prototypes in the pamphlet are: Pollution and Sedimentation, Destructive Fishing, and Over Fishing.



Location of prototypes.

SeKarang! Save the Coral Reef!

Prototype 1:



Ways to effectively protect coral reefs from destructive fishing:

1. Educate the locals and fisherman about the importance of healthy reefs.
2. Establish Marine Protected Areas (MPAs).
3. Promotion of more sustainable fishing practices.
4. Involving the community and park rangers can create a necessary sense of responsibility for managing and protecting their coral reef resources.
5. Promotion of other incomes such as raising seaweed and/or ecotourism such as dolphin or scuba tours.
6. Establish and enforce laws regarding blast fishing, cyanide fishing, fishing permits, ect.
7. Employ villagers to be reef watchers.
8. Install artificial reefs where blast fishing has destroyed reef beyond repair.

Reefs Threatened by Destructive Fishing:

Poverty is a big issue in coastal areas. This is mainly because their work is highly dependent on the seasons, unlike that of inland people who can work throughout the year. In addition to economic purposes, the destructive practices are also due to lack of knowledge and information. However, some people understand their activities have negative impacts on the surrounding environment, but they ignore the damage they cause and continue to use unsound practices.

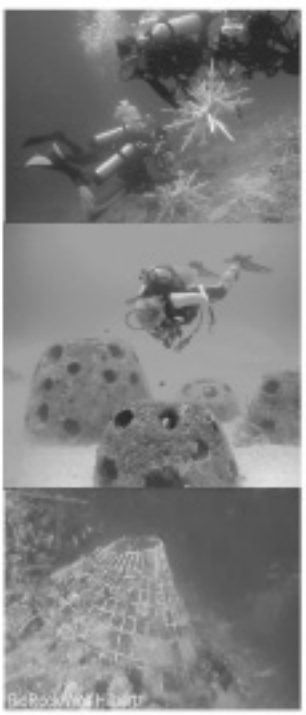
What Can Locals Do?

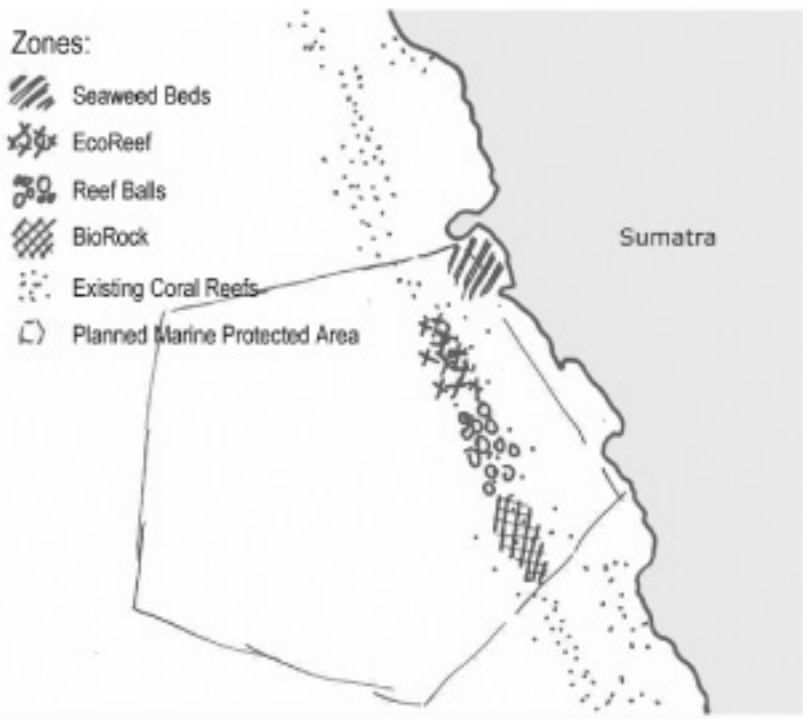
+ Help make, install, and monitor artificial reefs systems.
+ Find other incomes than destructive fishing such as raising seaweed and/or ecotourism such as dolphin or scuba tours.
+ Turn in destructive fishing offenders.

EcoReef: Ceramic "snowflakes," designed to mimic a branching coral thicket. In time, biological reef will replace the ceramic structure, leaving minimal lasting evidence of human intervention.

Reef Balls: Are made of a special, marine friendly concrete and are designed to mimic natural reef systems. Reef Balls are made in many sizes to best match the natural reef type which is being mimicked.

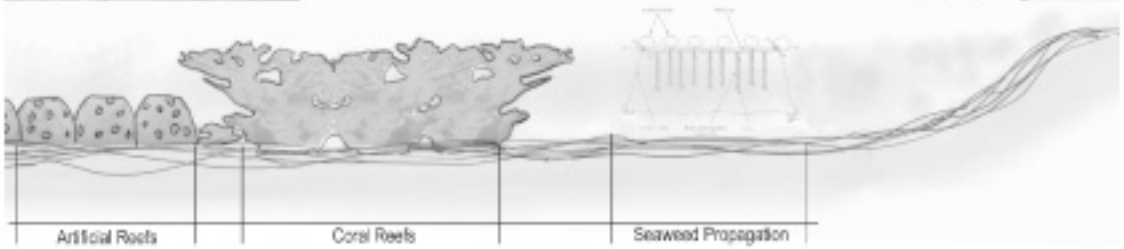
BioRock: Uses electricity to grow limestone rock on artificial reef frames and increase growth rates of corals and other reef organisms.





For more info:
EcoReef: www.ecoreefs.com
Reef Ball: www.reefball.org
BioRock: www.globalcoral.org

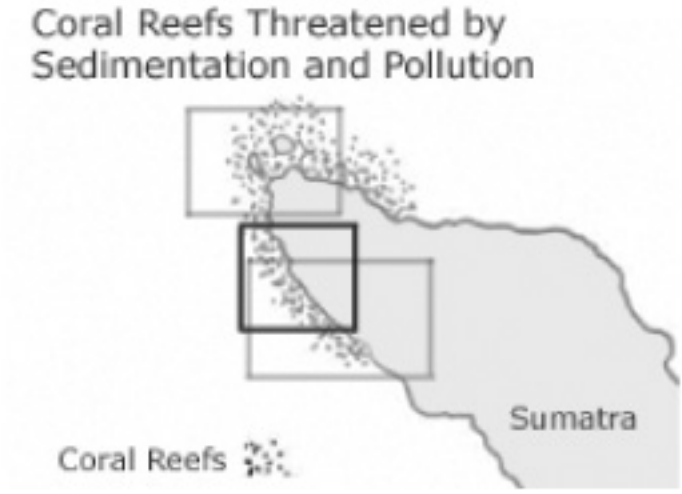
Typical Section



financial
human
social
physical
natural

SeKarang! Save the Coral Reef!

Prototype 2:



Reefs Threatened by Sedimentation and Pollution:

Sedimentation and pollution from land-based sources is causing widespread degradation of coral reefs. Increased nutrients in coastal waters from agricultural fertilizers, forest burning and sewage discharge increase algal growth and decrease water clarity. This impedes coral growth and, in some cases, causes algae to overgrow corals previously present. In addition, increased sedimentation from changes in land-use and from coastal development activities can adversely impact coral reefs through smothering of coral, screening out sunlight needed for photosynthesis, scouring of the coral by sand and other transported sediment, and decreasing the survival of juvenile coral due to lack of suitable substrata for colonization.

Ways to effectively protect coral reefs from sedimentation and pollution:

1. Proper disposal of sewage and storm water. Construction and maintenance of waste water treatment plants to ensure that they are not overloaded, malfunctioning, or have outfalls that are incorrectly positioned.
2. Establish Marine Protected Areas (MPAs).
3. Promotion of more sustainable land use practices, land development and agricultural practices.
4. Educate public.
5. Establish laws or regulations regarding development permits, fishing permits, factory emissions, ect.
6. Establish buffer vegetation on land such as mangrove forest and seagrass beds.

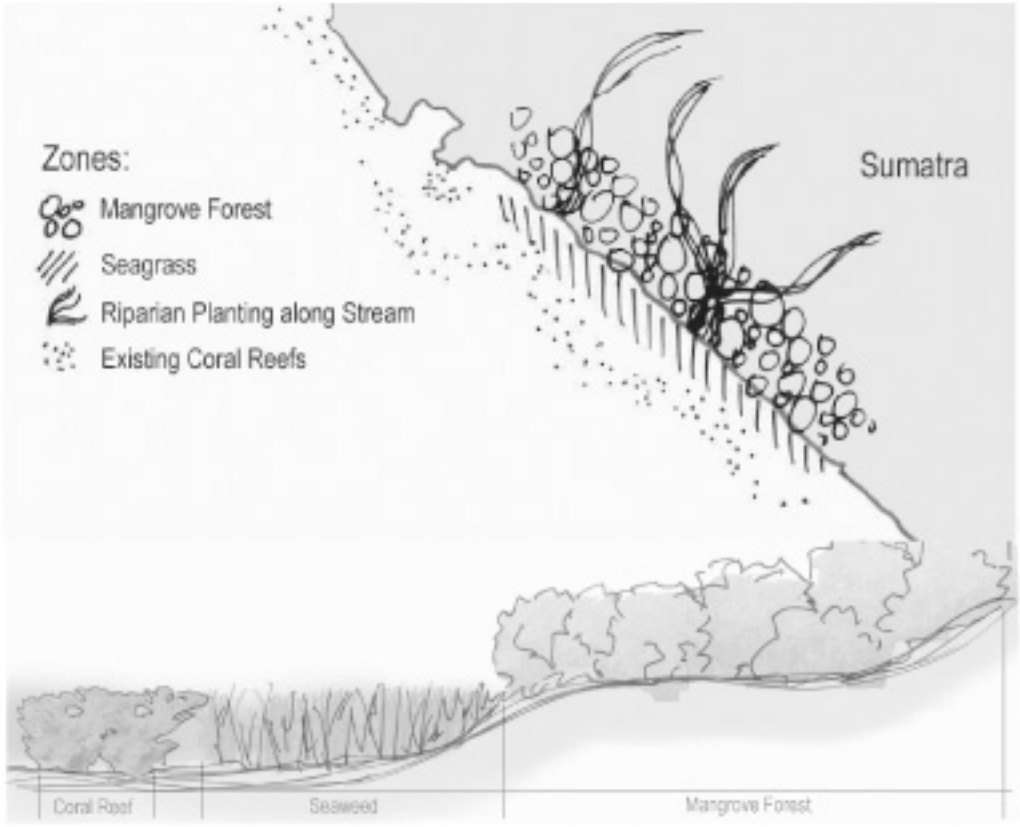
What Can Locals Do?

+ Don't destroy existing native vegetation that decreases sedimentation and pollution.
+ Plant native vegetation, look around area to see what species grow successfully there.
+ Don't dump waste into or near ocean.

Seagrass

Mangrove Forest

Riparian Planting

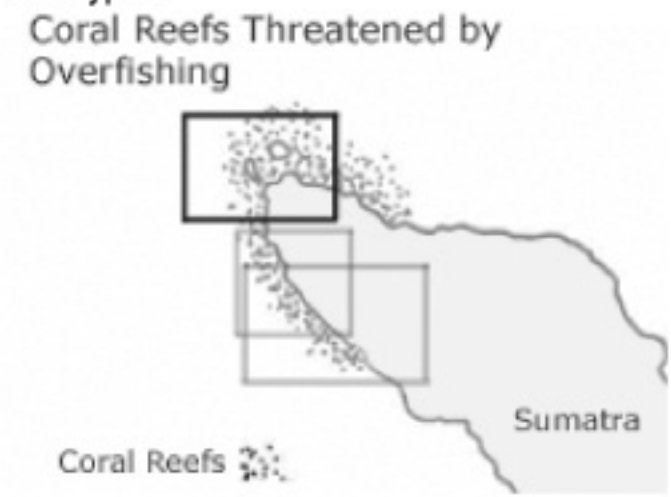


Typical Section

financial
human
social
physical
natural

SeKarang! Save the Coral Reef!

Prototype 3:



Reefs Threatened by Overfishing:

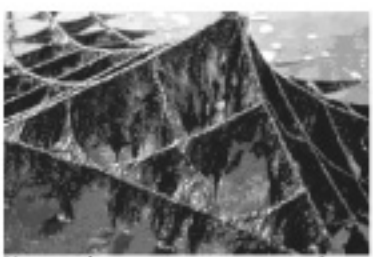
The demand in wealthy Southeast Asian countries and other nations around the world for marine aquarium fish, live reef food fish, pelagics, and bottomfish has further fueled region wide exploitation of certain species. Overfishing is a complex problem with varied impacts on coastal communities, the economy, and coastal ecosystems. If effectively managed, fisheries can provide a renewable source of food and livelihoods, but in Southeast Asia, many fish species are currently overexploited.

Ways to effectively protect coral reefs from over fishing:

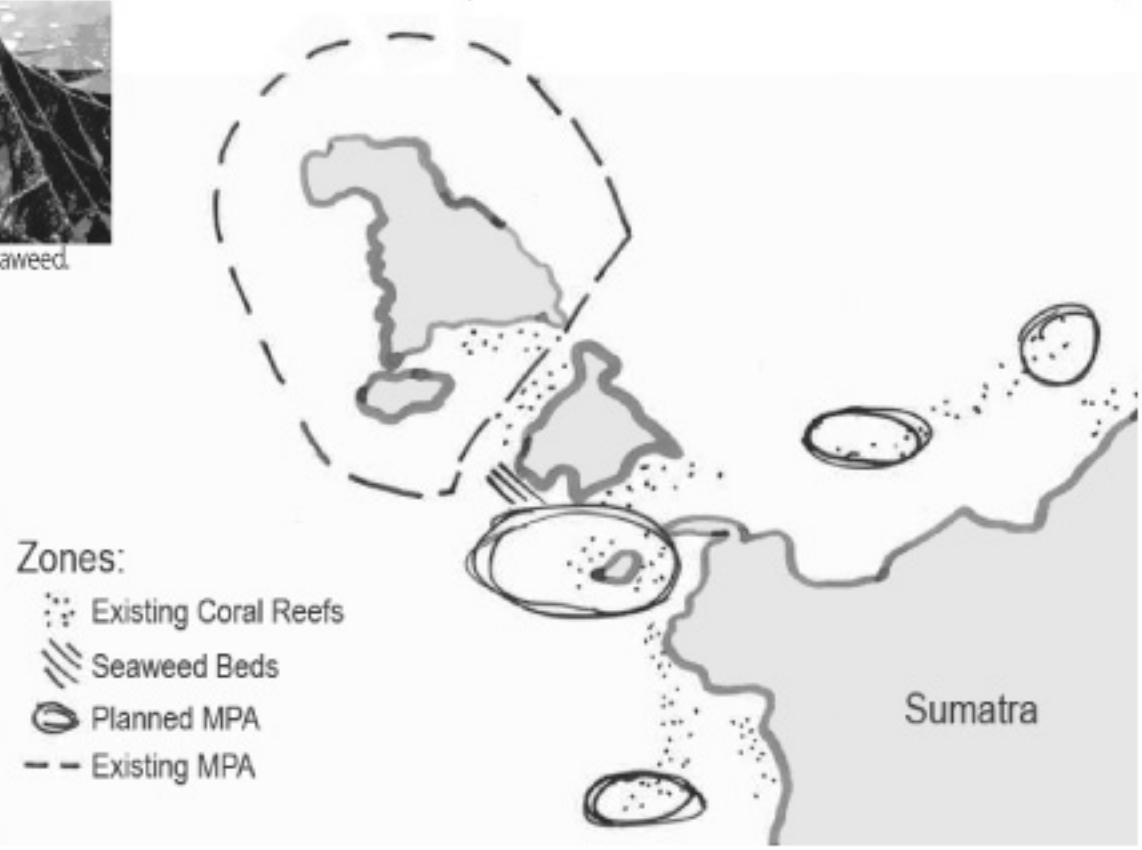
1. Educate villagers and fisherman about the importance of sustainable fishing.
2. Establish Marine Protected Areas (MPAs) that are scattered through out the coast. Preferably the MPAs should be located on important breeding grounds or the MPA should have some important ecological significance.
3. Promotion of more sustainable fishing practices such as nondestructive gear and nets that have large holes to release smaller fish.
4. Spread fishing among several species of carnivorous fish.
5. Promotion of other incomes such as raising seaweed and ecotourism.
6. Establish and enforce laws regarding fishing.
7. Promote the development of alternative livelihoods such as raising seaweed.
8. Establish minimum and maximum length requirements to keep fish.
9. Establish laws where there is no fishing during certain breeding times.

What Can Locals Do?

+ Use less destructive fishing practices, such as nets with larger holes.
+ Don't fish near breeding areas.
+ Find other incomes than fishing such as raising seaweed and/or ecotourism such as dolphin or scuba tours.



Net used to propagate seaweed.

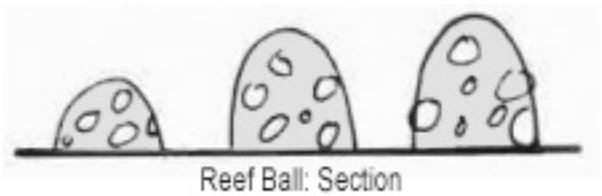


SeKarang! Save the Coral Reef!

Appendix:

Reef Ball:

A Reef Ball is a designed artificial reef used to restore ailing coral reefs and to create new fishing and scuba diving sites. Reef Balls are used for beach protection, freshwater mitigation, and many other uses too. Reef Balls are made of a special, marine friendly concrete and are designed to mimic natural reef systems, they are used around the world to create habitats for fish and other marine and freshwater species. Reef Balls are made in many sizes to best match the natural reef type which is being mimicked



Reef Ball: Section

EcoReef:

Ceramic "snowflakes," designed to mimic a branching coral thicket, immediately attracts large numbers of both schooling and sedentary fishes to the previously barren and lifeless rubble field.

In the short term, even large-scale deployments look natural, especially with live coral transplants on the modules. In the long term, the branching design (combined with the inherent fragility of ceramic) allows the modules to fragment and disperse as living corals colonize them.

EcoReef: Section

BioRock:

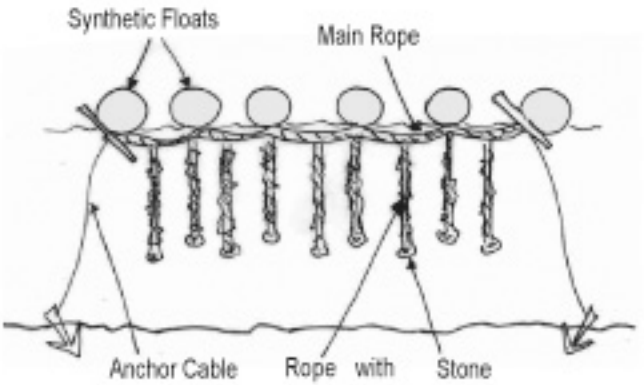
Biorock is a radical new approach to artificial reef construction by means of Mineral Accretion to literally grow reefs. Mineral Accretion is a chemical process pioneered and patented by Professor Wolf Hilbertz and Dr. Tom Goreau, two marine scientists.

This technology uses electricity to grow limestone rock on artificial reef frames and increase growth rates of corals and other reef organisms. Living corals are carefully collected and transplanted onto the structures by attaching with wires or wedged between steel bars. These corals are quickly cemented into place by the growing minerals forming all over the structure's surface.

BioRock: Sections of a variety of types

Seaweed Propagation:

Seaweed can be propagated at sustainable levels as an alternative income. Drawing to the right shows a simple structure that can be made to grow seaweed.



Section of Seaweed Propagation Device

Resources:

Cora reef info:
http://www.reefbase.org
http://www.reefbase.org/resources/res_overview.asp?changearea=true&Region=0&country=IDN
http://www.coral.org
EcoReef: www.ecoreefs.com
Reef Ball: http://www.reefball.org/pastproj.htm
BioRock: http://www.globalcoral.org photo taken by Wolf Hilbertz

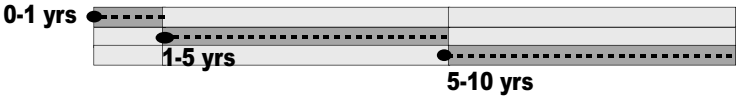
financial
human
social
physical
natural

reconcile with nature

Human impact severed the aftermath of tsunami; the best way to mitigation and rehabilitation is to reconcile with nature: wait or help the nature, to see how it recovers by itself. This workshop focus on reestablishing healthy shoreline habitats around Northern part of Banda Aceh to mitigate the damage in a manner of nature friendly to help the coastal people find a way to live their traditional marine life harmoniously with a sound shoreline ecosystem. . .

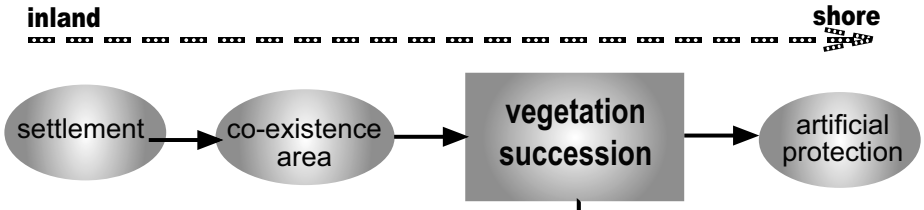
Time Horizon --- *what shoule we do in 10 years time?*

ooooo In order to make good use of the resources, different time periods are designted for special targeted purpose. People in different time period have different concerns and focus. The time span for each period is showing below ooooo



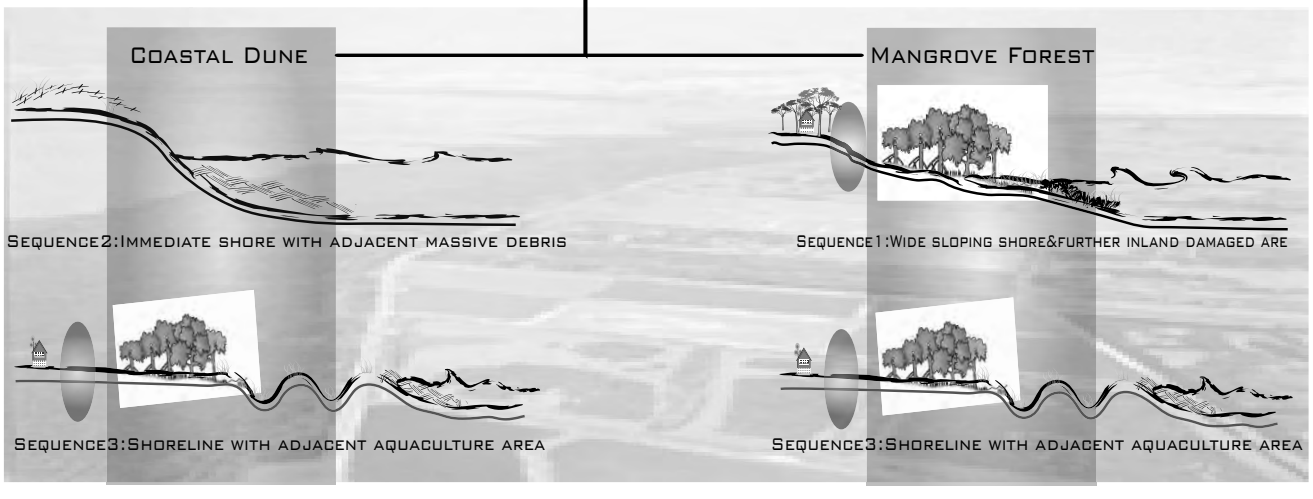
Spatial Sequence --- *what should be there from shore to inland ?*

ooooo Spatial sequence is an order for different elements in the reestablishment process. Three different sequences (showing below) are designed to accommodate different shoreline situation. Generally, all types of shoreline spatial sequence should base on four fundamental elements. Their order in the sequence is essential for the built up habitat. ooooo



Vegetation Succession --- *what should we plant on the shore?*

ooooo *Within the spatial sequence, vegetation succession need detailed design because it is essential to shoreline habitat. Two types of vegetation succession are suggested, which may fit into differnt types of spatial sequences.* ooooo



Vegetation succession
Spatial sequence
Time horizon
reinforcement
resilient
reconcile
nature
ocean

financial
human
social
physical
natural

reconcile with nature

Time Horizon

0-1 yrs

+Reinforce and reconstruct damaged shoreline using both artificial methods and natural friendly methods -

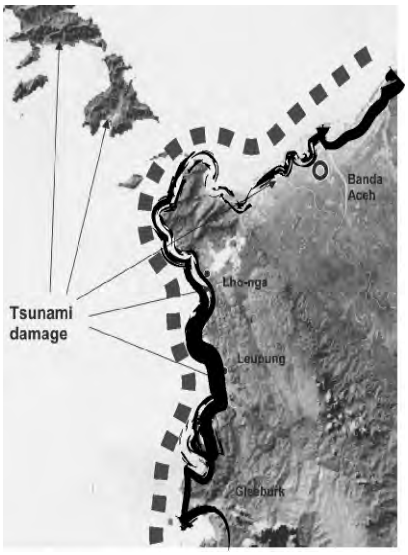
After tsunami, shoreline area was badly eroded with great lost of surface sand and soil. Worse still, the land was no longer capable to retain sand and soil against constantly tapping sea water. Before large scale reforestation being implemented, it is important to prevent shoreline area from further erosion and make it strong enough to accommodate vegetation in this time period.

+Clear up debris and prepare land for revegetation -

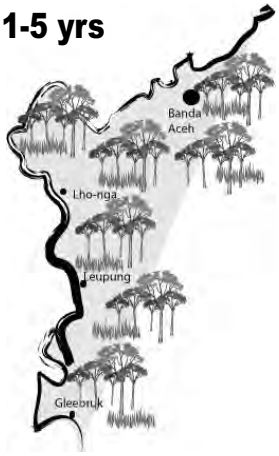
Massive debris generated by tsunami could be made use of to build up protection structures

+Integrate the rehabilitation sites with the new settlement for manpower efficiency -

Newly developed shoreline need to be taken care of. Local people settled in near shore area can participate in the shoreline rehabilitation process. It is also possible to form some memorial ritual such each family help to take care of one segment of the revetment site and have their death's name on the stone to be memorized.



1-5 yrs



+Large-scale reforestation in shoreline area according to different types of coastal ecosystem -

Coastal ecosystems provide shoreline stabilization and buffering services. Some concerns about the shoreline revegetation are the access to the sea. The scale of the shoreline forest and its relationship with the inland settlement should be well handled to ensure the efficiency of the natural system without forcing local people to change their way of marine life too much. Access can be made together with the estuaries of the rivers.

+Set up non-developed barren land for eco-recover -

Since people are wiling to move back to their original land near shore, some restrains should be made in the early years of eco-recover to ensure that there is no more disturbance on the ecosystem. non-developed areas serve as the transition and buffer from the human settlement to natural system.

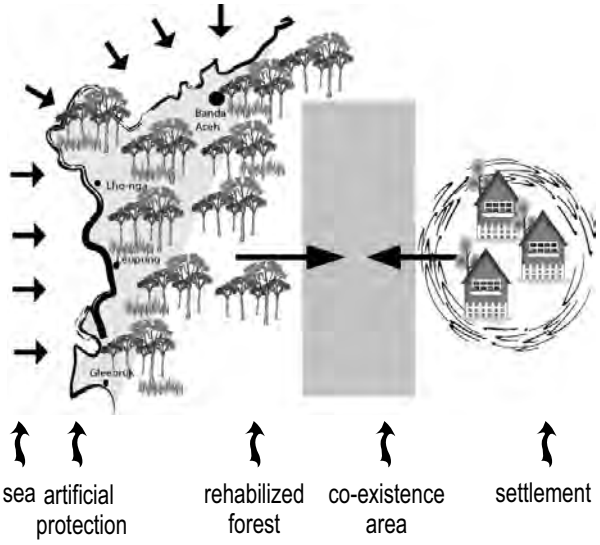
5-10 yrs

+Nurish and aggradize vegetation coverage

+Gradually resettle to non-developed areas-

The final stage of rehabilitation is to join the human settlement with the natual system. The non-developed areas in the second stage would be developed to co-existence areas for people and the nature.

NOTE: DIFFERENT FOCUS FOR DIFFERENT TIME PERIODS SHOULD BASE ON A COMPREHENSIVE SHORELINE REHILITATION PLANNING. RESETTLE TO SHORELINE AREA SHOULD TAKE A LONG TIME FOR THE ECOSYSTEM FROM RECOVER



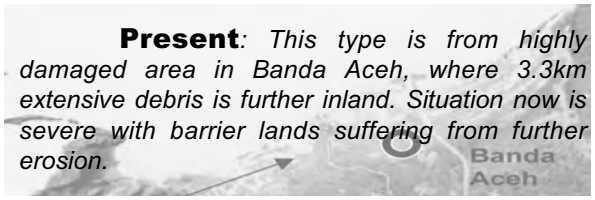
financial
human
social
physical
natural

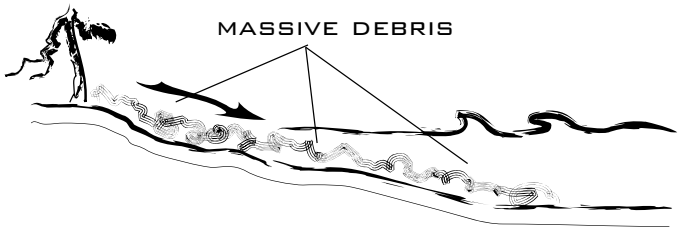
Spatial Sequence

There are three prototypes of the shoreline spatial sequence generated from three typical sites of Banda Aceh . The methods for spatial management are suggested below.

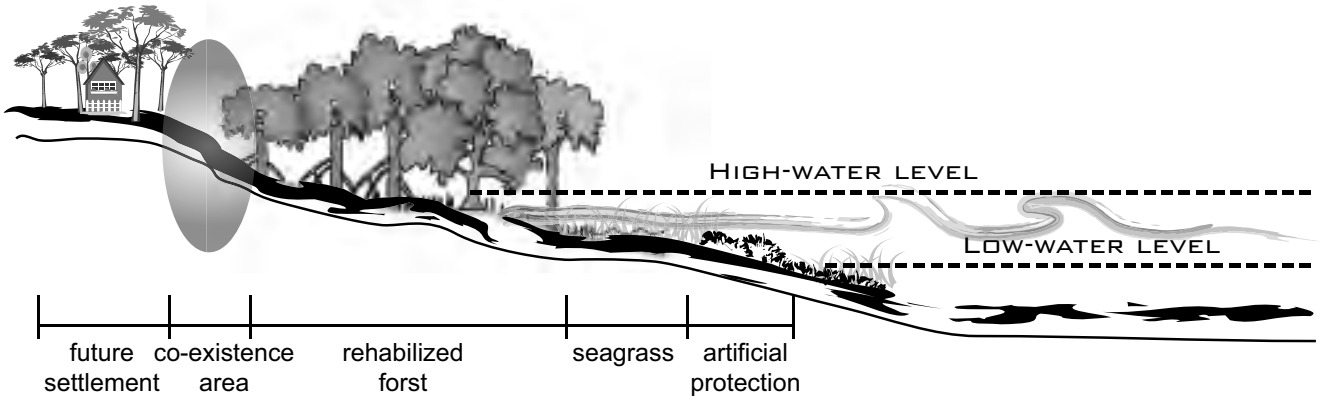
Sequence1:Wide sloping shore

Present: *This type is from highly damaged area in Banda Aceh, where 3.3km extensive debris is further inland. Situation now is severe with barrier lands suffering from further erosion.*





Designed Sequence

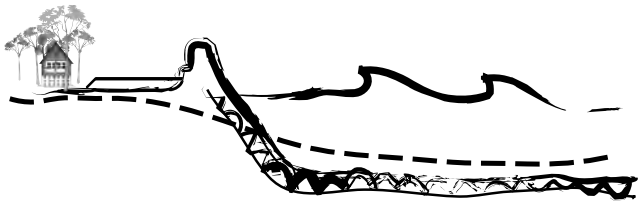


spatial sequence	future settlement	co-existence area	rehablized forest area	foreshore seagrass	artificial protection
suggested method	local people would eventually come back to their former land. The re-settlement sites can be integrated with the rehabilitation sites and the temporarily relocation sites.	certain non-developed strip between coastal area and new settlement sites could serve as a transitional area to help the ecosystem recover without further disturbance. Such strip would be develped into co-existence area in the later stage of rehabilitation	mangrove and some native tidal species such as nipal and other palm forest could be planted in the intertial areas to establish a sound natural eco-system on shore.	seagrass can be intentionally planted behind those artificial protections to further prevent the erosion	offshore seawall or barrier island could be constructed for high damaged areas; concrete groins for severely eroded areas; stone revetment is the best choice because of its low cost and easy management
Note	It is important to maintain the degree of the slope, for mild slope can mitigate the force of the wave and retain sand and surface soil. Resettlement to the shoreline areas should be restricted. However, people should take care of the newly rehabilized forest to ensure its success, especially during the first one to five year.				

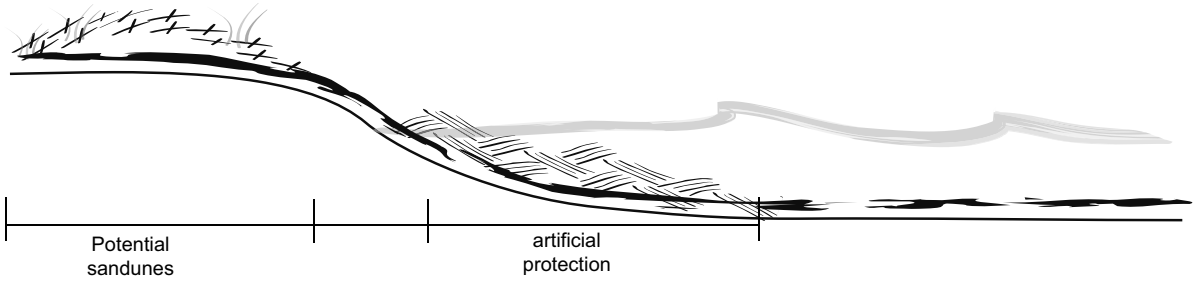
reconcile with nature

Sequence2:Immediate shore with adjacent massive debris

Before&Present: *This type is from the northern most part of Banda Aceh, where the shoreline and settlement were totally damaged. The damage is so sever that the shore configuration has been changed a lot with intensive inundation area and receding foreshore.*



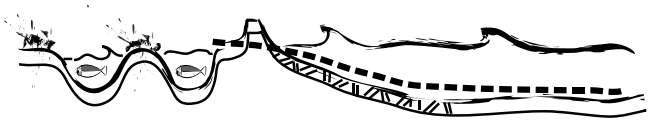
Designed Sequence



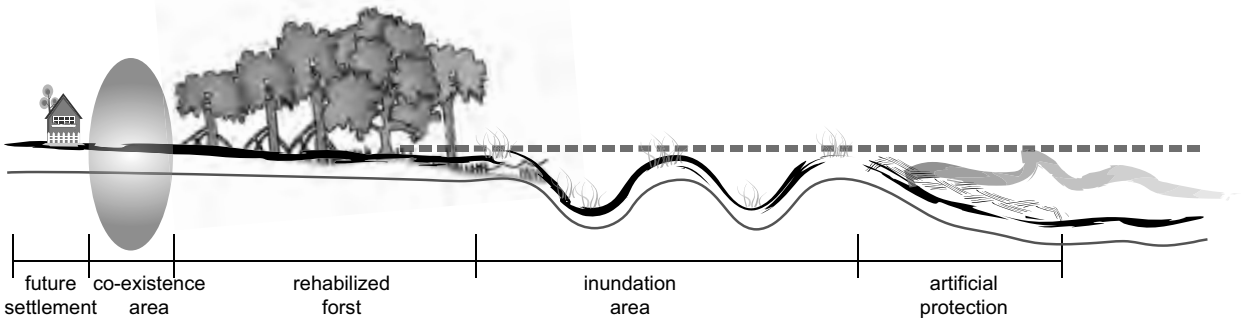
spatial sequence	potential sand dunes	artificial protection
suggested method	The area is no longer suitable for settlement. Changed shore may be suitable for sand deposit.	+offshore breakwater +concret groin +stone revetment
Note	The rehabilitation of these areas is critical, for they are the very front barrier island for the main land. They can serve as buffer area for future disasters.	

Sequence3:Shoreline with adjacent aquaculture area

Before&Present: *This type of shoreline habitat is widespread all over Banda Aceh. The former aquaculture ponds were inundated or destroyed, left the newly forming lagoon or contaminated lakes.*



Designed Sequence



spatial sequence	Inundation area	artificial protection
suggested method	The shape of the land is suitable for sustaining sand from sea waves. It could be left vacant as buffer areas or developed into near shore wetland.	+offshore breakwater +concret groin +stone revetment
Note	This area is originally highly populated area with thriving aquaculture and fishery. Local people from this area are especially willing to move back to the sea. Like type one, non-developed area should be zoned to ensure the land recover.	

financial

human

social

physical

natural

Vegetation Succession

The main ecosystem modulators are temperature, salinity, chemical suitability and physical sustainability. Coastal ecosystem in Sumatra can fall in to the category of mangrove forests, beach vegetation, brackishwater forests rocky shores and coral reefs. Based on the shoreline topography and local climate, two types of vegetation succession are listed below. Each type can fit into types of the context of the spatial sequence discussed above.

Coastal Dune

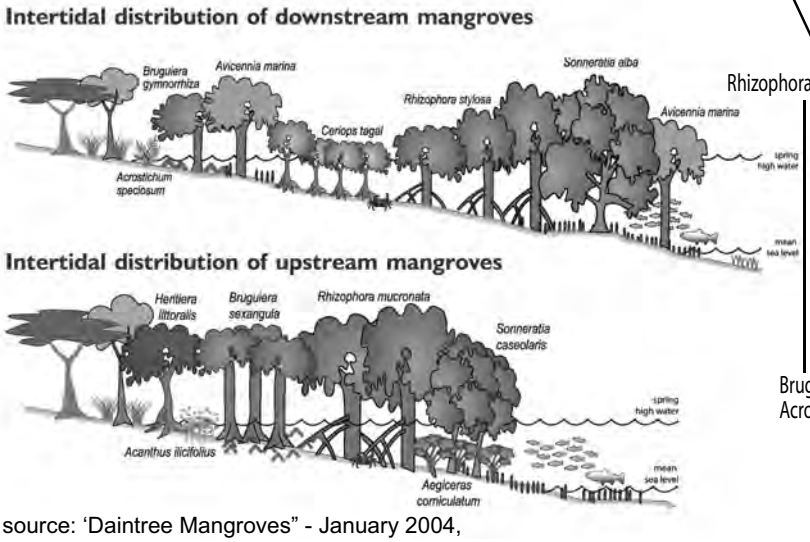
Vegetated dunes can occur on sandy seacoasts to support plant growth and sufficient wind action to move sand. Coastal dunes, particularly those of the barrier type, have a value well beyond that of habitat, serving as coastal protection and preservation in several ways. Continuous barrier dunes serve as flexible barriers to storm surges and waves and are of particular value in affording protection to low-lying backshore areas and in helping to preserve the integrity of low barrier islands. Dunes provide protection more effectively and at a lower cost than a

zone	pioneer	intermediate	forest
species	grass,sedge,forb	shrub	varies
function	“dune builders”	“stabilizers”	
substrate	sand	sand	sand/soil
wetness	periodically flooding	less flooded	almost dry
nutrient	low	med	relatively high
Note	Forests form on dunes only after a substantial period of soil development and only on sites with considerable protection from salt spray and flooding. Trees can be planted successfully to convert large mobile dunes and dune fields to forest after dune stabilization with pioneer and intermediate zone species. The most important thing is to build up sand deposit on shore and identify native beach grasses to dune plants.		

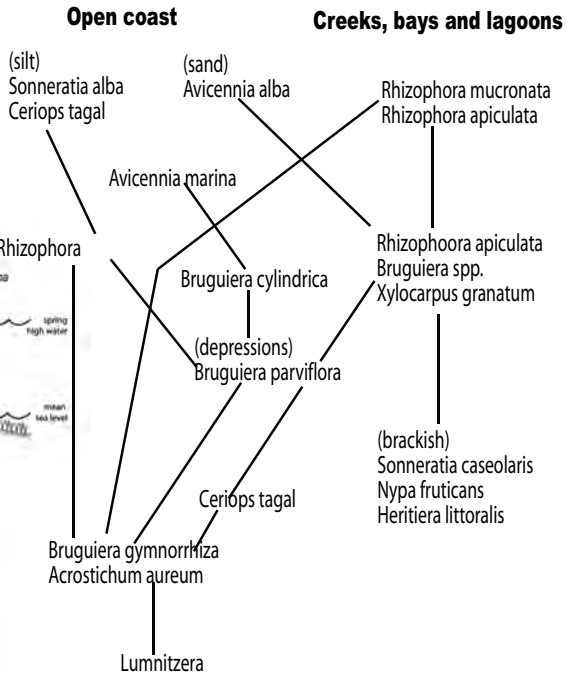
source: creation and restoration of coatal plant communities, Roy R. Lewis, III

Mangrove Forest

Mangrove forest is the most typical and efficient species on shore. It is reported that a large scale mature mangrove forest can reduce the wave force by 35%. It is reasonable to choose mangrove as the primary species for reforestation.



source: ‘Daintree Mangroves” - January 2004, the university of Queensland



source: ‘the Ecology of Summatra, Tony Whitten, etc.

financial
human
social
physical
natural

shoreline rehabilitation

Sustainable Aquaculture:

an integrated approach to coastal planning

The tsunami of December 26th greatly impacted the coastal communities of Sumatra. Government agencies are currently discussing plans to "repair" the shoreline in Aceh with large swaths of mangroves to act as a buffer against future tsunami events or storms. These mangroves will replace the many acres of shrimp farms that once dominated the coastal landscape. Actions such as this must be implemented with caution. Community involvement is integral to the success of such a proposal. This project explores an alternative framework integrating shrimp farms within the mangrove plantations to sustain the livelihood of families who depend upon this industry. A foundation of ideas for a sustainable shoreline are provided that could afford economic opportunity, habitat rehabilitation, and protection against natural disaster events.

economic diversity +

community benefit +

mangrove conservation +

financial

Traditional Aquaculture Methods

Empang parit is the traditional application of integrated aquaculture in the mangrove area. It usually consists of an unexcavated central platform that alternates between being flooded and exposed and a canal that runs along the pond dikes where fish, shrimp, and crabs are cultured. Tides are used to carry seed stock into the system and to exchange water. The forests are locally run and operated and self-managed by the community.

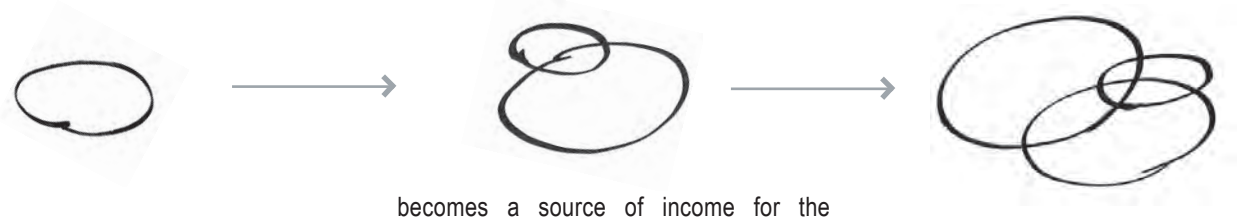
previous shoreline treatment: short-term large scale shrimp farms that caused the destruction of mangroves

current plans to create a protective shoreline buffer with mangrove plantations

sustainable aquaculture incorporates economic opportunity within the mangroves

human

Growth Process



promote small scale incremental change

encourage empang parit methods

becomes a source of income for the community

support system for small scale farmers

gradual adoption of sustainable techniques

large/medium scale farms launch tourism, education, and research programs

social

Action

+Inform and educate shrimp farmers, local government, and the community.

+Formation of community groups separated by special interests and skill sets (such as farmers, fishermen, craftspeople and outreach).

+Training on integrated coastal management for government staff, community members, and shrimp farmers.

+Partner with and train local NGOs.

+Establish a demonstration pond as a catalyst and create a learning facility.

Desired Impact

+Increased shrimp farmer and community knowledge and understanding of the importance of coastal resource conservation to their own well being.

+Increase participation, awareness, and community empowerment to influence resource use decisions, and ability for self management.

+Increase understanding of integrated coastal resource management processes and methods.

+Increase local capacity for coastal resource management and sustainable shrimp culture practice.

+Experiment with and promote small and incremental changes to traditional practices that are more sustainable. By offering a successful example it is the expectation that this will build trust among shrimp farmers and willingness to adopt new practices.

physical

Resource: Good Practices for Community-based Planning and Management of Shrimp Aquaculture in Sumatra, Indonesia
http://www.crc.uri.edu/download/Good_Practices_Aquaculture-Sumatra.pdf

natural

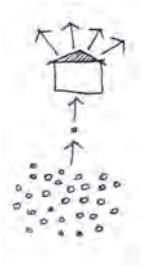
for more information please visit http://courses.washington.edu/larescue

Sustainable Aquaculture:

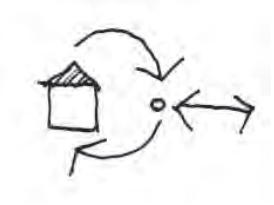
an integrated approach to coastal planning

Social Implications of Sustainable Aquaculture

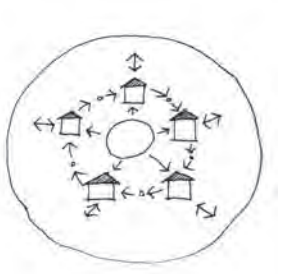
Previous approaches to aquaculture have not only dominated the landscape of the shoreline of Aceh, but have ignored the local community. The following diagrams illustrate current and possible structures within communities.



current social structure: products exported on a worldwide scale, no profits to community, work through a middleman.



the backyard structure: allows a family or individual to gain control of income return and marketing of products.



the community framework: provides local ownership and management. community profits from harvested goods.

financial

Backyard: Family

The Wai'anae Backyard Aquaculture Project in Hawaii supports families interested in small-scale production.

+ financial assistance is provided to families for initial capitol and 1st year operating fees.
+ family-run associations are created to establish a support network.
+ families are trained and provided technical assistance while coordinating a common marketing system.
+ once families complete training program and construct backyard system, they help other families do the same.

resource: Wai'nae Backyard Aquaculture Project. http://www.sustainable.org/casestudies/SIA_PDFs/SIA_hawaii.pdf

woman processing in backyard

human

Market: Family + Community

This idea stems from community forest practices. In Southwestern Thailand, a grassroots organization called Yad fon (Raindrop) Association follows this type of system.

+ local support and direct involvement of residents.
+ through learning techniques, small villages can ensure livelihoods gain or re-gain autonomy.
+ a group savings program provides loans for communities in need.
+ persuade a first step with initial communal projects such as digging a well to allow leaders and skills to come forward and set up a community driven program. community gains more control and incentive to protect resources. farmers can resell products at market.
+ word spreads to other communites as practices are adapted.
+ local knowledge can be applied as investment in natural systems is restored.

resource: Mangrove Action Project. http://www.earthisland.org/map/index.htm

selling fish at the cooperative market

social

physical

Education: Community

+ educate children through school programs.
+ educate local community through training programs initiated by grassroots organizations.
+ provide education as research destination.
+ provide education to tourists as tourist destination (opportunity for tourism volunteer activities: help restore mangroves and re-build ponds).
+ create outreach programs with local universities.
+ promote education at a global and local level.

school children replanting mangroves

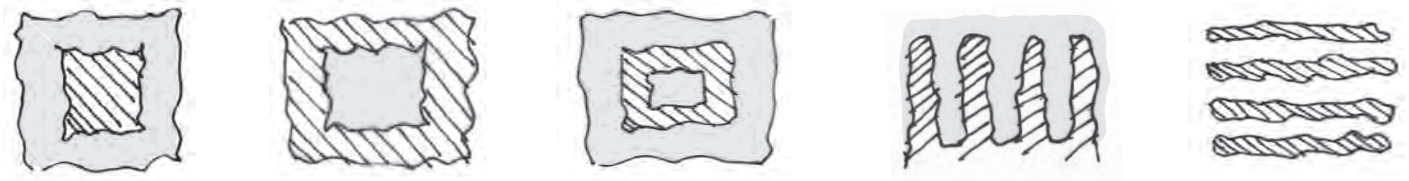
natural

Sustainable Aquaculture:

an integrated approach to coastal planning

Pond Layout

Tidal wetlands are formed by a system of ponds which retain mangroves on dikes as strips between ponds or in remnant patches inside ponds. The pond forms depend on the species for culture and on the size and shape of the area, which in turn determines the number and sizes of ponds and the position of water canals and gates. These forms can be combined to meet the needs of production and the site. The layout forms can be reconfigured and combined to create a small backyard or larger scaled community operation. These forms are not meant to be isolated but linked together resulting in a system that supports production diversity. Production diversity allows for options within the community, providing a variety of income opportunities, rooted within the community's knowledge and skills.

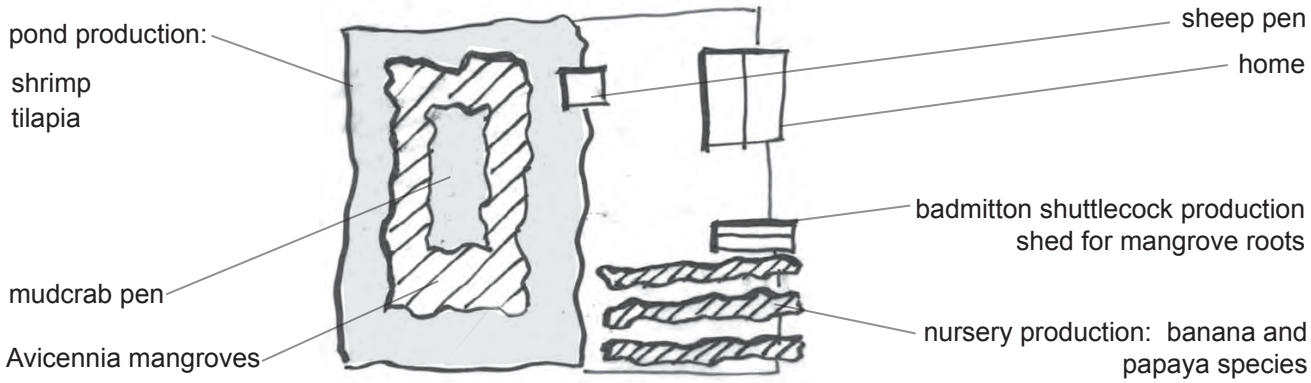


+mangroves as island | +mangroves as edge | +integrated mudcrab island | +vegetation on dikes in comb form | +nursery production

Backyard Prototypes

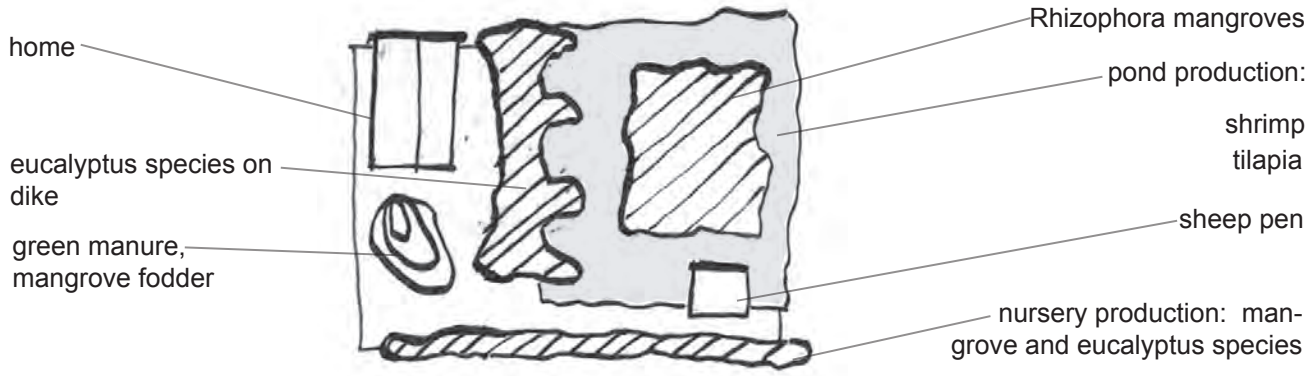
Backyard operations are run by an owner/operator or a family, and consist of both a home and working space. These farms have less variety than the larger scale operations, typically ranging from two to four product types per lot. Goods are sold from the home or at the local market, consumed by the owner and/or exported for profit.

Backyard Production: shrimp, tilapia, bananas, papayas and shuttlecocks



shrimp | mangrove | crab | mangrove | shrimp | home/workshop/nursery

Backyard Production: shrimp, tilapia, mudcrabs, tea tree oil, green manure



shoreline rehabilitation

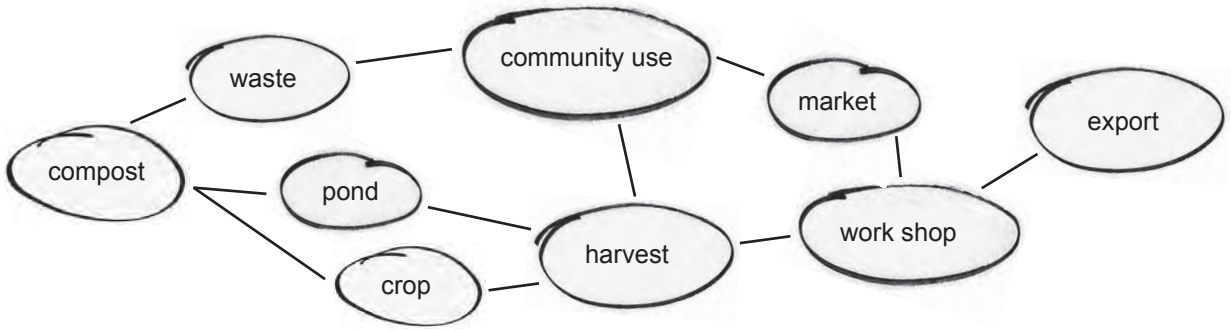
Sustainable Aquaculture:

an integrated approach to coastal planning

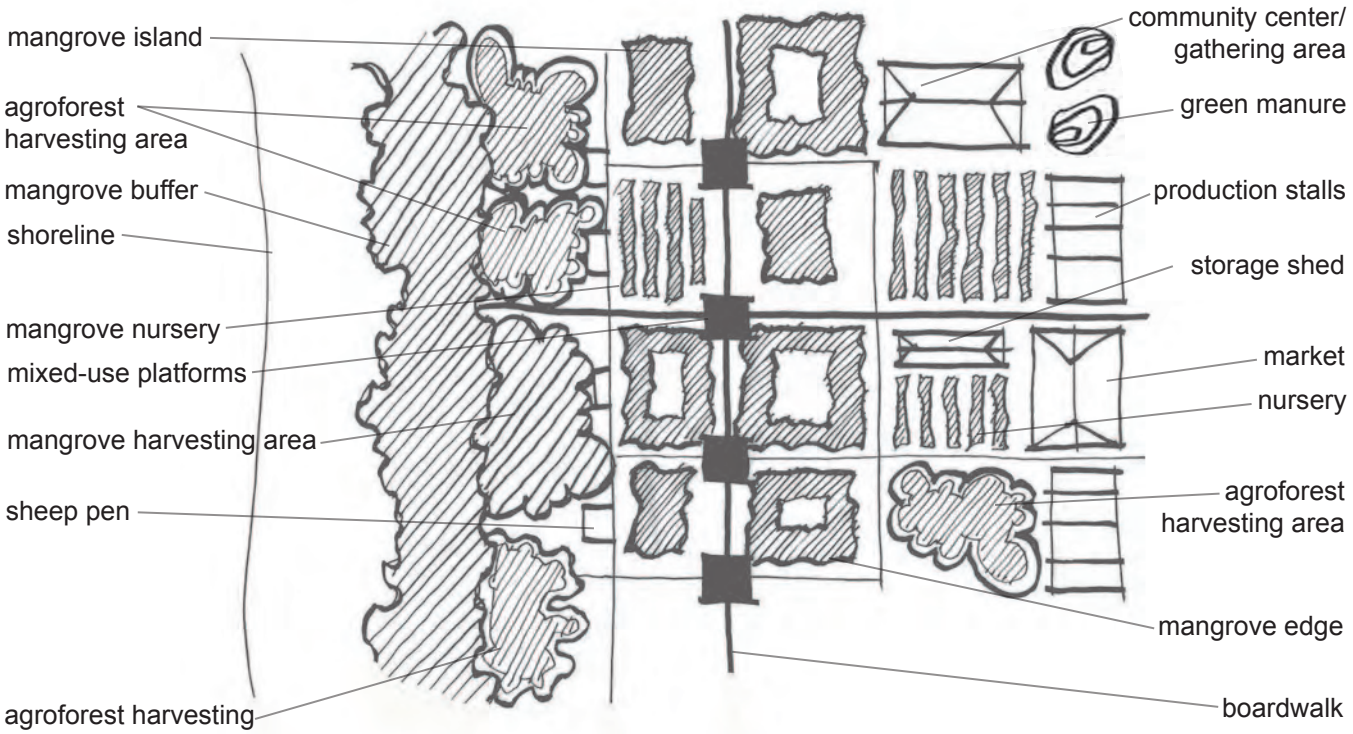
Community Scale Prototypes

These larger scale operations are run by a mixture of foresters, aquaculture farmers, crop harvesters, artisans and merchants. The traditional methods of Empang Parit farming are supplemented with a diversity of small cottage industries. These farms can be located along mangrove buffer zones along the coast, creating an opportunity for livelihoods in addition to security of mind. They are operated by the community, with each farmer operating a plot. The variety of products stemming from this organization is broad, determined by the choices made by each plot owner. Goods harvested are processed in on-site production shops and filter out to the market area or are utilized for wider export. This arrangement of forms also lends itself to programs catering to education, tourism, and research.

Functional Diagram: process of community economy



Local Community Production: pond products, forest products, processed goods, community economy



shoreline | mangrove buffer | agroforest harvesting area | pond and mangrove production: dikes, channels and boardwalks | nursery | market area |

financial

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social

physical

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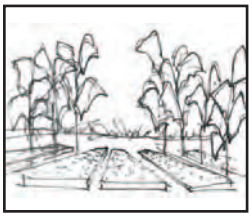
Sustainable Aquaculture:

an integrated approach to coastal planning

Processes and Techniques

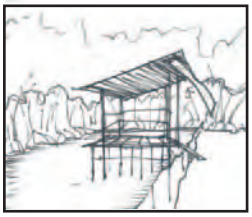
These are examples of small scale measures implemented by the community within the aquaculture systems. These processes and techniques supplement the overall framework of an operation.

Pond Crop Rotation: Use a single pond space for a diversity of marketable products. Species stocked depend on the season, young tilapia are stocked in the ponds in January and grow out from February to May. In May the fish are harvested and the young shrimp are added to the ponds. As shrimp grow out from June to September, mudcrabs are raised/fattened in pens within mangroves. In October ponds can be drained, dried and prepared for next culture cycle. Larvae are collected naturally from tidal flow.

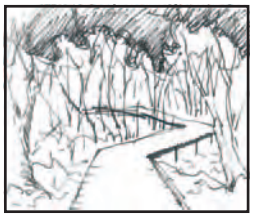


Nursery: Raise mangrove propagules to supplement community harvesting or use as potential stock to sell to government for shoreline treatment. Because Rhizophora, Avicennia and Sonneratia are fast growing and flower within their first year, they are among the few mangrove families best suited for replanting. Food crops such as bananas or papayas can be raised to reestablish agroforest harvesting areas. These nurseries can be managed at a family level in a backyard, or at a community level, reusing filled-in abandoned shrimp farms.

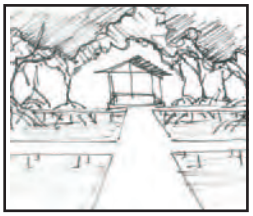
Green Manure Processing: Fodder can be collected from mangrove harvesting areas for use as fertilizer and food for livestock within the community. Tree debris is shredded and spread over crops or fed into ponds to increase production. Leaves and other trimmings can be fed to livestock such as goats, cows and sheep.



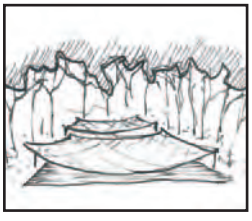
Organic Pond Fertilization: Nutrient input can be added in the form of animal manure or compost. Pen structures are built over ponds and sheep are closed in at night or during the day, manure falls through slats in the bottom of the structure to reach the pond. Household waste such as food scraps can be disposed of on compost piles placed on similar structures built over the ponds.



Debris and Re-use within the Community: Before the mangroves can be reestablished, debris from the tsunami can be used to build items such as boardwalks, oyster trays, shelters, animal pens, fencing, and compost bins. Random debris that is not useful for lumber can be used build the dikes of the ponds.



Mixed-Use Platforms and Boardwalks: Use can vary according to types of adjacent ponds. Possibilities for tool storage, pond monitoring or maintenance, as well as opportunities for education, research and tourism. Boardwalks seperate pond activities and can run along canals or on the top of constructed-dikes.



Protective Nets: Structure tannin treated nets over ponds to protect from predators. Marketable fish/shrimp are collected at the end of the culture period by draining the pond and using harvesting nets.

resource: Interview with Charles Angell, local Sustainable Aquaculture expert.

financial

human

social

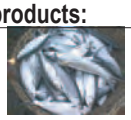
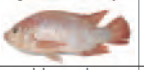
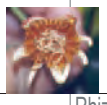
physical

natural

shoreline rehabilitation

Sustainable Aquaculture:

an integrated approach to coastal planning

Product Matrix:	source	harvest	value/uses	ecological value	challenges/notes
pond products:					
milkfish 	high tidal range , can hold water at least one meter deep in brackishwater pond.	drain pond. fry require a seperate nursing pond.	high demand, highly profitable. consumed and sold locally and nationally.	dikes reinforced with mangroves or cash crops.	can be cycled with shrimp crops, ideal for a small-scale operation.
shrimp 	brackishwater pond, culture during rainy season.	varies according to species raised.	global market.		can be cycled with other crops. collect larvae naturally from tidal fluctuations.
tilapia	freshwater to brackishwater. stock in january.	with nets from february to may.	requires few inputs and works well on subsistence farms.		able to undergo large changes in salinity. 
oysters	pen-cultured, rafts.	reach market size in 6-9 months, feed on detritus.	large demand globally.	can be grown in old shrimp ponds.	not common in sumatra, would need to gain familiarity among locals.
mudcrab 	pen-cultured, can restock with crabs from a nearby river.	fattened in may, cultured for 4-5 months. must be delivered in live condition.	alternative income for fishermen.	prefer forested areas, can recharge natural crab populations.	ensure that native crab species are used, to prevent the release of invasive species. prefers dense forest canopy.
forest products:					
banana	plant in well-drained areas.			can be mixed with other species to create an agroforest community, fodder can be used to create fertilizer community run, provides habitat.	
papaya 					
eucalyptus		harvested and distilled for scent and oil.			
mangrove					
+green manure	fodder collected from mangroves.	can use debris leftover from harvesting activities.	fertilize fish ponds and/or crops.	replaces the use of chemical based fertilizers.	
+lumber 		harvested by community or through backyard operation.	homes, roofs, fishing poles, nets, floats, boardwalks.	community ownership, direct benefit.	will need adjacent nurseries and management plan to ensure it is not overlogged.
+firewood	Rhizophora.		renewable fuel.		
+tannin	bark of Rhizophora.		production of leather.	artisans take value in products harvested from their forest and promote their protection, thereby reducing reforestation.	more common in india
+dye 	Bruguiera gymnorhiza seedlings.	seedlings are peeled, chopped up, boiled and the fabric immersed in the soup, then dried in the shade.	resulting colour is a red-brown, and repeated dyeing gives black. The dye also strengthens fishing nets, grass skirts and other fibers.		in southeast asia, the tree is one of the traditional dyes used in batik-making: it produces an orange-red color.
+medicines	Rhizophora.	varies.	varies.		
+paper and pulp			this is already a large industry in indonesia.		create a program for locally made paper products.
+honey 	bees feeding in river mangroves *Aegiceras corniculatum.*				can this be done in indonesia?
+shuttle cocks	roots of Avicennia.	roots regenerate quickly.	to construct shuttlecocks for badmitton.		ideal for backyard operation.
+crafts	pneumatophores.		baskets are woven with forest materials.		

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for more information please visit http://courses.washington.edu/larescue

Salvaged Sites

This concept is about the visual and physical sites through out the northern coastline of Banda Aceh that survived the Tsunami. Many of these sites have become Icons of the event, they represent powerful symbols of hope. Many of the buildings that have survived are **Mosque**, the compelling images of these buildings among the scarred landscape are silent reminders of the power of nature.

salvaged sites +
debris as structures +
implementations +
phasing system +

financial

Salvaged Sites

The approach of this design is based on providing alternative methods of rebuilding. The tsunami left few resources, with the exception of a few standing buildings. Reclaiming some of these sites seemed appropraite it allowed several functions: collective rebuilding and community participation.

human

Debris

The notion of using recycled materials to rebuild and reclaim sites seemed appropriate in this situation, many reusable materials end up in landfills. Encouraging community members to use debris to rebuild public spaces seemed logical and an inexpensive method of rebuilding community spaces with in a shorter time frame. By using debris from the Tsunami in refurbished and new structures,and integrating new uses and functions the materials themselves become Everyday Memorials.

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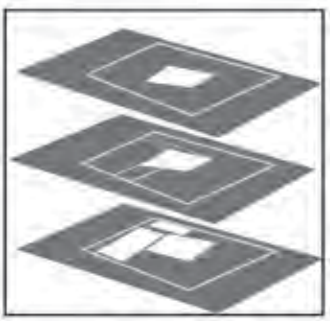
Implementation

The implementation of projects of this scale are based on collaboration, organization and community participation, it enables community building. Providing and outlining how systems work with one another is fundamental in providing a realistic time frame and developing a phased system where goals can be met.

physical



Phasing System

The phasing system is over a five year period with the main goal being the evolution of the conceptual site into physical spaces built with debris.

Phase I: Anchor- focus is on the center node and the resources available

Phase II: Community Infrastructure focus on creating physical and social form to meet the communities needs.

Phase III: Re-establishing functions: focus on maintaining and managing community functions.

natural

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Salvaged Sites

Debris Structures

The Tsuanmi left layers and layers of debris scattered through out Banda Aceh. Providing the people of Banda Aceh with examples of how debris has been used can perhaps provide them with new resoruce they can use and begin their procesof rebuilding much quicker based on the use of found materials. Its serves a dual function.

Tires

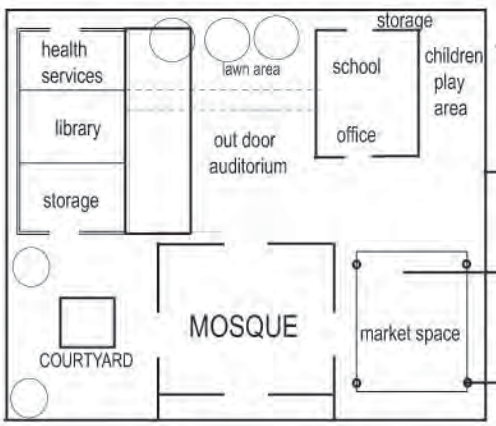
Car tires can be utilized in many creative manners that are applicable to the building of strutucres. Students from the Rurual Studio in Alhabama designed a wall made of earth rammed tires that was then stuccoed over. The tires gave an unusal form to the wall making it an interesting space to visit.

Concrete

Gabion cages can be filled with concrete rubble and rocks. Gabions are used as retaining walls, and are structurally sound. They are built of inexpensive materials, such as rebar and thick wire gauge. They can be used in this project for a multitude of things as well as being an efficent use of the debris scattered within close proximaty to the site.

Paper

The use of paper for structures isn't a new concept, however the Rural Studio has found new use for compressed card board boxes and heavier weight paper. The Paper bales are used in this example as insulating blocks in the student housing.



Examples Of Application On Site

Many elements in this plan can be built with recycled materials.

- walls + gabions filled with rubble/ concrete
  tire stuccoed walls
- paving + recycled broken slabs of concrete
- structural frames + recycled wood and bamboo

for more information please visit http://courses.washington.edu/larescue

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salvaged sites +
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financial

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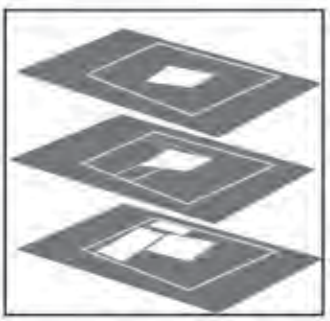
physical



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natural

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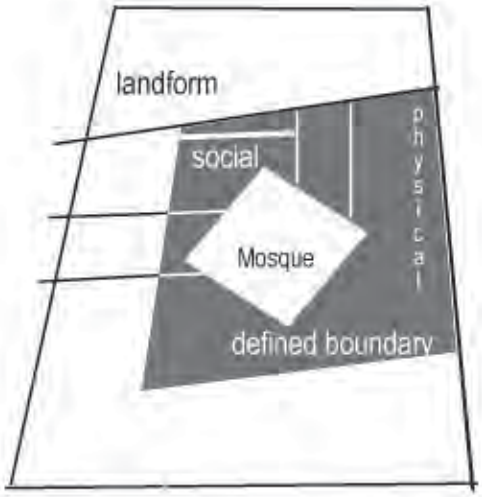
Salvaged Sites

Phase II Community Infrastructure: The focus is on creating physical and social forms to meet the communities needs.

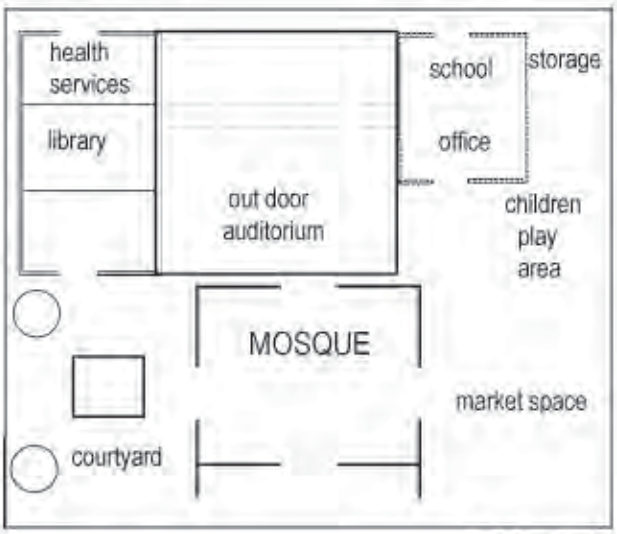
Change Through Time

During this phase the site begins to tranform into a physical and social series of spaces. The hierarchy of the spaces are determined by the communities need. The physical forms that develop take inspiration from the surrounding landscape. The overall concept for this phase is to allow the site to change through time, while developing the community infrastructre.



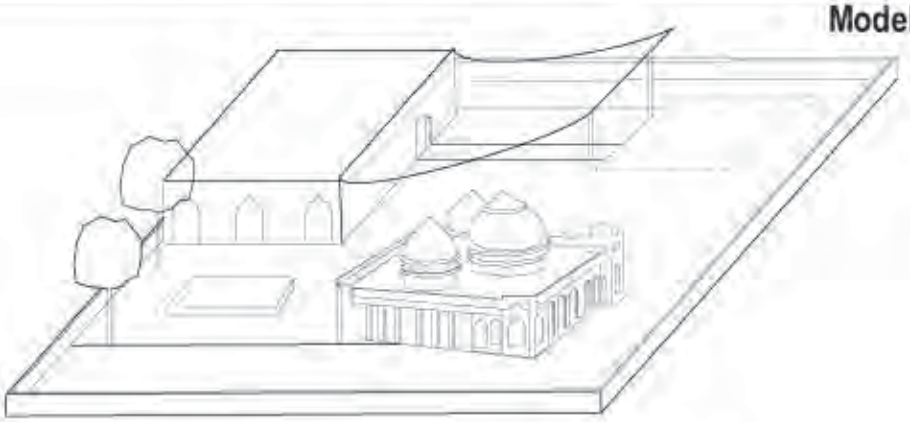
Conceptual Plan

The conceptual plan is based from examples on other Islamic communities. The Islamic community considers their religion a way of life and there for, their community spaces must be able to sustain their needs. The Mosque always retains its hierarchy and postions itself at the center of the community. Other buildings and spaces are determined souly on their function. Retaining a level of flexabilty is essential to the site.



Model

The model drawing in this phase illustrates the changes the site has undergone. Physical forms begin giving shape to the space and allow for more social interactions. The site begins to provide more functions for the community.



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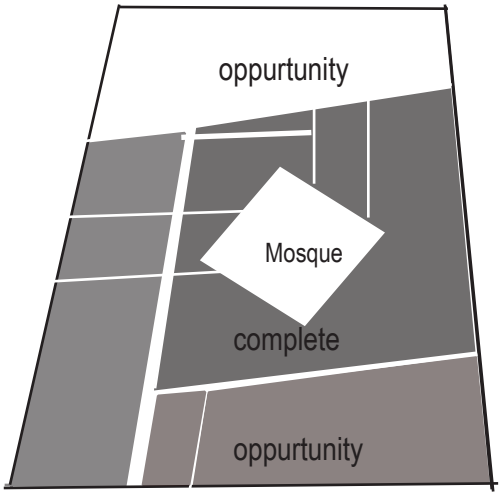
Salvaged Sites

Phase III Re-establishing Functions: Maintaining and managing site

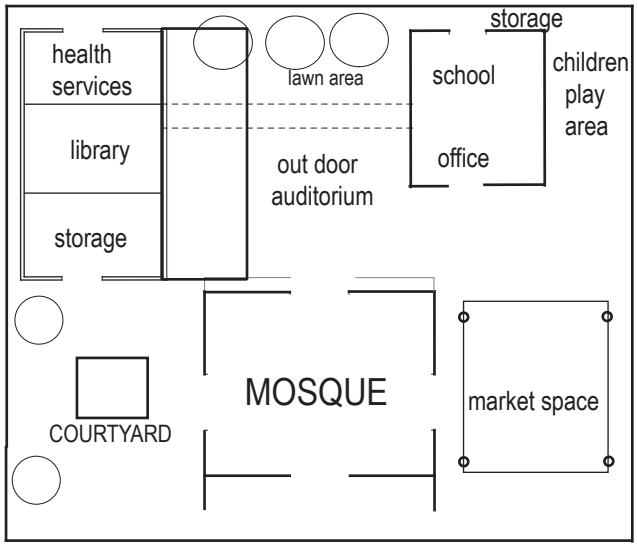
Change Through Time

The site has evolved from a single unit space into a boundary defined site with organized areas to meet a variety of needs. Through the phases the site has retained a level of flexibility and continues to maintain it. This flexibility allows for further growth through longer periods of time. The design allows for exterior opportunities once the functions of the site are established.



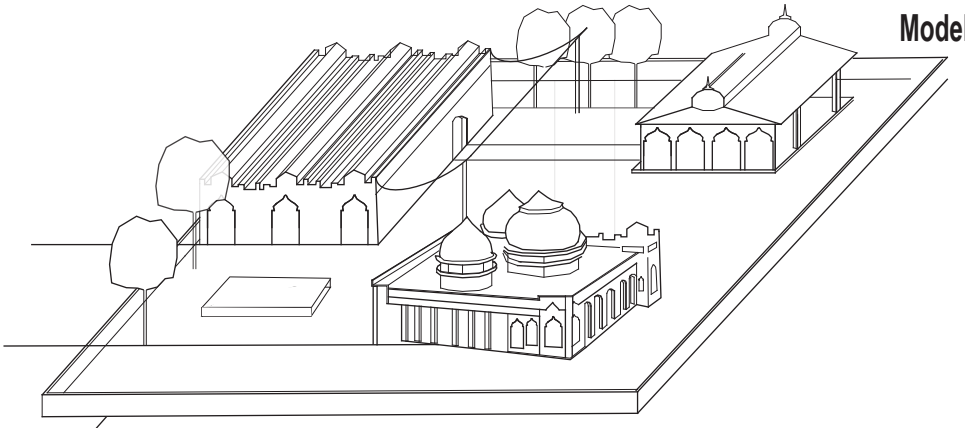
Conceptual Plan

The conceptual plan in this phase is focused on how certain spaces relate to one another and how their functions influence other areas. For example: the outdoor auditorium can be utilized by the all three buildings surrounding it or it can be a space for families to enjoy a picnic.



Model

The model drawings represent the three dimensional quality of the site. Although the site has been redesigned with recycled materials it has retained its architectural character.



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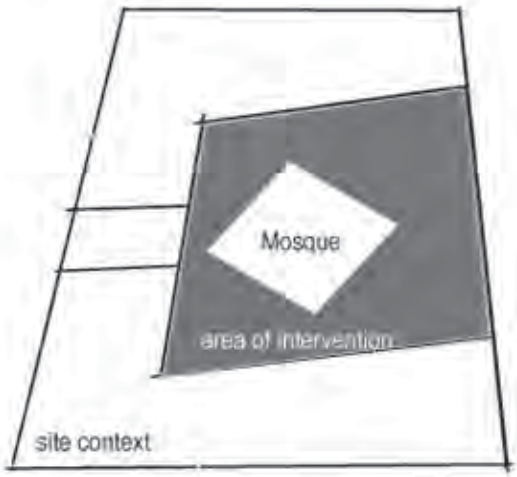
Salvaged Sites

Phase I Anchor: The focus of this phase is establishing an anchor, establishing the center of the site as the hierarchy

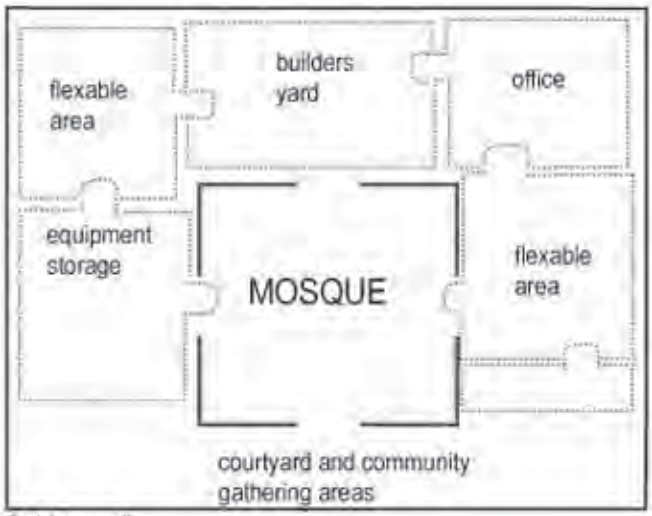
Change Through Time

The concept of **salvaged sites** focuses on establishing an anchor on the site that the rest of the space can develop from. The asperation for this project is outward growth. It seems appropriate that the intial rebuilding be focused on the Mosque and the immediate area around it.



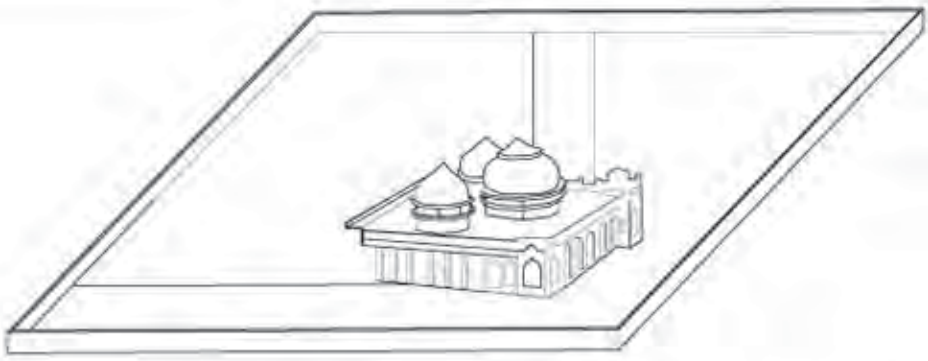
Conceptual Plan

The **conceptual plan** is used to illustrate the importantacne of the Mosque and the potenial growth around it. The enclosed walls around the Mosque are part of the Islamic culture. It is a symbolic reference to a way of life. Establishing a defined border around the site also provides the community with a clear understanding of the amount of space they have to grow into. During this phase much of these areas will be cleaned and organized into a series of builder yards with equipment storage.



Model

The simplicity of this model is to express visually the change that will occur through the three phases. This phase begins with the primary focus being the Mosque and defined boundaries.



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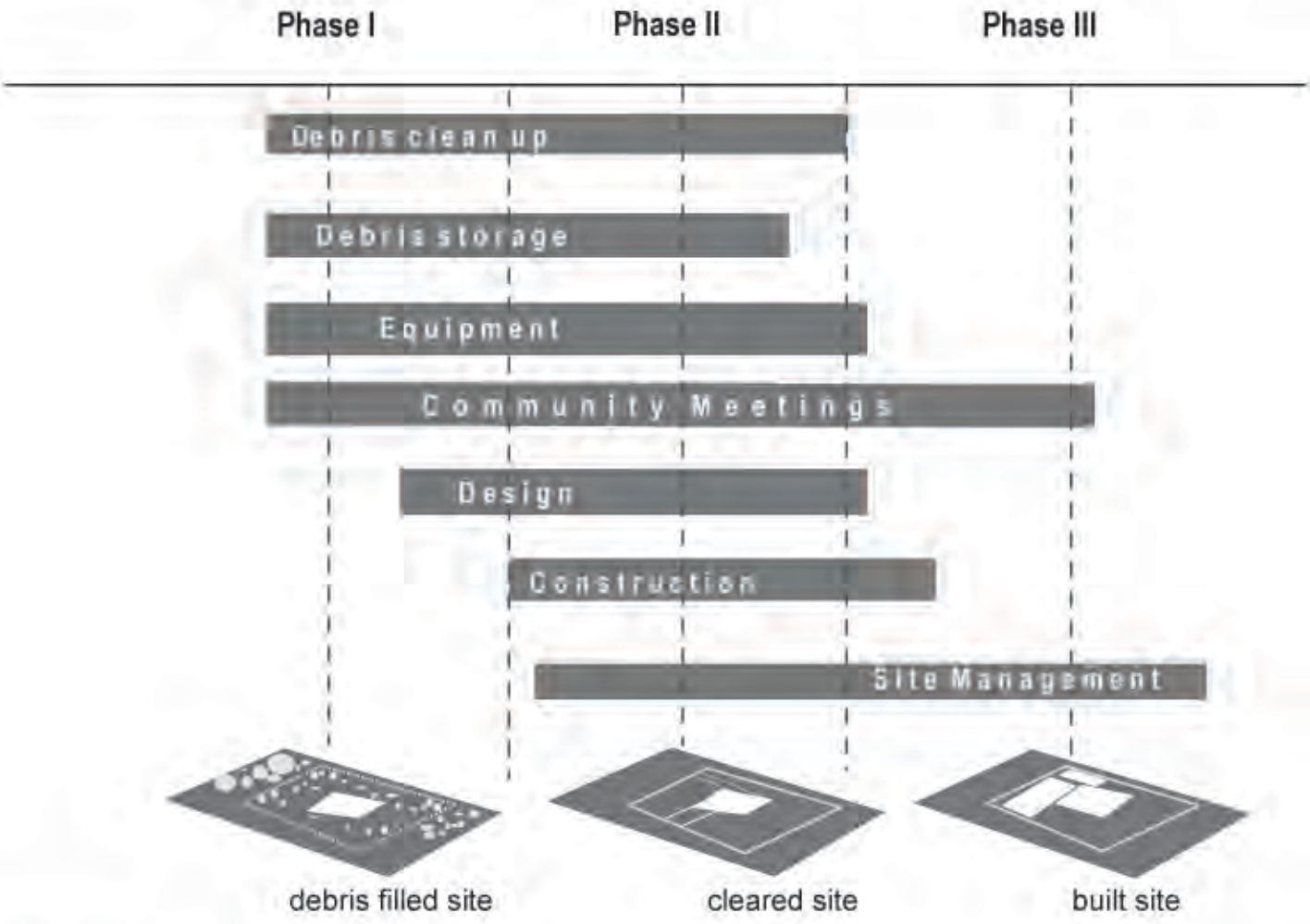
Salvaged Sites

Implementation : The implementation of this project is community driven



Site Goal + To gain local community participation and present alternative methods of rebuilding community spaces. By providing a phased system the whole project is spread out through a considerable amount of time, based on the community's needs and financial resoucres.

Schedule + This schedule is an example to illustrate what type of work and community planning must be done during each phase. Each schedule and task should be site specific.

Management + Allow site to adapt and conform to community's needs. While reflecting on the original concept and identity.

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Adaptive Rebuilding

The town of Sirombu on Nias was destroyed by the Tsunami- everything from the shoreline development, to the regional market, to homes. Here is a series of strategies to help Sirombu adapt the modular relief houses into a comfortable community over time.

community scale efforts +
adapting the new town +
reuse as secondary structures+

financial

human

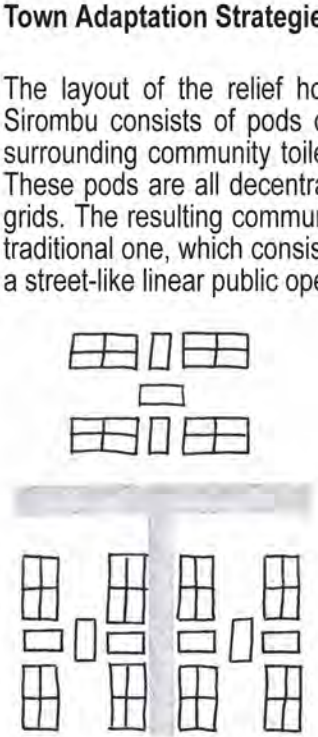
social

physical

natural

Town Adaptation Strategies

The layout of the relief housing built by Zero-to-One in Sirombu consists of pods of four clusters of four houses surrounding community toilet, water, and laundry facilities. These pods are all decentralized, consisting of a series of grids. The resulting community structure is nothing like the traditional one, which consists of elevated rowhouses lining a street-like linear public open space.

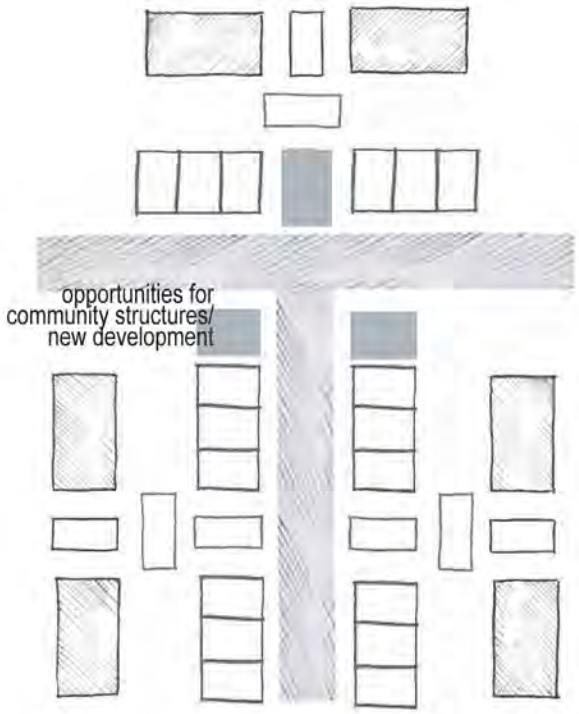


relief layout

+

traditional layout

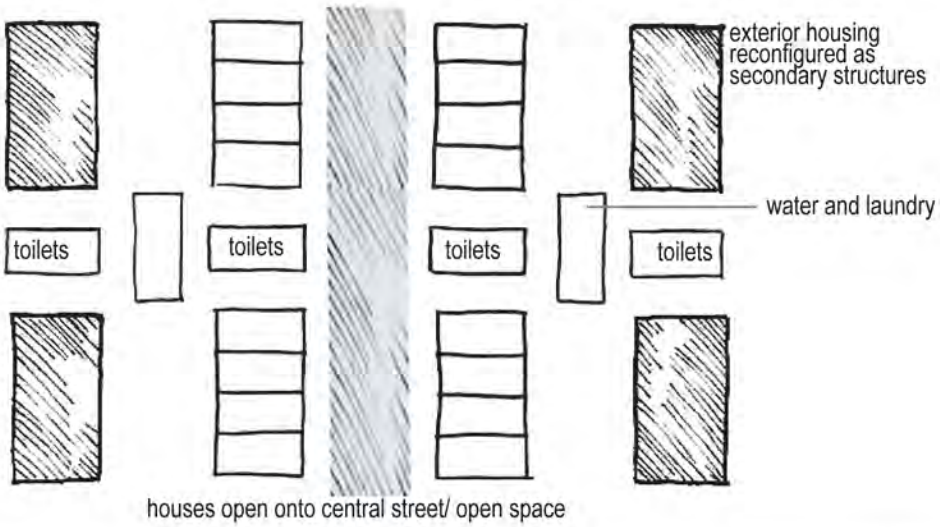
=



adapted layout

Reconfiguring the buildings of the new town creates possibilities for a more suitable community structure. One key strategy would be to focus the houses bordering the main road between two pods inward on the road, and adapting those along the outside of this new center to new uses. These buildings could then become secondary community structures.

In the reconfigured plan above, the houses are adapted to the three large attached house reconfigure plan; below, to the four attached house plan. Houses may be adapted using the ideas presented on the adaptive rebuilding housing strategies on the following pamphlet in response to the needs and number of community members wanting to participate.



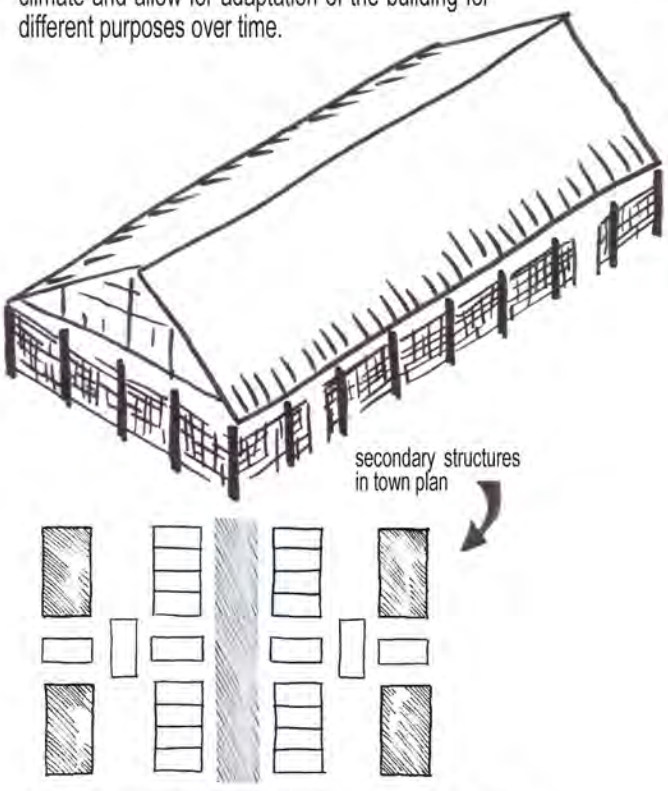
Adaptive Rebuilding

Reusing Relief Housing: Secondary Structures

The Zero-to-One buildings have potential to also serve the community as structures other than houses. As secondary structures, the buildings would not need to meet the community's needs as primary shelter and might not require as intensive construction strategies in their adaptation. These buildings might be able to serve as business opportunities, tourism functions, or community buildings. The post-and-slat construction method of the buildings will allow the community to rearrange the layout of the structures without completely disassembling them.

Screened Walls for Versatile Buildings

A pod of houses could be commissioned to serve the many functions as a secondary structure, and with the needs of the community changing, the ability for the structures to adapt is valuable. Looking to traditional uses of woven fibers such as palm and rattan as walls and screens, one might remove the concrete walls. Replacing them with screens will allow for air circulation in the muggy climate and allow for adaptation of the building for different purposes over time.

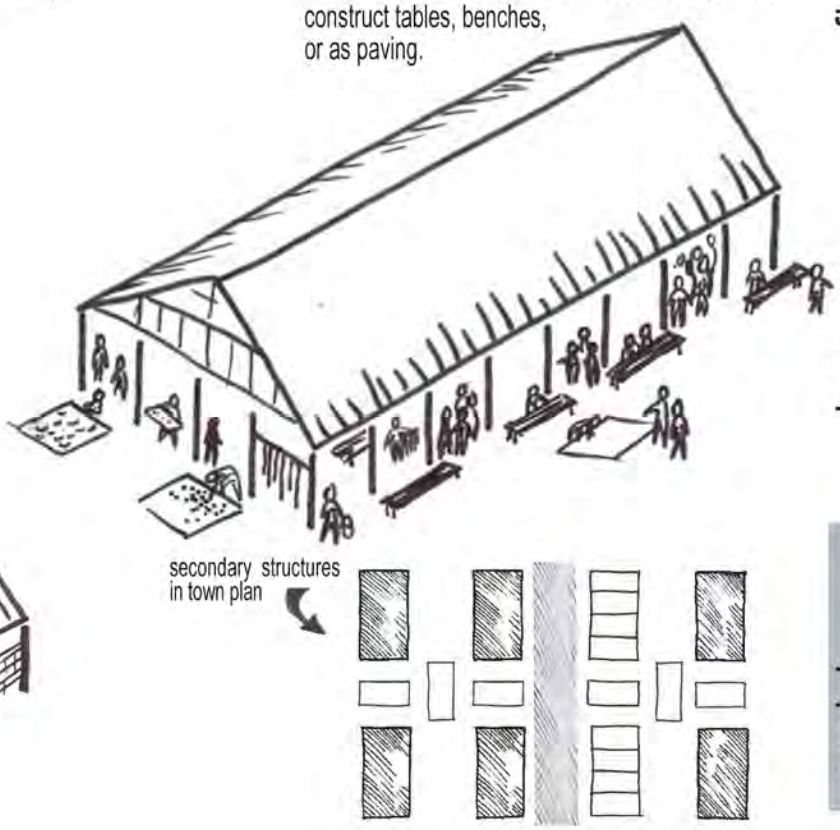


Uses supporting this building may include:

work space for craftsmen
surf hostel for Nias' growing tourism industry
schools
additional live/work space for nearby residents
storage space for nearby homes
animal pens
commercial space

Market Scheme

An entire pod of homes, or a series of pods, can be converted into market space for the town. As the western coast of Nias' main port, Sirombu held the region's market until the tsunami destroyed it. Removing the walls and leaving the infrastructure of the building could create an ideal market setting. The slats that formed the walls could be used to construct tables, benches,
or as paving.



A plan for a large market could extend the secondary structures out to the central open space. If the town's needs for more or less market space changed, structures could be easily converted for different purposes by adding or removing screen walls. The covered area, with the assembly of many permanent tables and benches from the wall slats, could be used by the public for many different purposes during the market's off-time

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Adaptive Rebuilding

A study on how the town of Sirombu on Nias may undertake rebuilding efforts to develop more permanent homes while integrating the infrastructure and materials of the temporary/emergency relief housing undertaken by the Zero-to-One foundation.

family and individual scale efforts +
adapting temporary homes +
reusing materials+

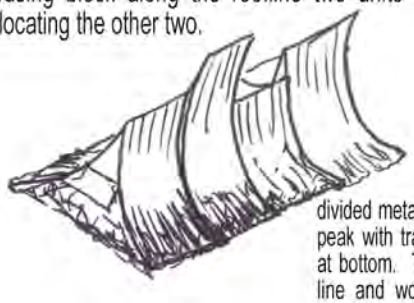
A More Environmentally Responsive and Culturally Appropriate Home

The traditional homes of Nias are a response to the local environment, and the forms they have become are a part of daily life and culture. Modern design and construction efforts should not only use what is available but look to traditional form to create a space that is both environmentally and culturally comfortable.

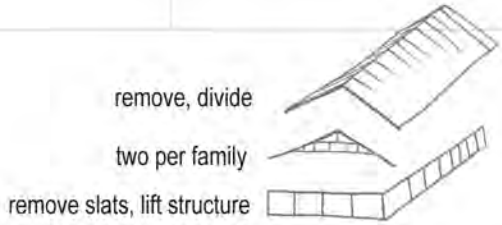
It would be ideal for families to be able to relocate their homes entirely and construct them in the manner custom to their needs. Some families will be able to do this, and will leave relief homes vacant. These vacant spaces will create rebuilding and redevelopment opportunities.

Phasing

The living situation during the rebuilding of the new home will be important for the family. Because of the nature of the four-unit pods of houses and that the new homes would be lifted an entire floor, it is impossible for families to remain in the unit while reconstructing. Families could swap units with eachother, or move into vacant units within the community to make the construction phasing and timing work together. The best method for redevelopment would be for all of the families in one pod to redevelop at one time as a group effort. In the four-unit scheme, theoretically, if a cut were made in the center of the housing block along the roofline two units could be rebuilt without relocating the other two.

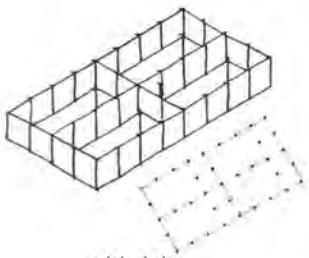


divided metal roofing, extending down from peak with traditional thatch fiber technique at bottom. This creates a more traditional line and would be an alternative to the existing, more modern roof



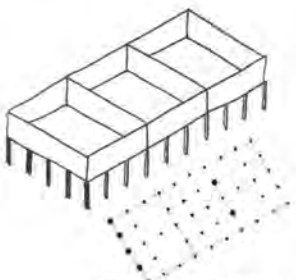
Adapting the Existing Houses: Models

The proposed adaptive strategy includes taking the structure apart and lifting it onto the support beams that originally helped form the walls. The roof, one mass of metal sheeting, would be removed and cut into portions for each unit. The roof's support beams would be removed and divided up amongst the units to have two (or three in larger units) support units per housing unit. The slats could then be removed from the support posts and a platform could be constructed atop the posts, using local materials or in conjunction with the concrete slats. New homes would be better-ventilated with screen-like walls rather than the thick concrete ones of the relief homes.

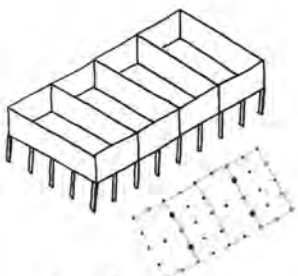


original plan

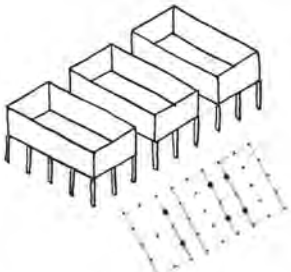
Here are four different ideas for adapting the temporary houses. Below the sketches for each idea are plan drawings showing the proposed layout in relation to original and proposed posts. Proposed ones are bolder.



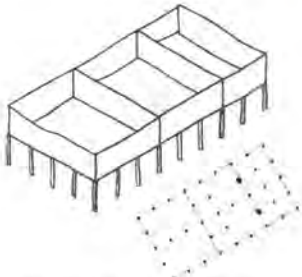
three larger rowhouses, adding one row of posts



four smaller rowhouses



three detached houses



two larger, one smaller rowhouse

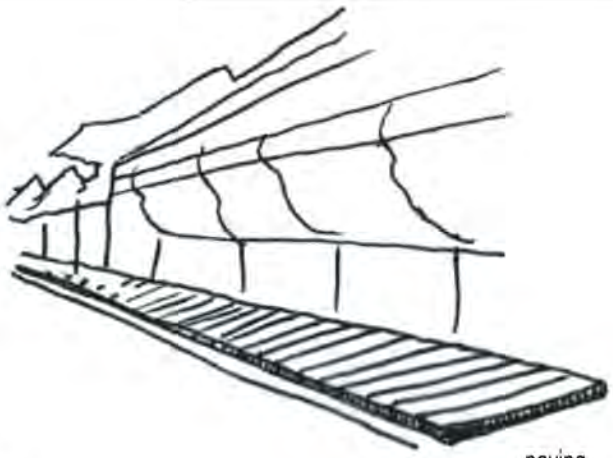
Adaptive Rebuilding

A study for Sirombu on Nias as to how the community may reuse the material from housing relief efforts to rebuild their community for non-housing purposes in a more long-term and sustainable manner.

reusing temporary housing material +
private and public spaces+
community, family, individual efforts +

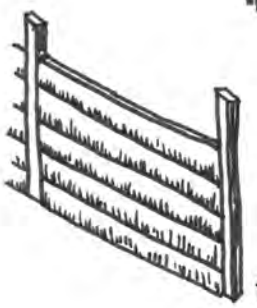
Public Space

The concrete slats, 2.05 meters long, 40 millimeters high, and 5 millimeters wide, which form the walls of the Zero-to-one relief houses, could be reconfigured to serve many purposes within the town.

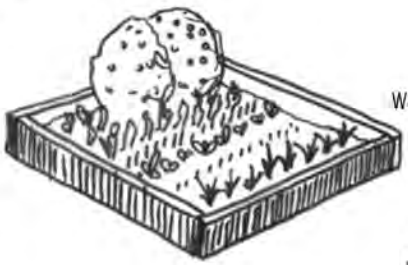


paving

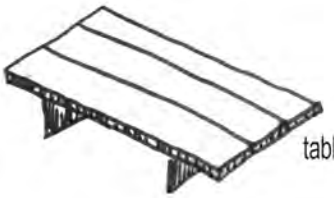
benches



fencing/walls



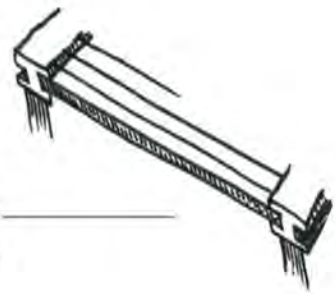
walls for raised planting beds and gardens



tables

Shoreline Structures

The impact of the tsunami not only destroyed the town's buildings but also the infrastructure for Sirombu's shoreline. In a community that makes most (80%) of its living off of fishing, the use and access of the waterfront is crucial. The modular fencing slats (used as walls for the housing) could be used to begin to reconstruct shoreline structures to help the community rebuild their economic livelihood.



fencing panels laid top to bottom can be set into the ground along the shoreline as paving for a boardwalk

fencing panels laid top to bottom, laid on pilings form the walkway for a dock

fencing set vertically and anchored to pilings can serve as a bulkhead

Builder's Resource Guide

The Builder's Resource Guide is designed to maximize the amount of relief aid given by exploring sustainable, alternative building technologies while looking at traditional Indonesian building methods and customs. This resource is also intended to empower individuals at the village level who may not receive any aid.

sustainable technologies +
earthbag +
eco-dome structure +
earthbag hybrid home +
bio-climatic design +

Earthbag

Earthbag is a construction method that uses plastic or textile bags (earthbags) packed with soil, and sometimes sand, gravel and cementitious materials. It can be used to construct foundations, walls, and domed structures. Earthbag is one of the most inexpensive building methods, and is very practical in areas that are prone to flooding, hurricanes, wildfires or areas with no wood or clay. Earthbag construction requires few skills and is faster than other earth building methods. Few tools, other than a shovel are necessary and any other tools can usually can be hand made. For both temporary and permanent solutions, earthbag construction is a very promising option for the rebuild in the Aceh area. For both temporary and permanent solutions. Emergency shelters made from sandbags and barb wire can be constructed in a few hours and have been proven to last for three winters. As a permanent solution, earthbag dome structures can be finished with a coat of cement or lime plaster. In the Aceh region, all of the other materials except for the bags can be found locally.

Examples

images: Calearth.org

Construction Materials

Bags

Polypropylene bags are the only suitable material for this area of Indonesia because of the high levels of sand in the soil. The weaker the fill material, the stronger the bag must be. Polypropylene bags are made of woven plastic and will deteriorate if exposed to sun, therefore steps should be made to protect the bags from sunlight both before and after construction.

Fill

A mix of sand and clay soil is ideal for earthbag construction. A mixture of sand and lime or lime-rich coral sand common in this region is also good. Any material that degrades in the bags could create pockets, weakening the structure. So all organic matter, rocks, and sticks should

Fill continued

be sifted out of the soil. Also remove all topsoil and only use the substrate and fill material. After the fill material is sifted and lime or coral sand is add the bags can be filled. The fill can be used either wet or dry however when using lime the fill should be moist so that the material sets adding additional structural support.

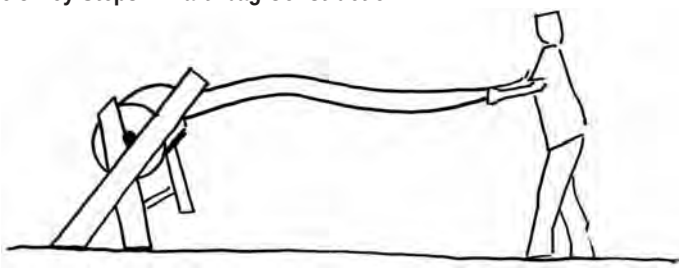
Barbed Wire

4-point barbed wire is laid between courses to keep the bags from slipping. As a rule of thumb, if the bag is less than 12 inches wide, only one row is needed. Two or more rows of barbed wire may be required for rows wider than 16 inches.

Tools

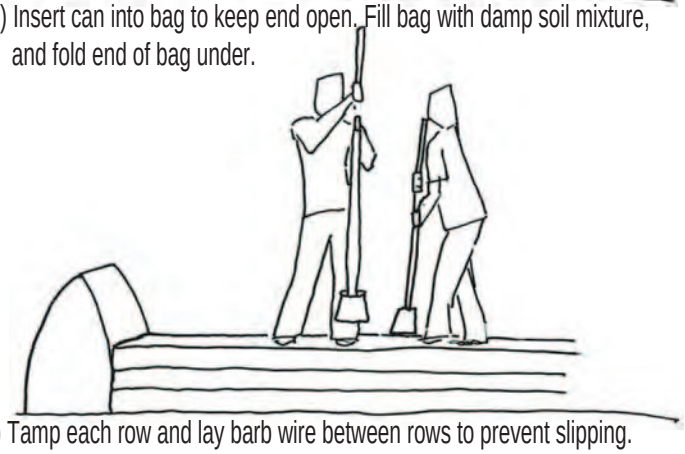
Shovels, wheelbarrows, coffee cans (with both ends removed), hoes, tampers, and cutting blades.

The 3 Key Steps in Earthbag Construction:



1) Cut bags to the size needed.

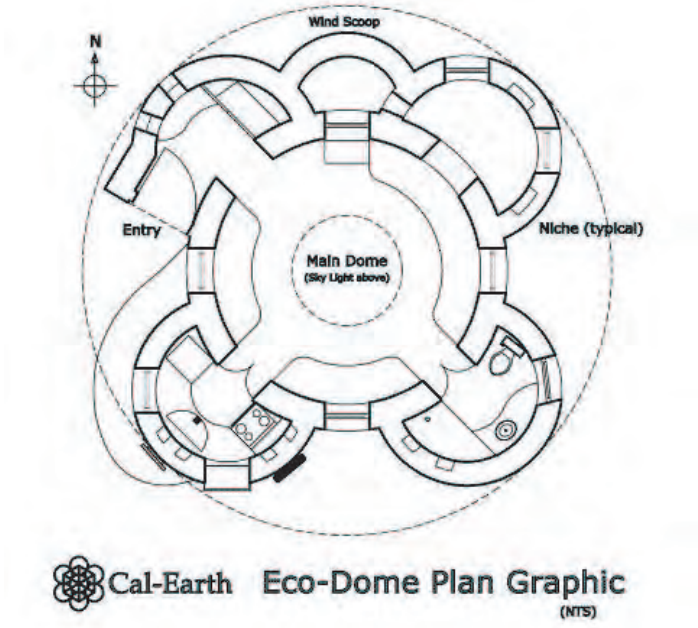
2) Insert can into bag to keep end open. Fill bag with damp soil mixture, and fold end of bag under.



3) Tamp each row and lay barb wire between rows to prevent slipping.

Source:Elizabeth, Lynne, and Cassandra Adams. Alternative Construction: Contemporary Natural Building Methods. (New York: John Wiley & Sons, Inc. 2000).

Eco-dome



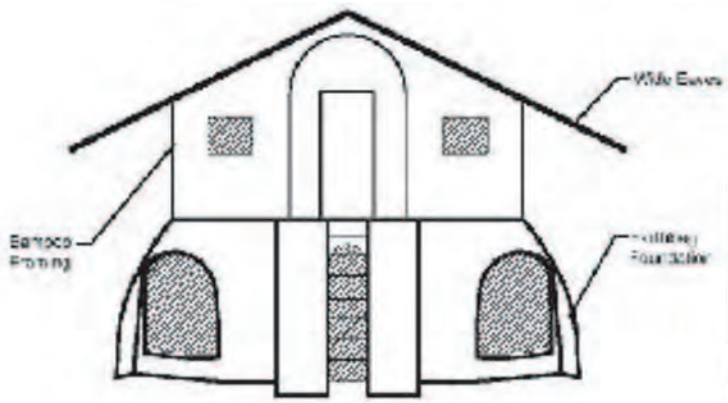
+ Built from local earth-filled coils (soil-cement or lime-stabilized earth).
+ Physically and culturally flexible design. The main dome and four niches can function as:
  a) main living room, entrance hall, kitchen, bathroom, bedroom
  b) living room, entrance hall, and three bed-rooms
  c) living room, entrance hall, two bedrooms, and a bathroom
+ Self-contained single unit
+ Can be repeated and joined together to form larger homes and courtyard houses.
+ Can be built by a team of 3-5 persons.
+ Designed with the sun, shade and wind in mind for passive cooling and heating.
+ Interior furniture can be built-in with same material.

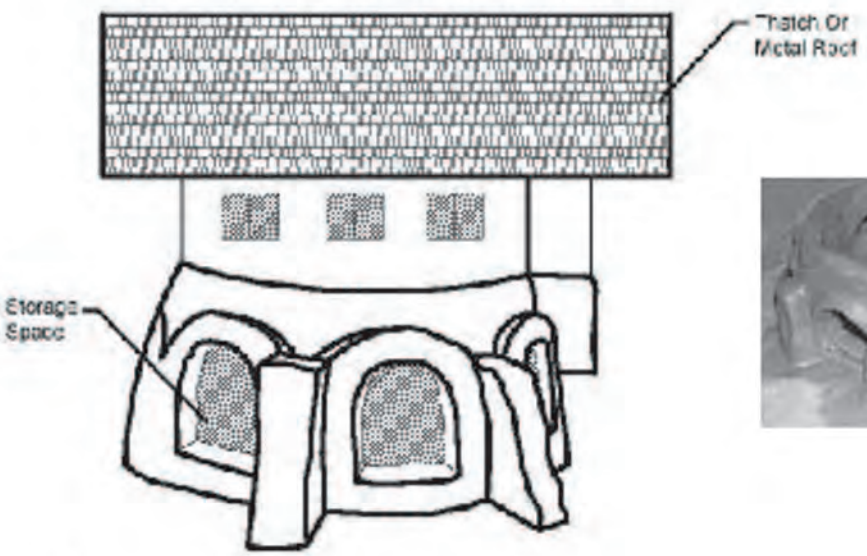
Information and Image source: www.calearth.org

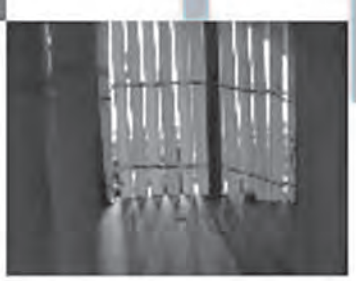
financial
human
social
physical
natural

Builder's Resource Guide

Earthbag-hybrid







+ Earthbag foundation is built from local earth.
+ Living quarters is built using primarily of local bamboo.
+ Familiar and traditional materials are used to finish and furnish upper living quarters.

Foundation

+ Earthbag creates a strong foundation that allows wind and floodwaters to pass through.
+ Earthbag foundation is resistant to structural failure during earthquakes.
+ Earthbag foundation provides a large dry storage area.

Design

+ Raised dwelling, similar in style to traditional building methods.
+ Living quarters could be built in a traditional manner.
+ Floor plan could be modeled after traditional layouts.
+ Upper story could be modular and easily disassembled and reassembled.
+ People could reuse the earthbag foundation as they reuse the wooden stilts of traditional homes.

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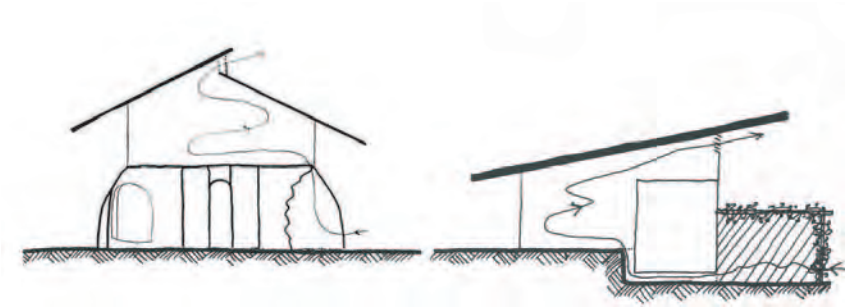
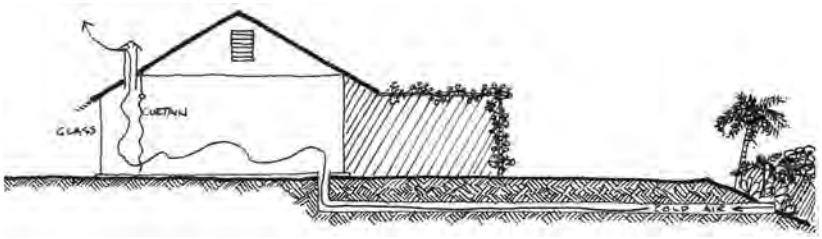
Bio-climatic Design

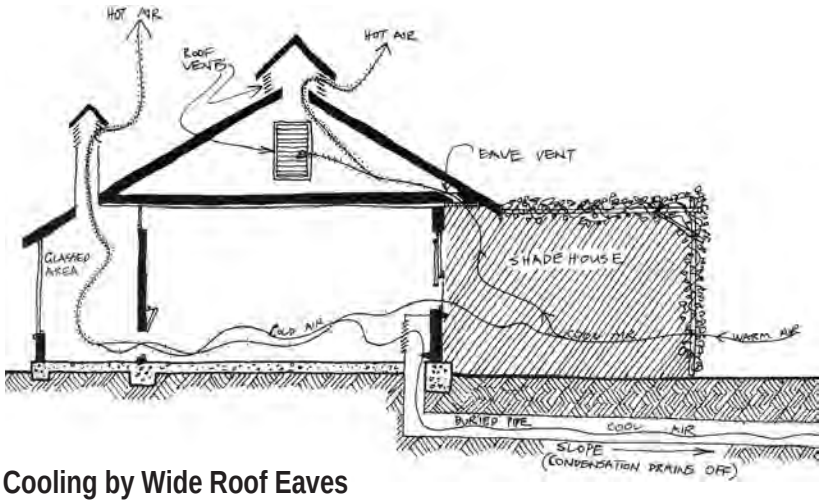
Cross-ventilation for Houses



Vented ceiling slopes allow hot air to escape the room, and cool trellis air to enter. The key to successful cross-ventilation is to allow air to flow along a simple path(no corners), and use large vents that allow for a lot of air to pass through. (Figure Source: Permaculture A Designer's Manual by Bill Mollison.)

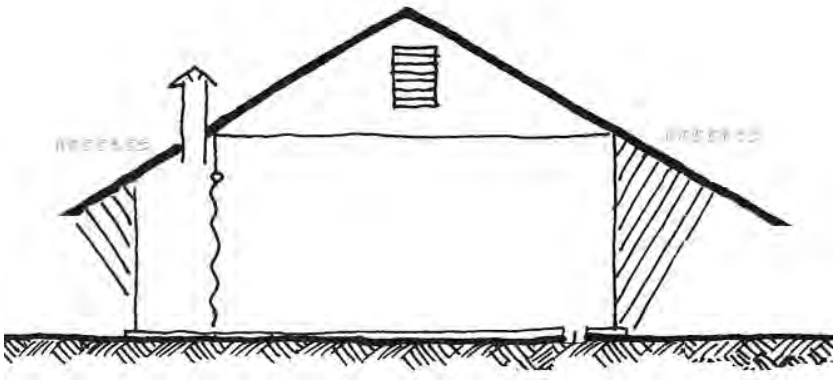
Cooling by Shadehouse and Buried Pipe





A 0.5 x 0.5 m tunnel 1 m deep and 20 m long sloping to the outside intake to de-humidify and cool the air, with a solar chimney to draw air through the house. Metal chimney or a hot roof (a roof that is unventilated) are the best cooling systems in a tropical house. The metal chimneys or hot roof draws in cool air from underground pipes. Where the earth cools the air that is in the pipe. The air that is drawn in from the pipe is more dense so it naturally sinks to the lowest level of the house but a fan can move the cool air throughout a room or house.
The cool air pipe needs to be buried at least 1 meter, and should be 15-20 meters long. The pipe should be laid at an angle that slopes away from the dwelling to allow for the moisture that develops to drain away from the house. The Outlets of the pipe should be covered with screen to keep animals out. A shade house which is a trellis covered with vegetation, can also be a good way to creatie cool air that could be utilized by creating vents in the exterior wall of the structure and at the eaves of the roof. (Figure Source: Permaculture A Designer's Manual by Bill Mollison.)

Cooling by Wide Roof Eaves



Designing a house with large over-hanging eaves shades the house. Shading the house makes the interior much cooler and the air coming in through the windows will be cooled by the eaves. Wide eaves also directs rainwater from the roof farther away from the house.

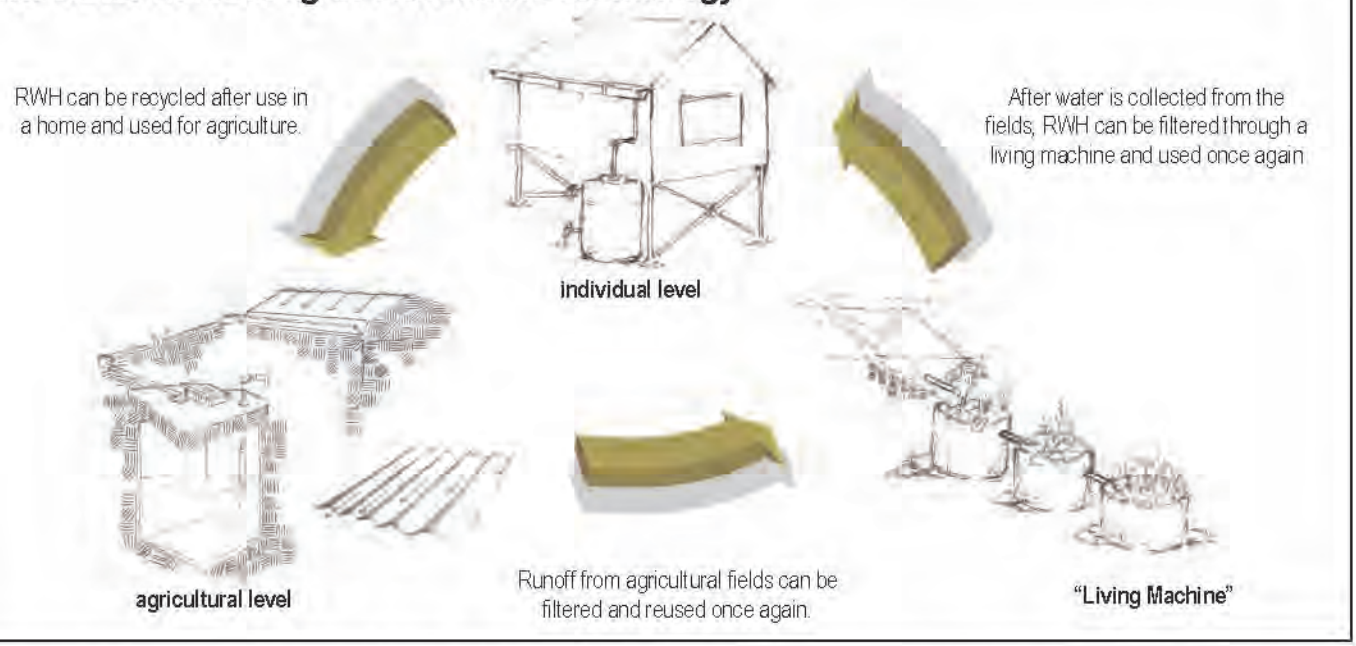
Information and noted images courtesy of: Permaculture A Designer's Manual by Bill Mollison.

Water Supplies

Rain Water Harvesting has been practiced throughout the world for thousands of years. Rain Water Harvesting (RWH) is a sustainable, ecologically friendly, and cost efficient resource that provides clean potable water for human use and consumption. Using RWH techniques benefit those especially in third world or developing countries and regions where municipalities, sewer lines, and potable water is not readily available. Rain water is a natural resource and it is available for everyone to utilize for their own benefits. By utilizing simple technologies and available resources, clean water supplies can be available to everyone.

*RWH requires 300mm of annual rainfall per year to be operable. Water basins need to be sized according to personal needs.

Rain Water Harvesting as Renewable Technology



Sumatra's Average Annual Rainfall Statistics

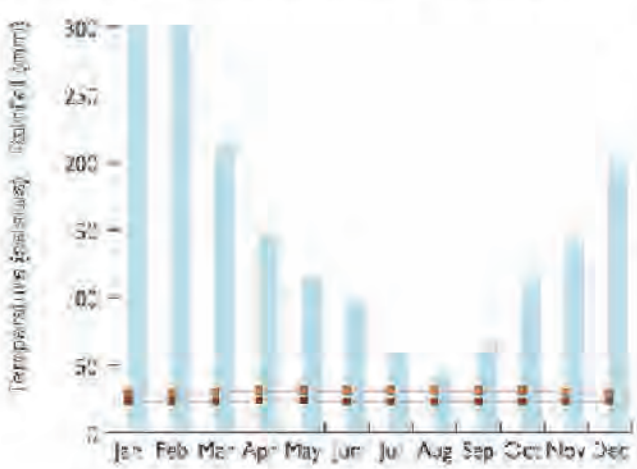
Indonesia Data (Average monthly totals) 2004

Month	J	F	M	A	M	J	J	A	S	O	N	D
Rain (mm)	610	510	330	280	260	180	200	230	220	270	360	460
Temp (°C)	26	26	27	27	27	28	27	28	27	27	26	26

*Information obtained from http://www.burford.oxon.sch.uk

Indonesia lies within zone AEZ 3 according to (WMO) the World Meteorological organization, this is characterized as warm humid tropics. Most of Indonesia has a moist tropical climate, with abundant rains and high temperatures. Annual rainfall ranges from 1000 to more than 5000 mm/yr, with more than 90% of the country receiving average rainfall of more than 1500 mm. December, January, and February are the months with highest rainfall.

Indonesia's Monsoon Season Statistics

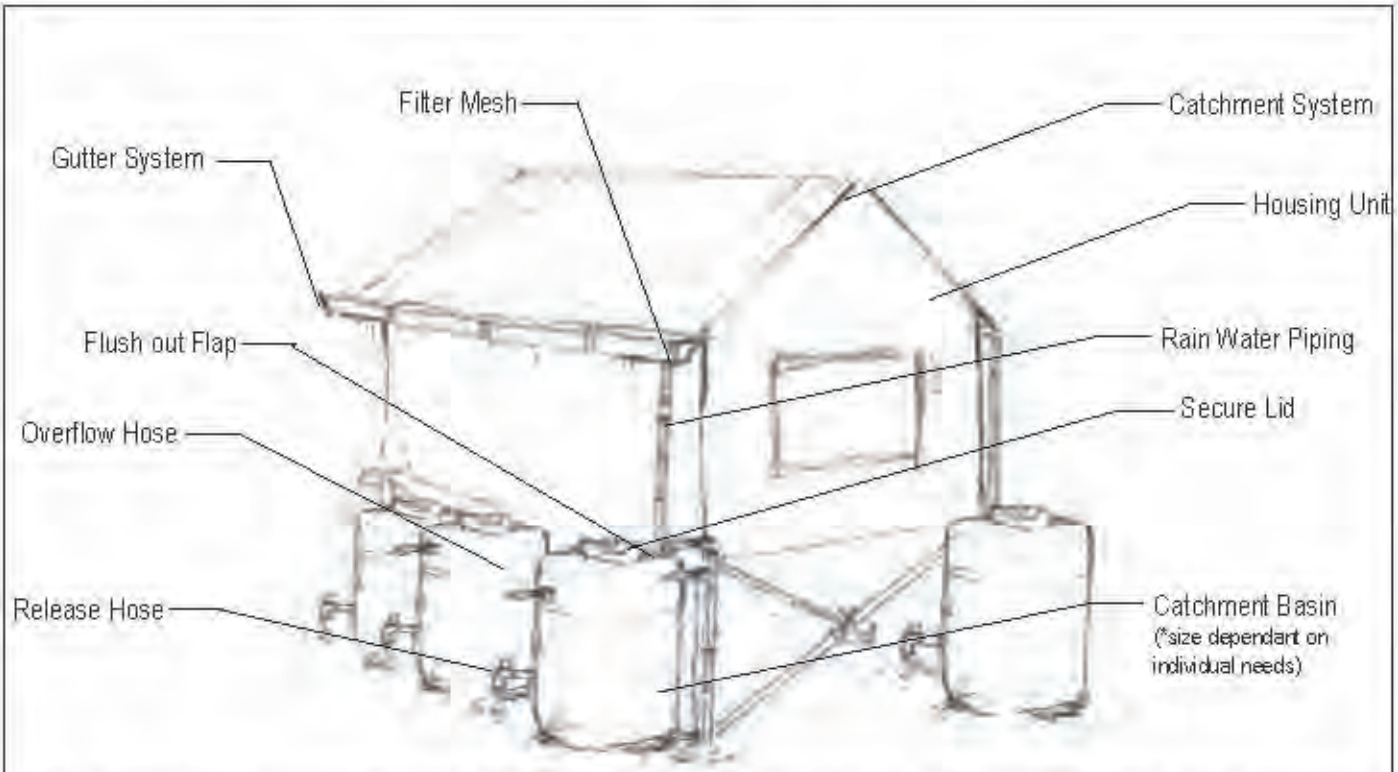


Monsoon Seasons bring great torrential rains through Indonesia. These seasons are typically found between the months of November through to March. With large amounts of rain water obtained from monsoons cisterns provide opportunity to capture potable water. The archipelago is alternately dominated by the north monsoon, blowing from China and the north Pacific between November and March, and the south monsoon, blowing from the Indian Ocean and the Australian continent between May and September. Rainfall is heavy and well distributed around the year almost everywhere in Indonesia. Many places have two wetter periods during the passage of the Doldrum belt; but south-facing coasts and islands south of the equator tend to be wetter during the period of the south monsoon, and north-facing coasts and the northern islands are wetter during the period of the north monsoon.

Water Supplies

SYSTEMS FOR INDIVIDUAL HOUSES

Rainwater harvesting (RWH), through diverted roof water is a technique which has been adopted in many areas of the world especially where conventional water supply systems have failed to meet the needs of the people. It is a technique which has been used since early civilization and examples of RWH systems can be found throughout history. The complexity of this technique is directly related with available materials within a particular region. Depending on toxicity levels in collected water, rainwater can be a resource for potable drinking water, agriculture and household needs.



This diagram shows a complete setup of a (RWH) project affixed to a house. This setup is ideal for one household to use or it can be expanded into a larger unit for the use by multiple households.

1. Materials and Components

Materials needed to create this technology include:

-impervious roofing material
-catch basin to hold water
-piping to channel rain water
-secure lid for basin
-water release hose
- impervious piping to channel rain water
- diversion / gutter system to collect rainwater
-catch basin of impervious material to hold water
-overflow nozzle
-optional-filter meshes and flush-lid

Materials can be supplemented with optional materials that are readily available for a given specific region. Factors that determine material includes cost, availability, and durability.

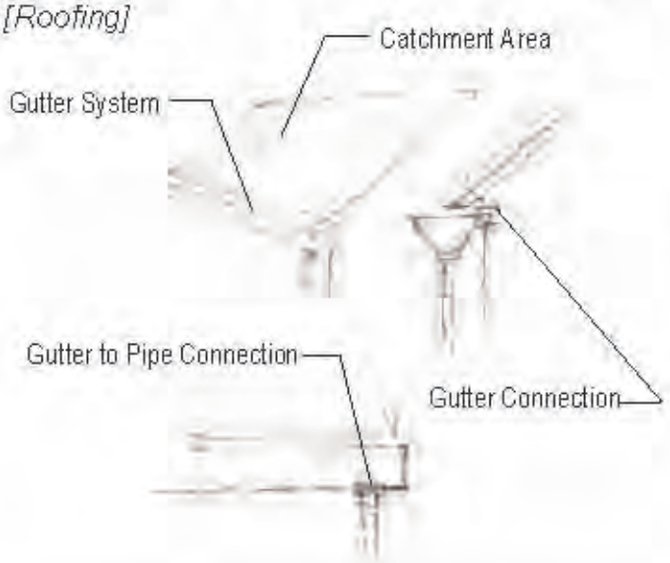
2. Maintenance

Annual maintenance is required for durability and care. Keeping this system operable and sanitary is essential if one is to consume from collected water. Maintenance includes a required cleaning of fallen debris and accumulated debris inside basin. Basins can be cleaned with ordinary water or disinfected with a teaspoon of bleach per 50 gallon containment. Roofs need to be swept regularly and gutters clean of dirt, fallen debris, bird droppings and any accumulated foreign objects. (Continued)

SYSTEMS FOR INDIVIDUAL HOUSES (continued)

3. Installation

[Roofing]

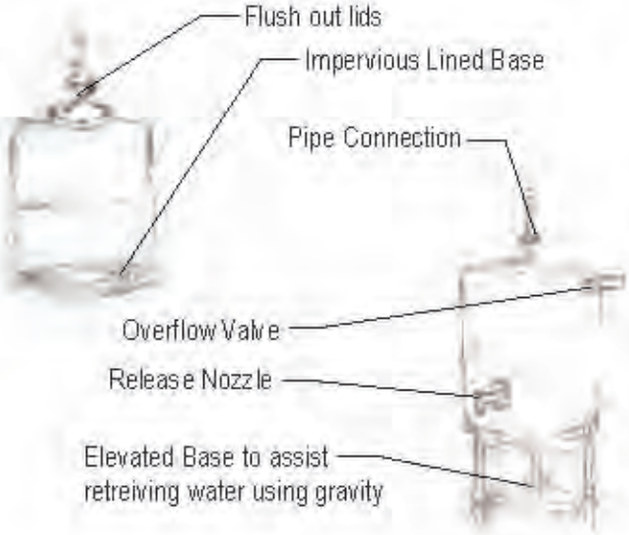


-Roofing material needs to be impervious free and clean of debris and preferably paint free or contaminated free. Any undesirable substances needs to be removed.

-Gutters need to be fastened and secured to roofs with available material.

-Pipe connection needs to be secured to roof structure and pipes need to be graded for proper drainage towards one direction. Connection pipes need to follow same protocol as roofing materials drainage.

[Catchment Basin]



-Flush-out lids are optional for (RWH). This option functions as a extra safety mechanisms that diverts initial rainwater and accumulated debris away from the basins.

-Impervious material needs to be a part of the drainage basins base. Having an impervious material lining catchment basins prevent water loss through absorption and infiltration.

-Overflow valves connected near the top of the basin ejects any water that exceeds the basins maximum capacity.

-Place release nozzle a few inches above base of catchment basin. This prevents debris that has settled to be transferred to water source.

[How to connect components]

-Connect roofing material to gutter system

-Connect gutter system to piping

-Connect piping to flush-out flap

-Connect overflow nozzle into

-Secure lid

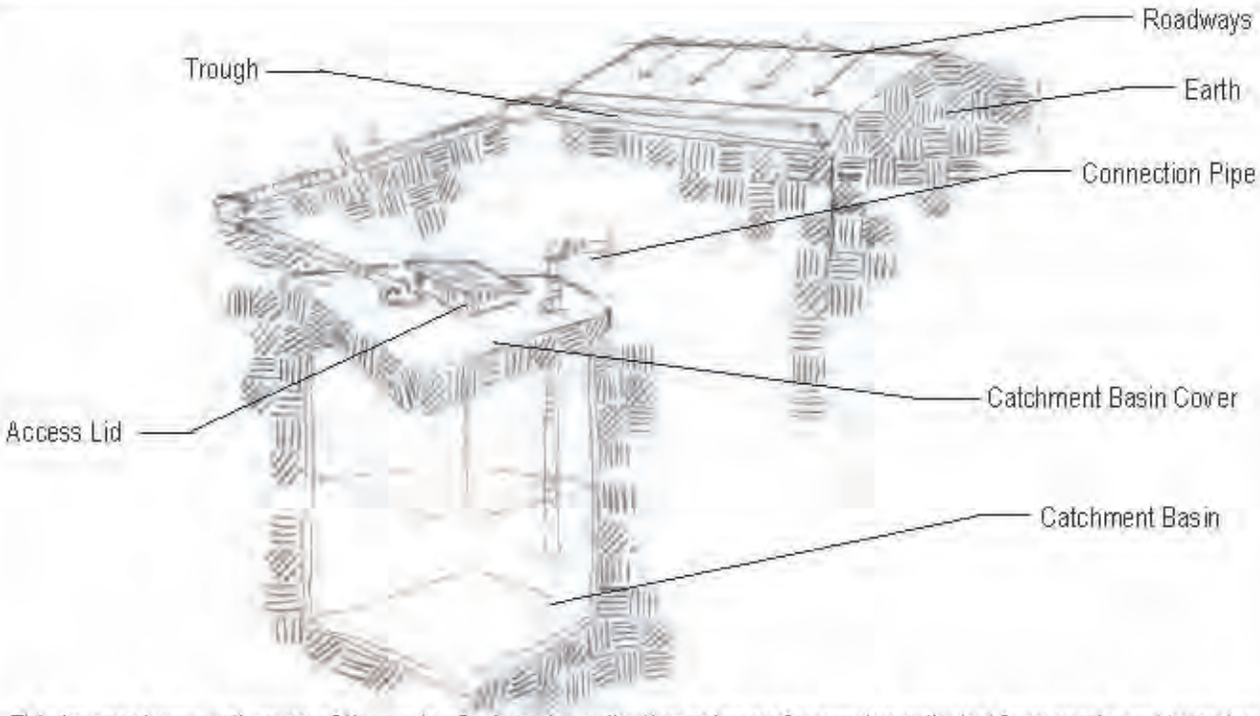
-Connect release nozzle

These images showthe connectivity diagram of all components and parts required to build a standard (RWH) system. Optional alternative materials can be used to supplement suggested materials in diagram.

Water Supplies

AGRICULTURE AND FARMING

Rain Water Harvesting (RWH) can be applied to many different levels of usage. Agriculture and farming practices depend heavily on the use of water. Water often times can be scarce, especially when structural conveyances of water are damaged, specifically conveyances from municipalities. Shortly after disasters or during times of drought, self sustainable harvesting can be crucial for the life support of a community. (RWH) provides farmers and agriculturalist to use alternative techniques in obtaining water.



This image shows a diagram of the cycle of rain water collection using surface water collected from roads and large land surfaces. This form of (RWH) collects large massive amounts of water and requires large amounts of land to be fully achievable. *depending on toxicity levels from collection surface areas. Water collected from systems such as these are not recommended for drinking, strictly due to possible levels of petroleum based chemicals.

1. Materials and Components

Materials needed to create this technology include:

- impervious surfacing material
- trough system to collect water
- piping to channel rain water
- catch basin to hold water
- lids for accessibility and maintenance
- water release valve
- optional filter meshes to filter and pumps to obtain water from basins.

Materials can be supplemented with optional materials that are readily available for any specific region. Factors that determine material includes cost, availability, and quality of given material.

2. Maintenance

Issues of maintenance have been described throughout the pamphlet. The most important maintenance issue is keeping basins clean. Steps to keeping basins clean include:

- Removal of debris in basins
- avoidance of contamination of water in basin by obtaining secure lids
- removal of dirt and debris
- annual cleaning of retention basin
- removal of debris from catchment areas

These maintenance issues are relatively quick and low in cost. Basins can be cleaned with one teaspoon of bleach to every 50 gallons of water.

AGRICULTURE AND FARMING (continued)

4. Process

Applying the concept of a continuing recycle of water increases the amount of sustainability practiced and increases the renewability of rain water collection.

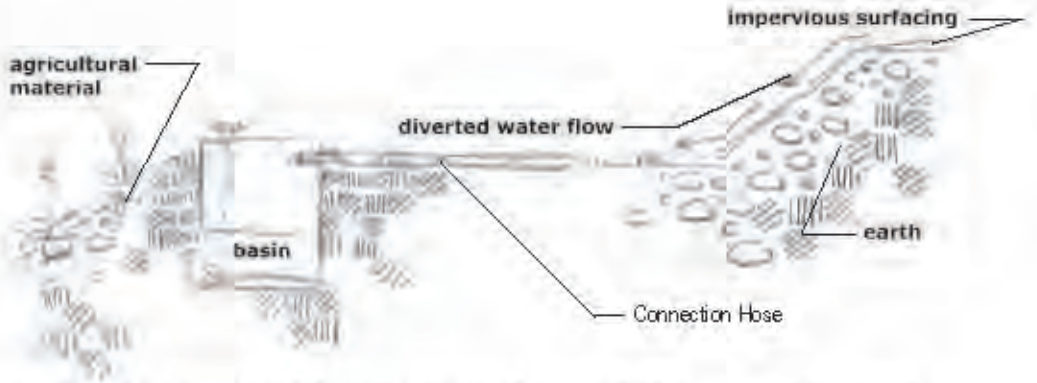


*image shows prototypical design layout of rainwater diversion. Please adjust techniques according to regional landscape, available material, and specific circumstances.

1. Collecting water from the impervious surfaces.	2. Divert water flow in trough systems and guide water to appropriate areas.	3. Water is diverted from trough system into piping system and then into basin system	4. Obtain water from basin-retention area and utilize water to agricutlureal needs.

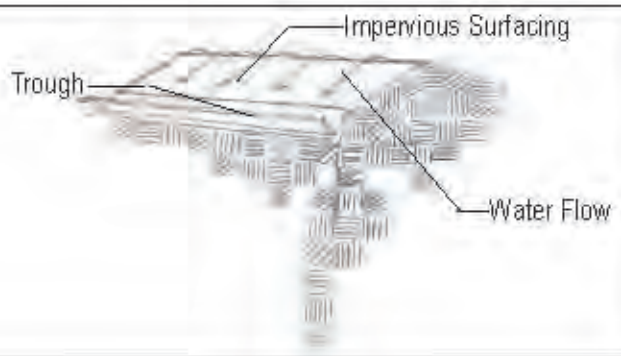
AGRICULTURE AND FARMING (continued)

3. Installation

Installation programs start with education. Educating those who will utilize this knowledge and apply it to actual construction is the most important aspect of installation. Educating people with the knowledge of how to build an organic purification and rainwater catchment machine builds a sense of community and ownership. This also trains people in understanding how green technologies work. This also instills the community a sense of ownership which helps promote maintenance. Having community members construct these structures saves money on labor and maintenance cost.

[Rain Water Catchment areas]

Roads provide large surface areas where (RWH) can occur. This collection technique utilizes water that would otherwise not be used.



[trough section]

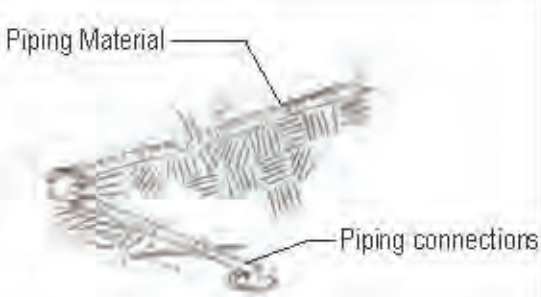
Building structures such as these is optimal for having them run for miles and miles. The larger the structure the more rainwater can be collected. The more rain water collected the less reliability on municipal water source is needed.

[retention basins]

Large retention basins benefit farmers. Constructing basins at large scales can supplement irrigation needs of farmers for up to three months. Build retention basins as large as possible and according to personal needs.

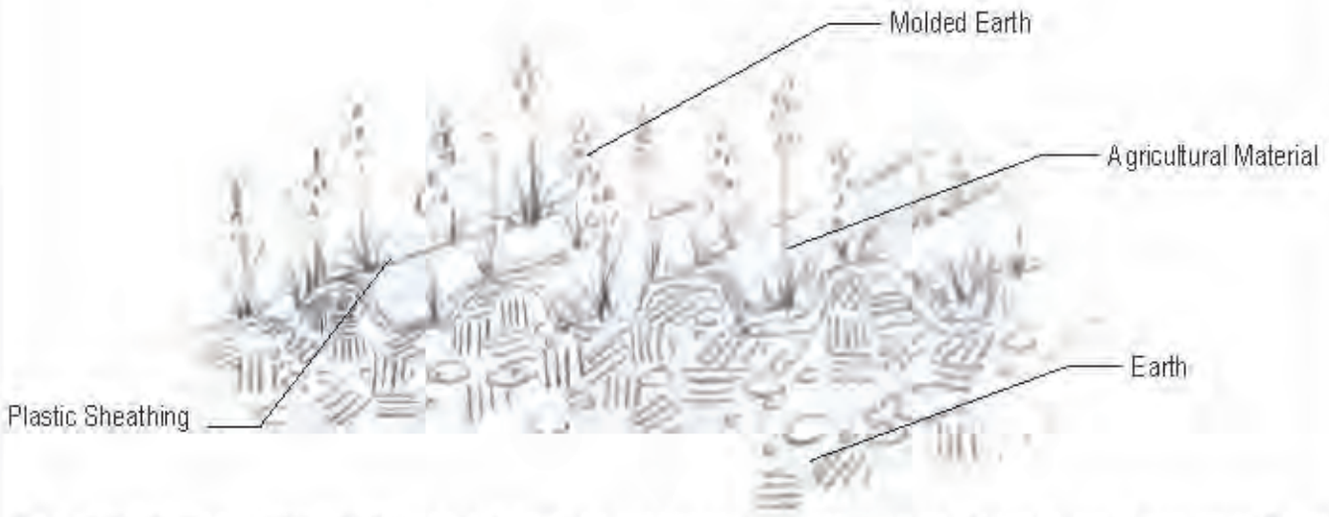
[piping]

Piping is essential for the transportation of water from retention basins. Using sturdy material is important to prevent moisture loss through seepage and leaks.



FARMING TECHNIQUE: SHEATHING MOUNDS

Rain Water Harvesting (RWH) can be applied to many different levels and scales in agriculture. Agriculture and farming practices depend heavily on the use of water. Water often times can be scarce for many reasons especially after disasters or during times of drought. During these times, self sustainable harvesting can be crucial for the life support of a community. (RWH) provides farmers and agriculturalist to use alternative, more efficient techniques in obtaining water.



This image shows a diagram of a farming technique that encourages more accumulation of diverted agricultural water. These earth forms maximizes the amount of water in a given agricultural plot. The formation of earth mounds converge water flow and divert water into a specific direction.

1. Materials and components

Materials needed to create this technology include:

-impervious surfacing material. Long sheets preferred; plastic sheeting recommended
-earth molding tools
-piping to channel collected run-off
-optional basins to catch run off water

Materials can be supplemented with optional materials that are readily available for any specific region. Factors that determine material includes cost, availability, and quality of given material.

2. Maintenance

Maintenance issues are relatively minimal with agricultural techniques such as this one. Maintenance issues include:

-removal of debris on molded earth
-avoidance of invasive non-agricultural plants
-removal of large rocks or debris that prevent infiltration
-annual cleaning of sheathing mounds
-reformation of disturbed molded earth

These maintenance issues are relatively quick and low in cost. Basins can be cleaned with one teaspoon of bleach to every 50 gallons of water.

FARMING TECHNIQUE: SHEATHING MOUNDS

3. Installation

Installation of these techniques requires in-situ training with farming communities. Techniques such as these have been practiced for thousands of years. In many cases, these techniques have either been forgotten about or abandoned over time. By providing education and training, these old techniques can be used once again.

[Side view]

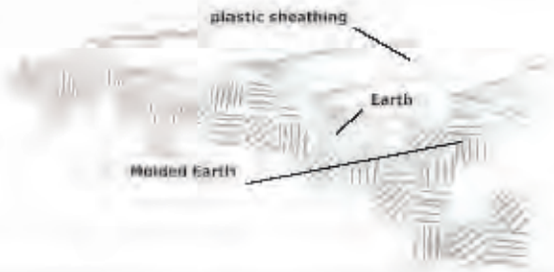
This image shows an enlarged section of the earth form and directional flow of the rainwater and or irrigation water. Plants planted on the top of the trough retain less water due to gravity that pulls the water away from the higher points.

-Molding Earth into an inverted U shape between agricultural plats forms runoff space.

[Side view]

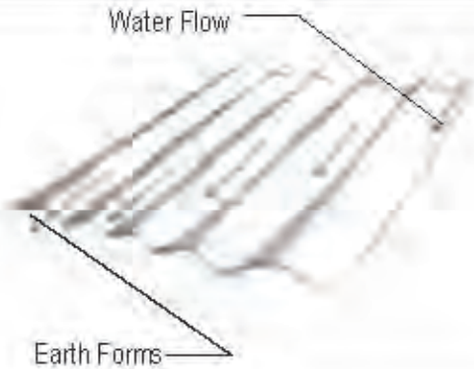
Catchment areas are created in undulating spaces between landforms. These small landforms channel water movement.

-Plastic sheathing or impervious material line molded earth forms to direct more water and runoff capabilities.



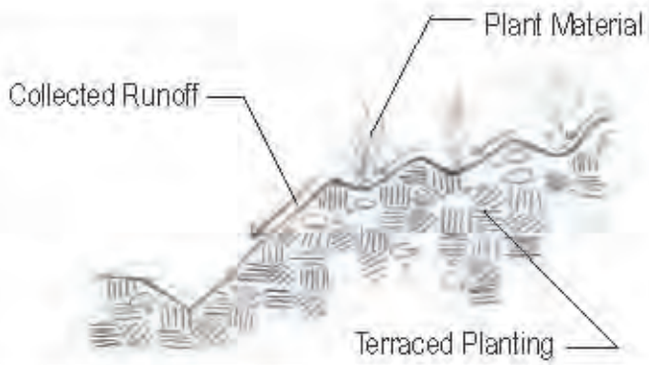
[Water movement]

Less water is needed for irrigation due to the concentration of water into diverted areas. This diagram shows the next step that can be taken to increase water collection. Water runoff from un-infiltrated water can be directed by sloping the land and diverting runoff water into a concentrated area.



[Elevated View]

Combining this process with the techniques of using a trough to recycle any water runoff from these landforms maximizes the potential harvesting of rain water and surface runoff. After collection or runoff water, water can be diverted into retention basins and used again in agriculture.



Water Supplies

THE LIVING MACHINE

materials and components +
maintenance +
installation +
renewing a resource +

Recycling rain water through (RWH) techniques does not stop after utilizing water only once after it is recycled. The living machine, through aquatic remediation furthermore enhances the green technology in obtaining water. After collected rain water is used once, the gray water can be recycled once more in a "living machine" type system, which allows people to use water once again, specifically for agriculture, to flush out waste water and even more houshold consumption needs. Water can be directly poured into baisns are retained through large catchment areas.

This diagram shows a filtering system called the "living Machine". This process of recycling used water collected from (RWH) systems furthermore utilizes green technology. This system uses aquaculture to mediate toxins found in water and help purifies gray water.

1. Materials and Components

Materials needed to create this technology include:

-impervious surfacing material
-catch basin to hold water
-piping to channel rain water
-release nozzle
-water release hose
-catchment/basin system to collect water
-gutter system to collect rainwater
-catch basin to hold water
-transfer Nozzle
-optional-filter meshes

Materials can be supplemented with optional materials that are readily available for a given specific region. Factors that determine material includes cost, availability, and durability.

2. Maintenance

Issues of maintenance will be found throughout the pamphlet. The most important maintenance issue is keeping basins clean. Steps to keeping basins clean include:

-removal of overgrown and plants in basins
-avoidance of algae growth
-removal of mosquito larvae
-annual cleaning of retention basin
-removal of debris from catchment areas

Basins can be cleaned with one teaspoon of bleach to every 50 gallons of water.

financial
human
social
physical
natural

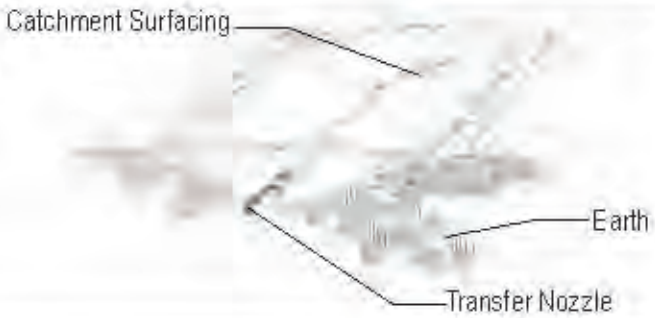
THE LIVING MACHINE (Continued)

3. Installation

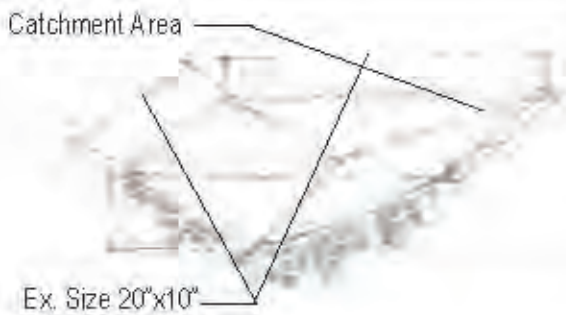
Installation programs start with education. Educating those who will utilize these technologies and apply it to actual construction is the most important aspect of installation. Educating people with the knowledge of how to build an organic purification and rainwater catchment machine builds a sense of community and ownership. This also trains people in understanding how green technologies work. This also instills the community a sense of ownership which helps promote maintenances. Having community members construct these structures saves money on labor and maintenance cost.

[Rain Water Catchment areas]

This system requires rainwater or gray water to be collected into an initial holding area. These areas can often times require large amounts of space to retain water. Catchment areas and holding tanks need to be free of debris and contaminants.

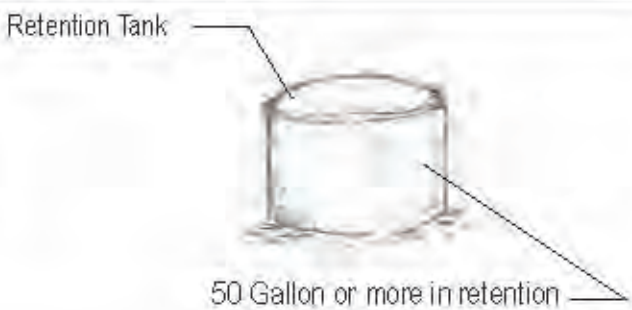


When using the living machine as a catchment technology, catchment areas need to be large enough to capture as much water as possible during any given rain storm. These areas need to be approximately 20' by at least 20'



[Basins]

Water basins can be constructed out of any container that will hold large amounts of water. Containers need to be preferably large enough to hold 50 gallons of water or more. Containers made of plastic ,clay, or concrete are more efficient than other materials. Having community members construct these basin structures dramatically reduces the cost of implementation.



An option that helps reduce levels of toxic contamination in the water can be mediated through aquaculture. Selecting plants that specifically live in wet environments or in anaerobic conditions is desirable. Plants will vary depending on region, location, and climate. Utilizing aquatic plants that synthesizes toxin levels in water is vital to aquaculture rendition to work. Finding plants within a local region is mandatory for plant survival.

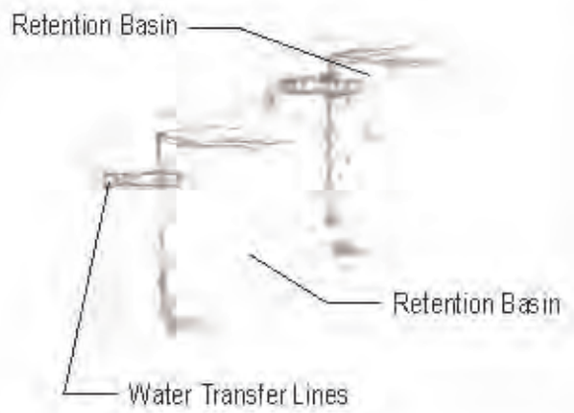
CAUTION: open water or standing water acts as breeding grounds for mosquitoes and their larvae. It is important to continually check water and water structures. Clean accordingly or do not leave water standing.

THE LIVING MACHINE (continued)

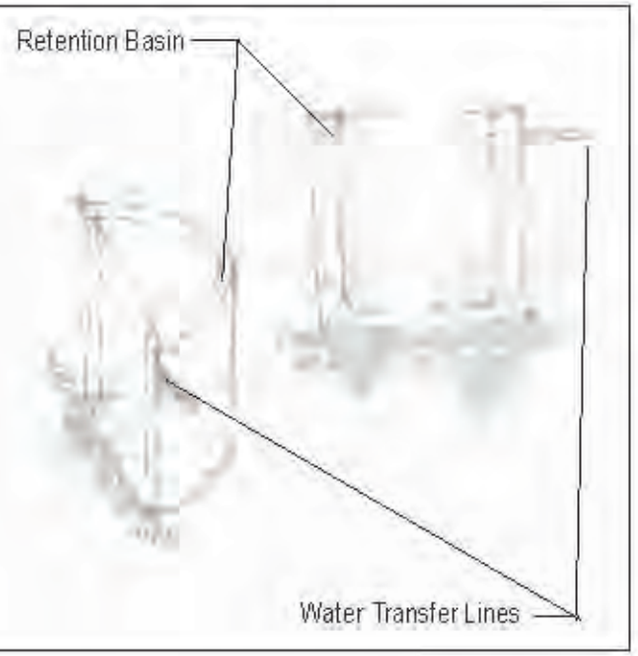
[Basins Continued]

Water transfer from basin to basin is important in the aquaculture re-mediation process. Theoretically as water is transferred from barrel to barrel more toxins and or contaminates are removed from the retained water. Having clear distinguished basins and distinguishing purification levels help minimize contamination of old water to newly processed water in adjacent basins.

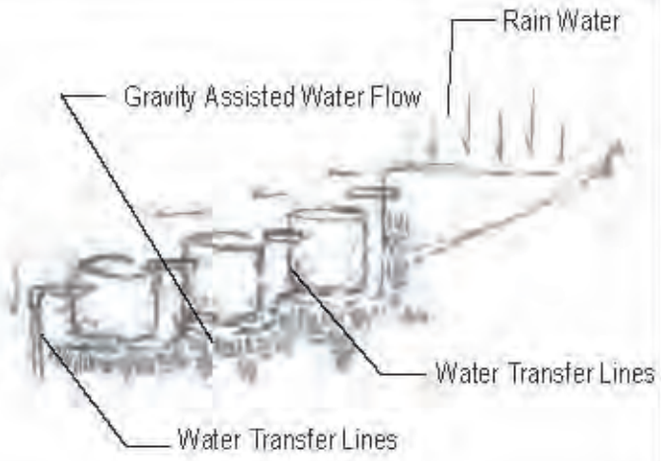
-Connect water transfer hoses away from base of basin
-Retention basins can be placed as near or as far as transfer lines will reach



This image shows a cross section of a basin. Basins can be made of any non pervious material that can withstand holding more than at least 50 gallons of water. This ensures that there is enough water to be used after the purification process. Purified water should be used for household purposes only. Consuming water after purification process is not recommended.



This diagram shows the use of gravity to convey water. This procedures eliminates any and all manual work, work from this system in the re-mediation process. Using elevated heights allows for proper flow and water movement. The more movement within the basins the less likely the basins will turn into mosquito breeding grounds. Water Transfer lines connect purified water into basin for later use. Covered secured retention is important to avoid further contamination.



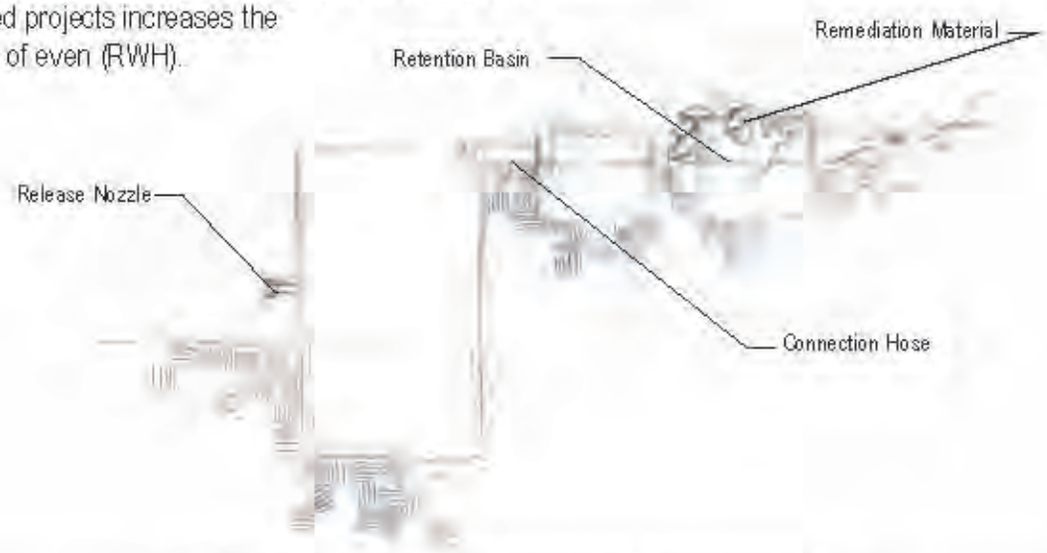
financial
human
social
physical
natural

Water Supplies

The Living Machine (continued)

[Renewing a Resource]

Connecting technologies from farming to water sources for village scaled projects increases the renewability of even (RWH).



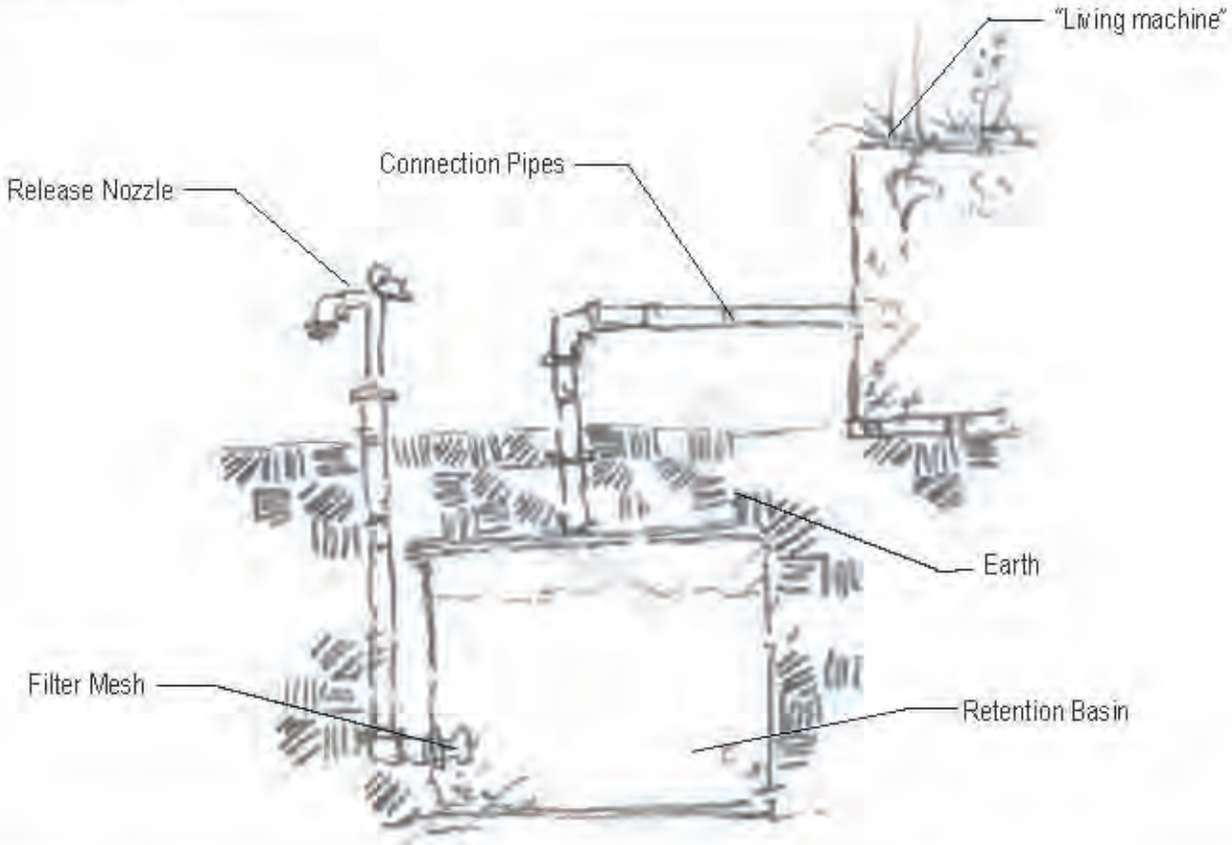
*(Please See pamphlet labled "Living Machine" for more information.)

1. Landscape agriculture in terracing format and allow for run-off to flow into one direction.	2. Collect water from run-off through trough systems and collect in basins.	3. To further recycle harvested rain water, allow divereted water to enter "living machine" like structure.	4. Filter Water through natural purification process and continue to use water until released back into watertable.

Water Supplies

The Living Machine (continued)

[filtered retention]



1. Collecting water from the source and begin to put through purification process	2. Process water through aqua purification and decontamination process. Allow for water to be processed.	3. Direct water to basin located above/below ground. Underground tanks are less susceptible to being contaminated.	4. Use mechanical pump or hand pump to obtain water and reuse for household or agricultural needs.

Retention after re-mediation is important. You can either use underground retention areas or above ground retention ares. Feeding water from the basins into a retention area of choice helps secure water from contamination.

-Having Water filtered and immediately transferred into a retention area is important in preserving overall water quality.

-Having water channeled into a non-exposed protected basin ensures that contaminates and other debris do not effect the water quality.

-Having underground basins further protects retained water.

-Basins above ground are susceptible to being tampered with or moved to where collected debris in the water is stirred.

Supplemental materials can be used to replace any suggested materials in the pamphlet. Local or regional materials can be used as long as materials are dependable and as of sustainable quality as suggested materials.

Agriculture + Forestry

"Participatory forestry refers to processes and mechanisms that enable those people who have a direct stake in forest resources to be part of decision-making in all aspects of forest management, from managing resources to formulating and implementing institutional frameworks. More specifically, community forestry refers to a component of participatory forestry that focuses on local communities as key stakeholders for sustainability." -www.fao.org

supporting agroforestry +
3 different strategies +
context +

financial

human

social

physical

natural

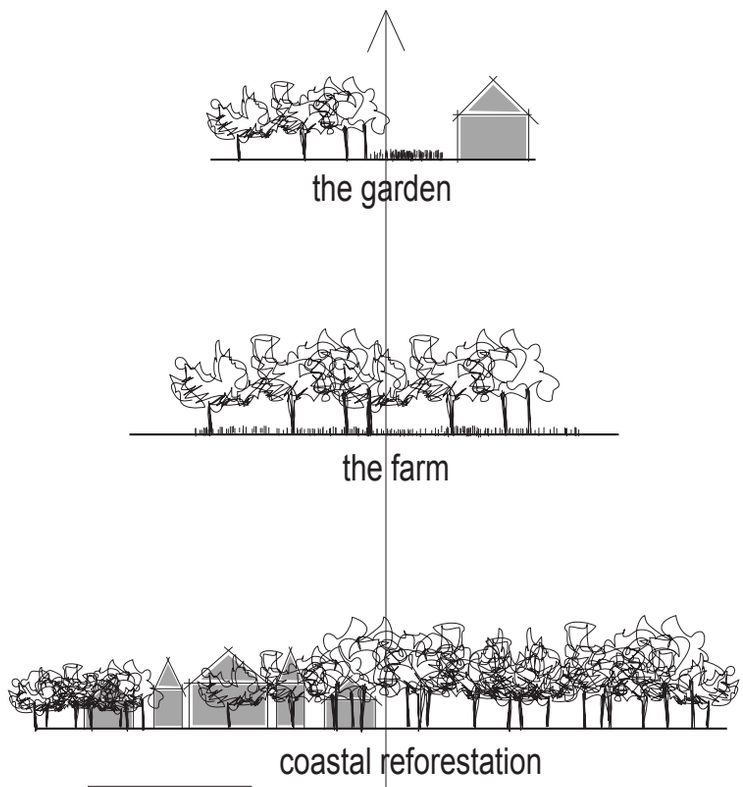
Supporting Agroforestry

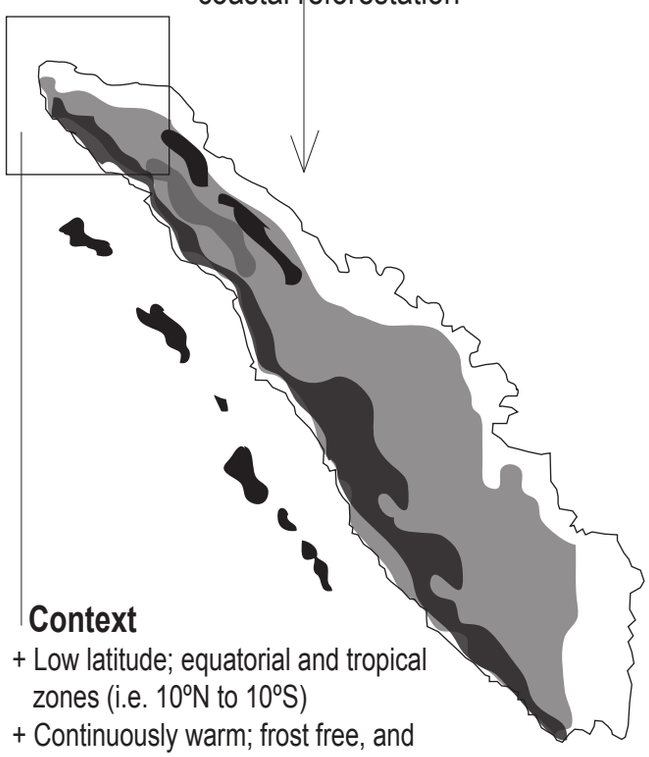
The December 26, 2004 tsunami destroyed Indonesia, and and more specifically, Aceh's primary sources of livelihood – agriculture. However, it is also necessary to acknowledge the physical and ecological degradation of the land and its resources due to poor agricultural practices even prior to the destruction from the tsunami, including a long history of slash-and-burn, illegal logging of timber, monoculture plantations, and shifting cultivation. Along with the devastating loss of habitats and lowland forests from the tsunami, it is now critical to implement and adopt more sustainable and community-oriented methods in the management of their natural resources.

Individuals and communities have the opportunity to re-establish lost forest systems by making small efforts such as planting fruit trees alongside their gardens. To create more substantial forested areas, shelterbelts can be planted adjacent to farmlands, and coastal reforestation projects that support local industries, resources, and coastal biodiversity. These projects can be implemented within the local communities or with the aid of facilitators such as NGOs and government agencies.

The Garden, **The Farm**, and **Coastal Reforestation** represent the 3 different community agroforestry plans which demonstrate the different scales in which the local community can manage and directly benefit from reforestation. Each plan looks at how both the private landowner and communities can practice sustainable agroforestry practices as a means to regreen, increase biodiversity, minimize and mitigate further soil degradation, and promote social and economic recovery. These plans also provide useful planting techniques that can be applied to the lowland areas of the Aceh Province.

These reforestation strategies can be applied simultaneously or independently, depending on the needs of its respective community. And each suggestion can be evaluated and adopted based on specific site conditions, community needs, and resource availability.





Context

+ Low latitude; equatorial and tropical zones (i.e. 10ºN to 10ºS)
+ Continuously warm; frost free, and approximately 1000cm of annual rainfall.

Agriculture + Forestry

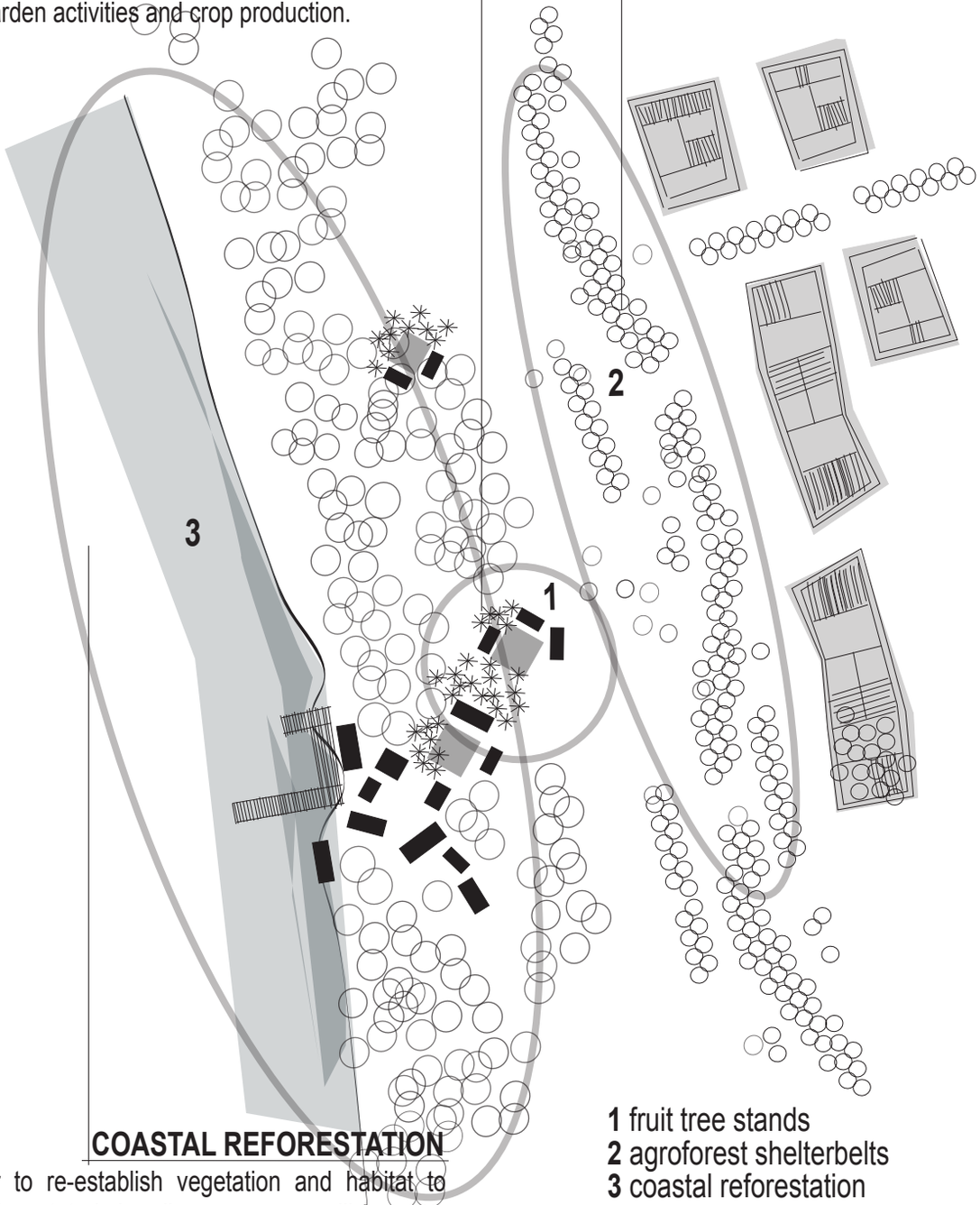
Community-oriented reforestation and environmentally sensitive agricultural practices can occur at 3 different scales and/or land uses.

THE GARDEN

Incorporate fruit tree stands adjacent to private and community garden spaces to add vegetative complexity to the site and provide additional resources to complement garden activities and crop production.

THE FARM

Establish agroforest shelterbelts alongside farmlands to supplement and replace agricultural activities, provide windbreaks, and discourage the necessity of shifting cultivation. Shelterbelts help to reduce wind speed, prevent wind erosion, provide areas of shelter and shade.



COASTAL REFORESTATION

In order to re-establish vegetation and habitat to Aceh's devastated shoreline, a program will focus on the maintenance of protected swaths of coastal forest adjacent to development and establish community-based forest management practices.

1 fruit tree stands
2 agroforest shelterbelts
3 coastal reforestation

See http://courses.washington.edu/larescue/jenn/design.htm for more in-depth information and resources

The Garden

Phase I [0-6 months] **: Container Planting**
Phase II [6 months - 3 years] **: Transplanting into Permanent Communities**
Phase III [3-5 years] **: First Harvest**
Phase IV [5+ years] **: Full Garden Production**

goals +
planting fruit trees +
techniques & plant list +
economic benefits +

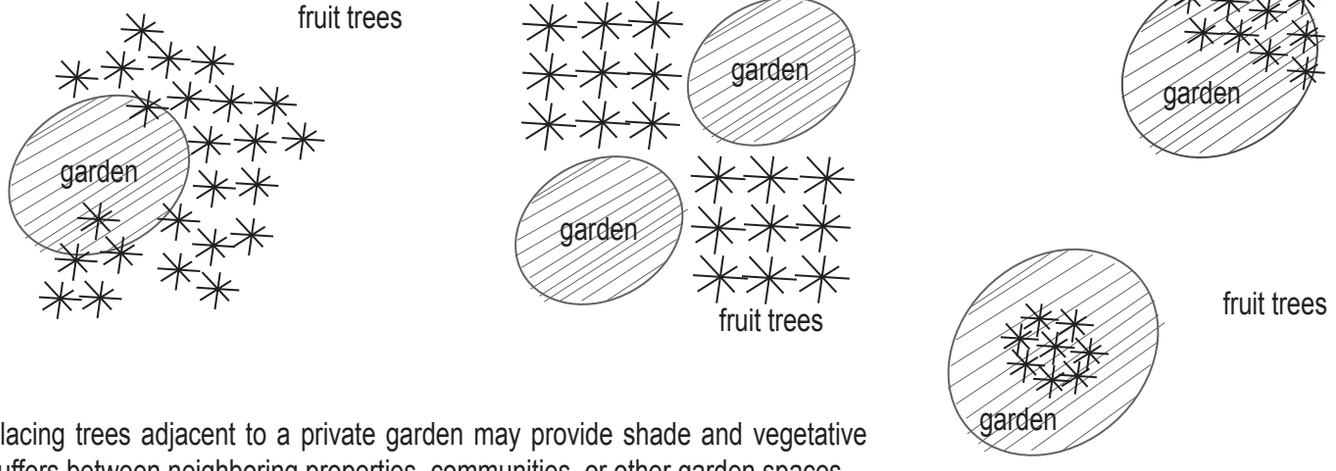
Fruit Tree Stands

Goals

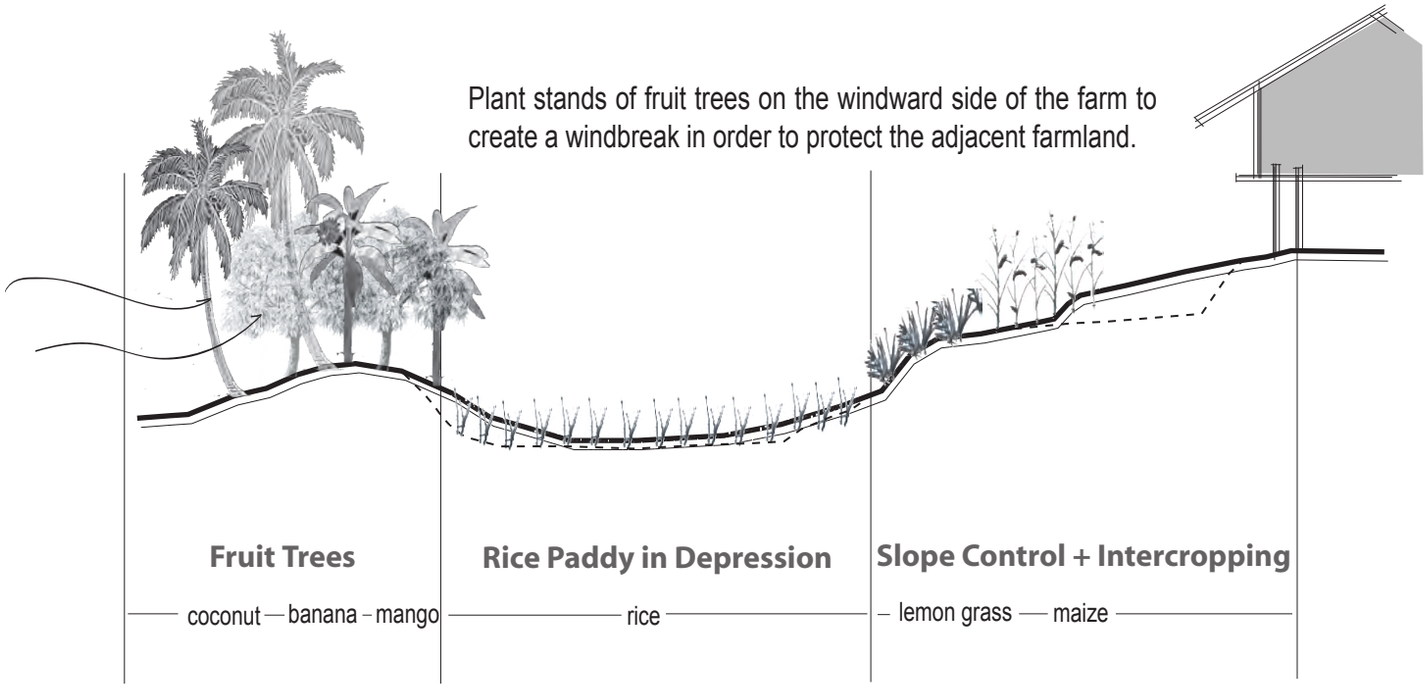
Incorporate fruit tree stands adjacent to private garden spaces to add vegetative complexity to the site and provide additional resources to complement garden activities and crop production.

Planting Fruit Trees

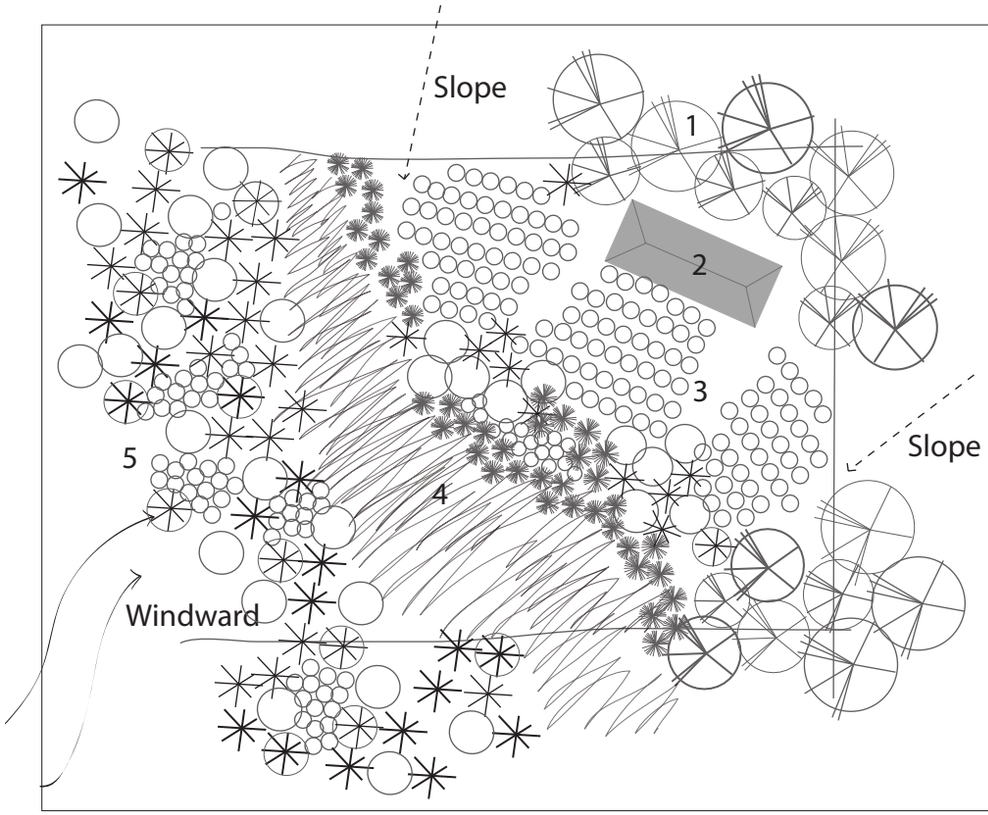
Fruit tree stands may be planted in a variety of forms that depend on the relationship between the garden and its immediate context. Planting in dense clusters establishes a distinct canopy and has the potential to support biodiversity in the understory.



Placing trees adjacent to a private garden may provide shade and vegetative buffers between neighboring properties, communities, or other garden spaces.



The Garden



1 Vegetation surrounds house or community structure to stabilize slope and infiltrate runoff

2 Shelter roof collects rain water to storage tank

3 Contour Plowing Intercropping + Crop Rotation + Fallow

4 Rice paddy planted at the lowest elevation of the site

5 Fruit tree stands

Techniques

SOIL

Short Term: A simple and low cost technique to soil desalinalization at the garden scale is labor-oriented tillage of clean, coarse materials into the soil in order to promote saline drainage. Fast growing legumes should be planted to provide organic matter, fix soil nitrate level, and provide a cheap and easy source of protein to the community.

Long Term: Intercropping and crop rotation should be implemented to maintain soil nutrients. Green mulch helps to build healthier soil and control invasives while enhancing garden productivity.

WATER

Short Term: Supply of irrigation water might not be sufficient before any clean water well or storage plant is restored / established. Rain barrels or other collection devices can be used to collect irrigation water if there is a lack of clean water available.

Long Term: Effective mulching techniques should be considered to maintain long-term soil moisture. On slopes, more drought tolerant species should be planted uphill and more water-dependent species such as rice should be planted in depressions, valleys, or foothills.

Planting List

Plant low maintenance fruit trees that can be cultivated in low and medium elevations. The following list of fruit trees can be customized according to the demands of the land and its respective communities.

Mango - Mangifera indica [Mango]
Soursop - Annona Muricata [Soursop]
Starfruit - Averrhoa Carambola [Starfruit]
Jambu Air - Sizygium Aquem Merr & L.M. Perry




Economic Benefits

To produce a larger variety of non-timber products (e.g.fruits) that can be harvested throughout the year for self-consumption or sale in the local markets.

The Farm

Phase I [0-2 years] **: Site Selection + Intercropping**
Phase II [2-7 years] **: Shelterbelt Planting + Crop Rotations**
Phase III [7-15 years + beyond] **: Integrating Agroforests + Farming**

goals +
how to create a shelterbelt +
techniques & plant list +
economic benefits +

financial
human
social
physical
natural

Agroforest Shelterbelts

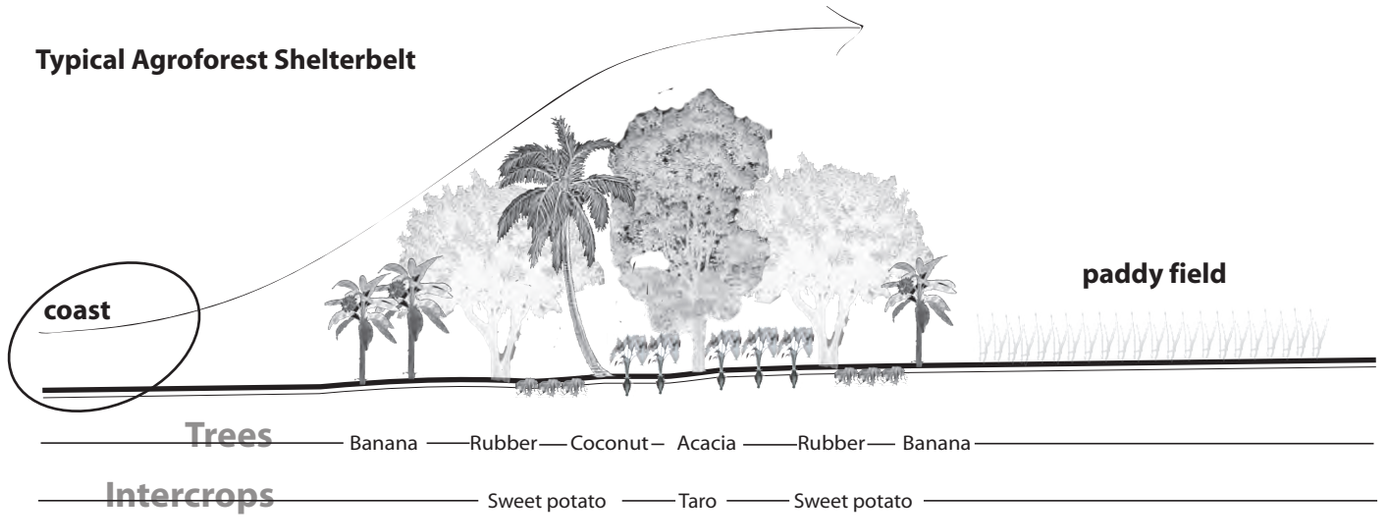
Goals

Establish agroforest shelterbelts alongside farmlands to supplement and replace agricultural activities, provide windbreak, and discourage the necessity of shifting cultivation. Field Shelterbelts reduce wind speed and prevent wind erosion, provide sheltered areas, and provide shade. The practice also provides more diverse agricultural products to improve local economy.

Typical Phases of Growth of a agroforest shelterbelt:

Phase I : quick changes and growth of shrubs and intercrops.
Phase II : trees begin to develop and shade out non-woody species. shade tolerant species can be established.
Phase III : trees mature and forest canopy develops. shelterbelt form establishes.
Phase IV : forest canopy can reach up to 35 meters

Typical Agroforest Shelterbelt



How to create a shelterbelt?

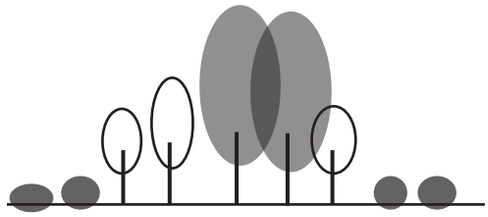
Height and Density : Dense shelterbelts that include tall standing trees of large, evenly dispersed canopies.

Row Design + Spacing : Plant 2-4 rows of taller tree species near the center of the shelterbelt to achieve an effective windbreak. Shelterbelts do not necessarily have to take up large portions of land, but biodiversity increases with the width of the shelterbelt. It is suggested that rows should be spaced at 2 to 4 meters apart. Low growing intercrops can be planted between rows to retain moisture.

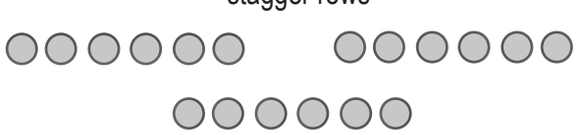
Species Composition : Species selection determines the success of shelterbelts. It is important to choose native tree species of appropriate hardiness, foliage, uniform canopy, and good branch retention for taller species that occupy the center (windbreak) of the shelterbelt. Smaller trees and shrub species should be planted on the outer edges of a belt.

Intercropping : Intercropping techniques can be implemented between tree rows to encourage agroforestry practices within a shelterbelt while supplementing agricultural revenue.

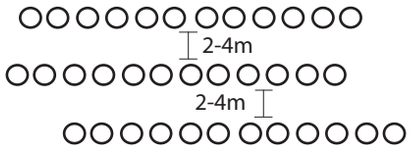
tall trees near center



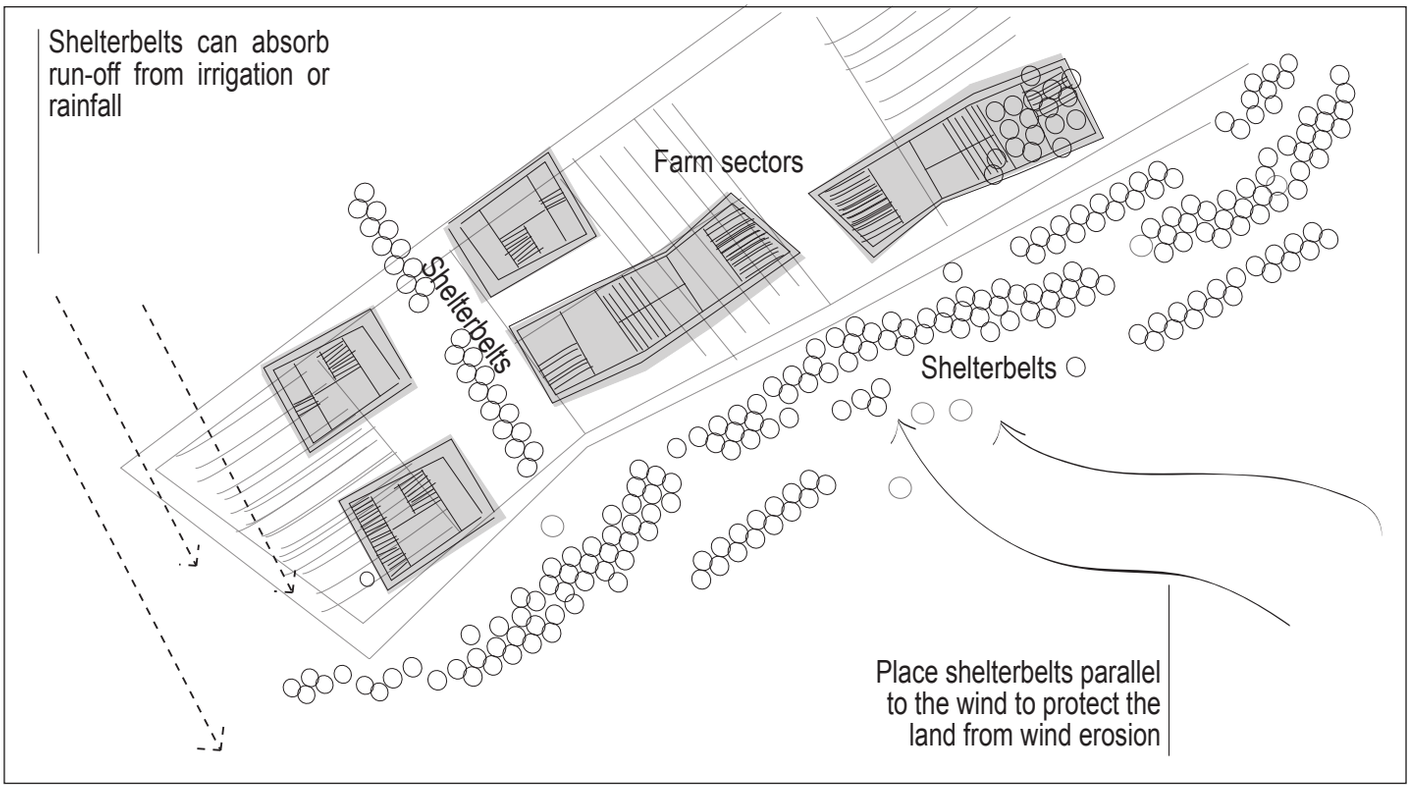
stagger rows



sufficient spacing



The Farm



Techniques

SOIL

Short Term: At the farm scale, machines like a mechanical roller/tiller should be considered to mix coarse materials intothe soil to improve drainage (site and salt content specific).

Long Term: Intercropped shelterbelts should be planted along windward periphery to slow runoff, check soil erosion and invasives, and to promote soil nutrients through intercropping and green mulching. When land is left fallow, controlled and productive species should be introduced to replenish soil nutrientsas well as substitute and discourage traditional slash-and-burn practices.

WATER

Short Term: The size and shape of the farm, the slope, and and the orientation of planting beds should all be considered to collect runoff and minimize surface evaporation (open water surface under tree canopy). On slopes, more drought tolerant species should be planted uphill, and more water demanding species like rice should be planted in depressions, valleys, or foothills.

Long Term: Matching plant selection to site conditions reduces the need of long-term irrigation. Microtopography such as depressions or trenches helps to trap irrigation or drinking water. Maximize vegetation coverage to promote extensive and consistent infiltration rate and groundwater recharge.

Planting List

The following tree species function successfully within a shelterbelt and/or common coastal and lowland species that will contribute to the reestablishment of lowland forest systems.

Trees:	**Intercrops:**
Rubber Tree - *Ficus elastica*	**Phase I and II:**
Sumatran Pine - *Pinus merkusii*	+ Sweet potato, Soybean
Coconut tree - *Cocos nucifera*	+ Cinnamon, Rice, and
Acacia - *Acacia mangium*	+ Leguminous crops
Durian - *Durio zibethinus*	(e.g. Groundnuts)
	Phase III +:
	+ Maize, Cocoa, Taro
	+ Banana, Nutmeg, Clove
	+ Pineapple

Other intercrops that have a varying degrees of shade tolerancy (less shade tolerant in the beginning phases of the shelterbelt, and intercrops with higher shade tolerance as the canopy develops) will provide a sustainable environment to retain moisture and prevent invasive growth along the understory.

Economic Benefits

On top of basic crops from farms, shelterbelts would provide non-timber products such as fabrics, fruits, annual crops and firewood to maximize overall revenue for local communities year-round and improve the standard of living.

Coastal Reforestation

phase I [0-2 years] **: Rebuilding Coastal Communities**
phase II [2-5 years] **: Establishing Young Coastal Forests**
phase III [5-8 years] **: Harvesting Young Coastal Forests**
phase IV [8+ years] **: Coastal Forests Matured**

Coastal Economy + Biodiversity

Goals

Use large-scale planning strategies to identify and reclaim coastal community land in order to establish and preserve coastal forests, mitigate coastal erosion and re-establish coastal habitat in order to sustain aquaculture.

In order to re-establish vegetation and habitat to Aceh's devastated shoreline, a program will focus on the maintenance of protected swaths of coastlines as agroforests adjacent to coastal development in order to improve forest management and community economy.

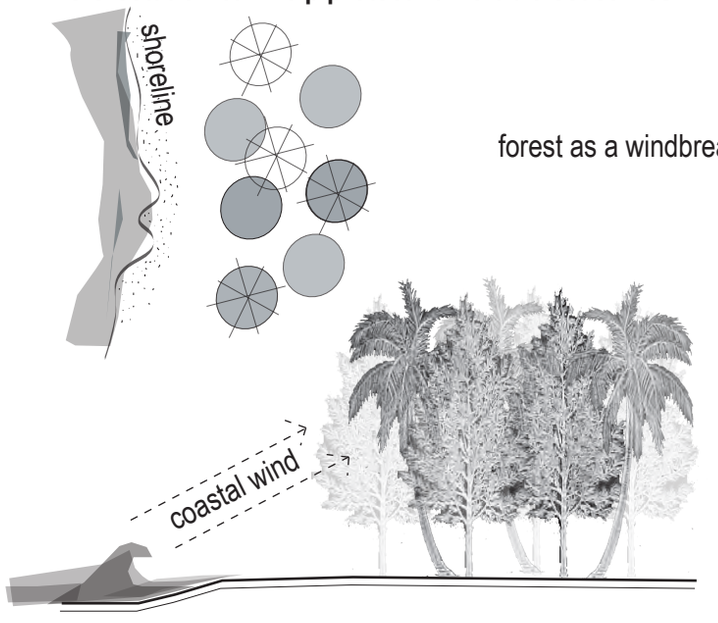
Short-Term Program :

+ Delineate reforestation areas adjacent to coastal development and communities
+ Tree Propagation
+ Building of coastal infrastructure
+ Establish community ownership of coastal forests

Long-Term Program :

+ Coastal forests to function as a landscape buffer and productive agroforest.
+ Establish and preserve sustainable coastal ecosystems.
+ Integrate forestry management practices in coordination with other coastal industries and sources of livelihood.

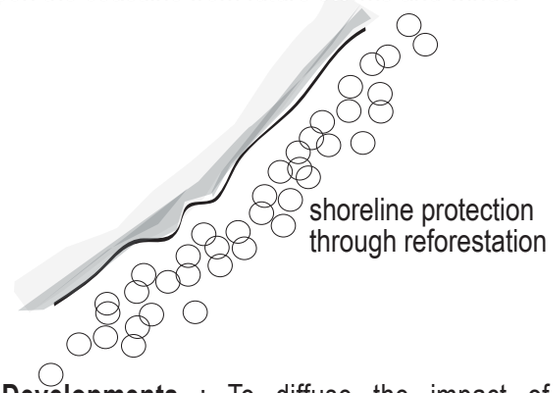
Reforestation can help protect vulnerable coastlines



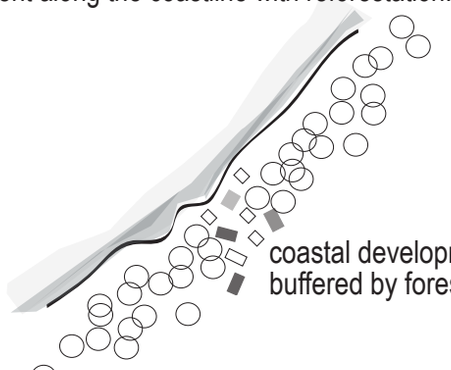
Creating Biodiversity

The coastal forest as a landscape buffer between:

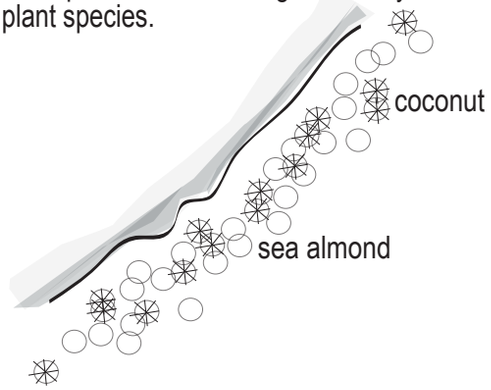
Sea + Shore : Mitigate further coastal erosion and reduce impacts upon the coastline from future storms and winds.



Coastal Developments : To diffuse the impact of development along the coastline with reforestation.

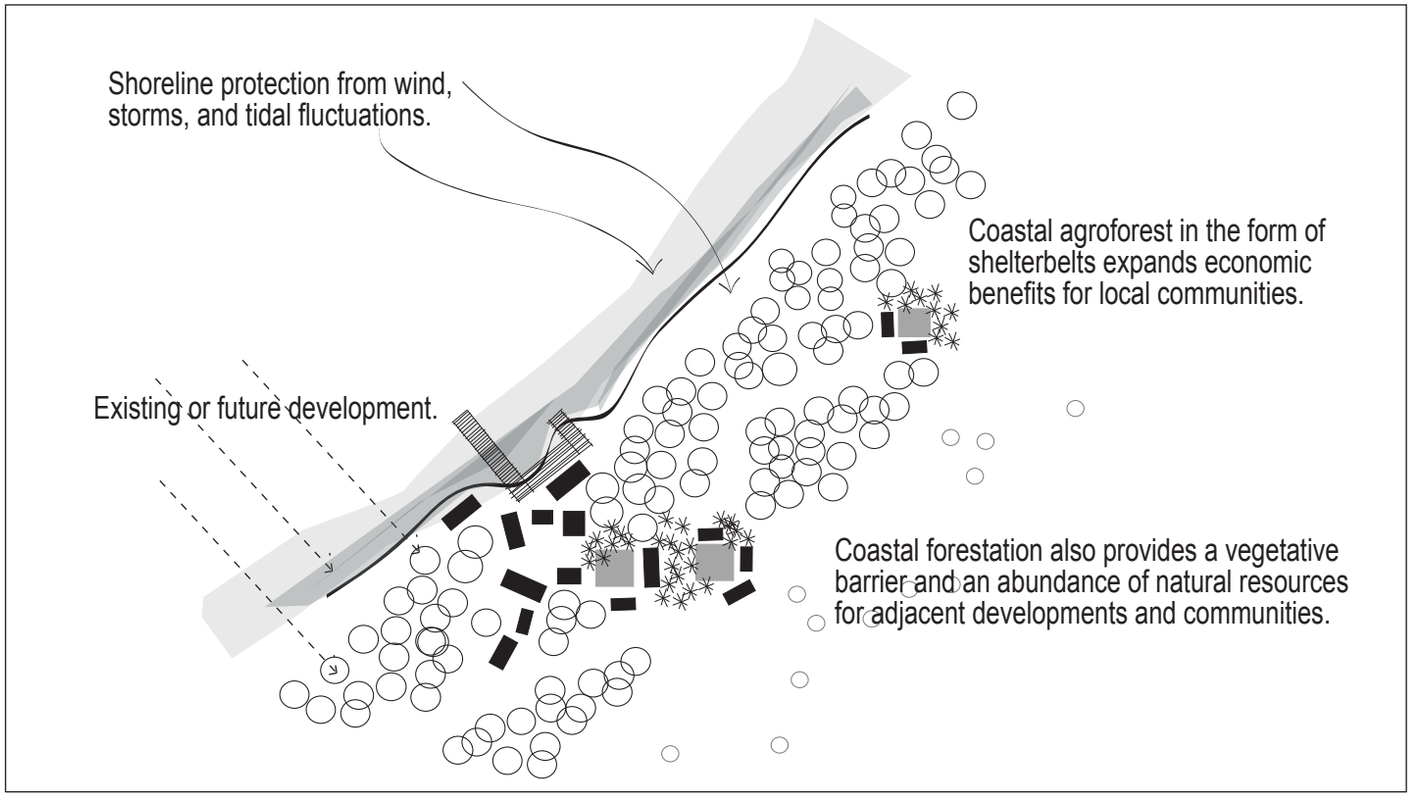


Habitats : Promote vegetative density planting of a variety of coastal tree species to encourage diversity in coastal habitat and plant species.



+ Establish herbaceous, shrub, and fast-growing tree species in initial development to create biomass.
+ Interplant with slower growing tree species that will help in long-term stabilization of the land.

Coastal Reforestation



Techniques

SOIL

Short Term: For large-scale coastal reforestation, wash soil with chemicals and mix with coarse materials. It is ideal to mitigate the soil through the cultivation of salt tolerant annuals and then gradually shift to fruit trees or other complex plant communities as soil quality improves. Green mulch or other groundcovers can be planted to protect fragile transitional spaces from weed invasion.

Long Term: Agroforestry and intercropping promote biodiversity and a healthy ecosystem. Here, healthy soil can be established as various macro and micro flora and fauna flourish, espeically in a no-tillage, forested environment.

WATER

Maximize vegetation coverage to promote extensive and consistent infiltration rate and groundwater recharge. Select appropriate plants to specific site conditions which will also reduce the need of irrigation in the long run.

Planting List

Coconut tree - *Cocos nucifera*
Casuarina - *Casuarina equisetifolia*
Sea Almond Tree - *Combretaceae Terminalia catappa*

Other coastal species in the Aceh province:
Casuarinaceae Casuarina equisetifolia [tree]
Euphorbiaceae Glochidion sp.
Goodeniaceae Scaevola sericea [shrub]
Guttiferae Calophyllum inophyllum [tree]
Lecythidaceae Barringtonia asiatica [tree]
Leguminosae - Papilionoideae [tree]
Sagu Palm - *Palmae Metroxylon sagu*
Nipah palm - *Nypa fruticans* [grows well in mangrove forests]
Pandanaceae Pandanus sp. [palm tree]

Economic Benefits

Major economic benefits would come from noon-timber products of coconut, rubber, palm fabrics and various fruit trees. Selective harvesting of the timber would be recommended, giving communities the option to replace initial species with market-demand crops. Instead of selling raw materials for timber products, communities should also consider processing and crafting their resources into products to increase economic gains.

Sea Grass Farming

In order for Tsunami victims to begin rebuilding their lives independent from foreign or governmental aid, the people will need jobs. This project looks at the type of jobs that people had before the Tsunami, their relevance after the Tsunami, and a new job possibility Sea Grass Farming.

financial

human

social

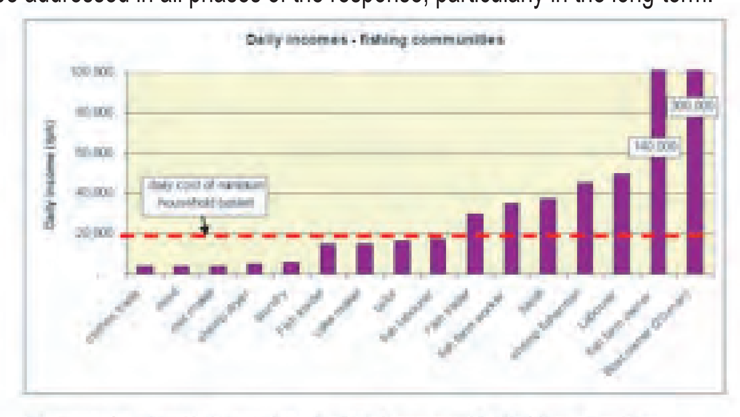
physical

natural

Livilihoods Before the Tsunami

Fishing is the mainstay of economic activities most affected by the tsunami, with additional income coming from trees (pisang, coconut, banana) and livestock (most commonly chickens but some goats and cows). Padi farming communities tend to be situated within the belt behind the fishing communities. Hill farmers (vegetables, trees) are found on higher elevations behind the padi farms.

The figures below shows the kinds of occupations fishing communities were engaged in before the tsunami and the average daily incomes. The dotted line indicates the daily cost of the minimum quantity of basic food and non-food items needed by a typical household of 5 people (just under Rph 20,000 per day)5. For the lower paid occupations two incomes are necessary to break even. In some households men may do two activities (e.g. fish in the morning and work in padi farms in the afternoon and women who work may also do one or more activity). Most women's occupations are low-paid, so women-headed households are therefore particularly vulnerable. In many poor families young children leave school at 12 and help out in productive activities. This is a long-term issue that should be addressed in all phases of the response, particularly in the long-term.



A disaggregation of households according to livelihood groups provides the following breakdown:

Rural fishing communities

	Poor	Middle	Better Off
Type of household and income-earning occupations	• Female- or elderly-headed households • Farm labourers • Fishermen (employed on large boats)	• Fish farm 1 ha • Fish farm worker • Small boat owner (10 men) • Small boat owner (1-2 men)	• Large fishing boat owner (35 men) • Fish farmer 3-4 ha
Amount of land around house	• 30m x 20m land around house	• ½ ha of land around house	• > 2 ha of land around house
Other sources of income	• <5 coconut trees	• Chickens • 40 coconut trees*	• Chickens • 150 coconut trees
Padi Farm land		• May also own farm land in village or elsewhere	• May also own farm land in village or elsewhere
Estimated % of population	50%	40%	10%

Income from coconut trees is relatively good, and provides cash currently.

"Urban" fishing communities

	Poor	Middle	Better Off
Type of household and income-earning occupations	• Female- or elderly-headed households; fish loaders • Fishermen (employed on large boats) • Hawker	• Bejak driver • Labourer • Fish seller • Trader • Carpenter etc	• Large fishing boat owner (35 men)

Indonesia - Banda Aceh Subset 1

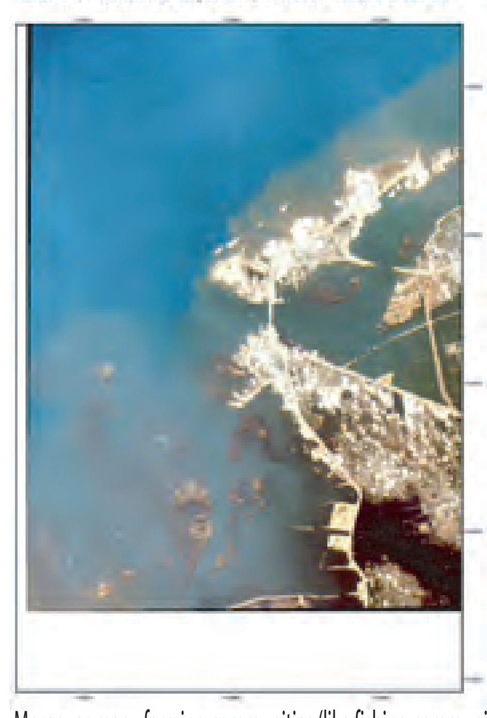
IKONOS - January 10, 2003 - PRE-DISASTER IMAGE

Sea Grass Farming

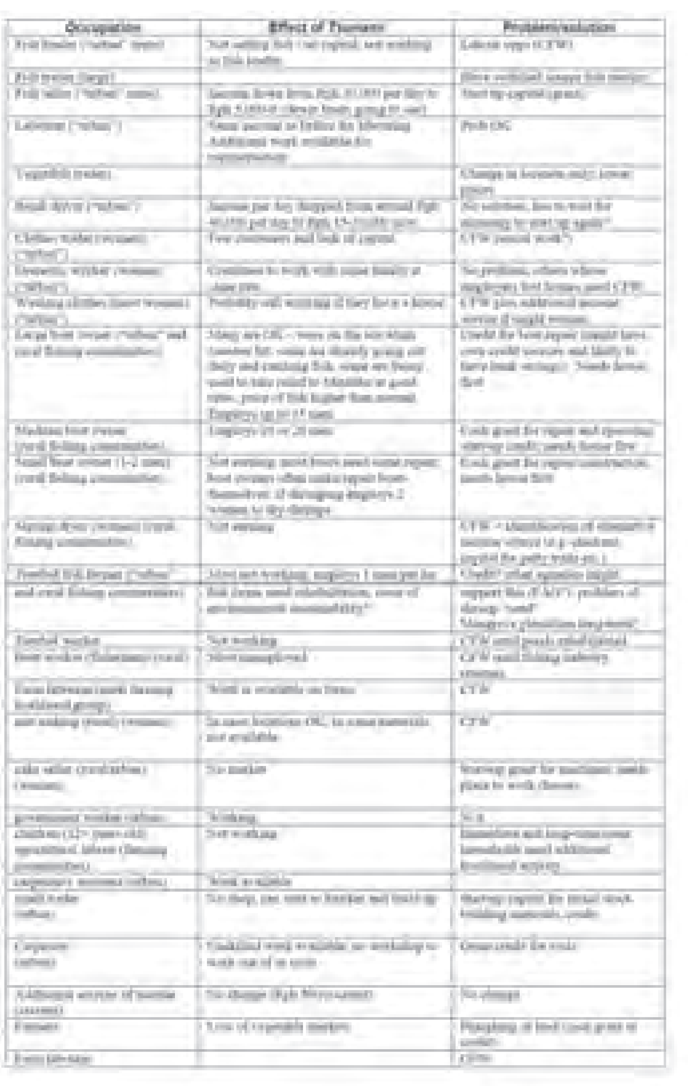
Tsunami's Effects

1 : 5000

IKONOS - December 29, 2004 - POST-DISASTER IMAGE



Fishing communities were hardest hit with some suffering near-complete destruction and some villages escaping major destruction. The impact on fishing communities has included loss or damage to houses, loss of assets and productive equipment, loss of economic opportunities, loss of markets, loss of ice-making facilities.
"Urban" fishing communities were also badly affected and effects on these communities includes difficulties for businesses such as bajak drivers and clothes sellers whose customers are gone or have no purchasing power.
Farmers (padi growers) were also affected but to a far lesser extent than fishing communities. Some damage to land or crop loss has occurred in areas where farm lands are close to the sea, but generally the farm land is behind the fishing community. Farming communities, however, have lost markets for other crops such as chilli (price down from Rph 12,000 per kg to Rph 3,000 per kg) and cocoa (no market at all) and in many areas the cost of the some commodities is higher than normal.



Occupation	Effect of Tsunami	Problem/solution

Moreover, many farming communities (like fishing communities) were previously able to access subsidized rice through the government's BULOG system (known as raskin) (at Rph 1,000 per kg compared to around Rph 3,000). This system has ceased while the food is being distributed to those affected by the tsunami – and farming communities may not have been identified in this category. Generally the destruction of Banda Aceh's trading infrastructure is a major problem for recovery. Ice factories for fishing boats and traders (between Banda Aceh and Medan) are clearly missed. Moreover, the relief operation is likely to have driven up prices for truck hire which will hamper the ability of traders to trade in local produce. The destruction of the trading hub of Banda Aceh is a key constraint to immediate and longer term recovery for all livelihood groups.
The following table provides a summary of the different types of occupation along the coast, the effect of the tsunami on the activity, and possible ways to address the current constraints to the activity.

Resource: 'Indonesian Livliehoods'. Save The Children Report 2004

Sea Grass Farming

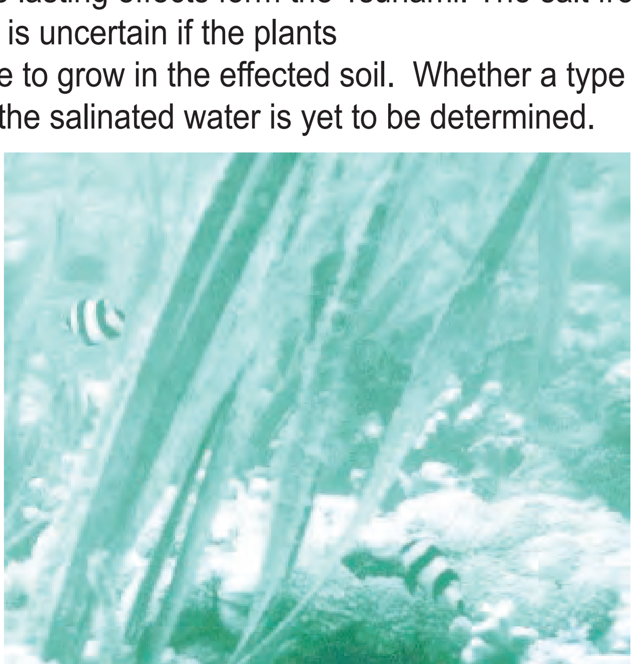
Sea Grass Farming

Before the Tsunami the major industries supporting the Achenese were fishing and farming. As a result of the Tsunami many fishing boats were damaged or lost, the habitats of marine animals along the shoreline were changed, and plants on the island became saturated with salt water.

In order for the fishing workers to get back to work they will need to repair their boats, purchase the necessary equipment and then find the good fishing spots. The fishing industry in the Tsunami affected areas have a hard task ahead of them, however, in caomparision to the farmers in the farming industry, it will have more immediate rewards.

The farmlands that were covered with sea water have lasting effects form the Tsunami. The salt from the sea water will change the chemistry of the soil. It is uncertain if the plants planted on these farm lands pre-Tsunami will continue to grow in the effected soil. Whether a type of plant that has economic value will be able to grow in the salinated water is yet to be determined.

One plant with economic value that already grows in the sea that can be harvested right off shore is sea grass. I propose that Sea Grass Farming become a new industry in the Aceh.



Advantages in Aceh

Food availability in Aceh is not a big problem – the Government's Bulog system exists to ensure low prices of staple items for consumers and good prices for producers. Markets are currently functioning in most areas and production in Aceh is usually almost double the consumption needs. Therefore, farmers whose fieldsbecame flooded may choose to change their livilhood at least for awhile and harvest sea grass. Depending on the depth of the water and behaviour of the sea youth could earn some money from harvesting sea grass and either making products out of it and selling them or selling the sea grass to companies that manufacture furniture and other products made from sea grass.

Sea Grass Farming

Sea Grass Products

Home Décor Items

couches/chairs

tables

wine racks

lamps

decorative boxes

cd racks

Acccesories

bag

baby basket

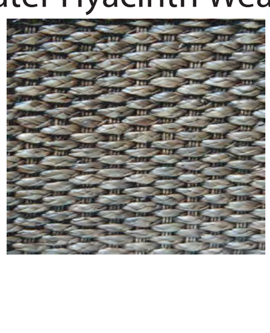
wastebasket

There are many ways to use sea grass that are not shown in the pictures. It could be used unprocessed and be weaved to make roofs, ropes or jewelry. The Achenese people with their ingenuity and creativity will be able to adapt the material into something of use in their daily lives or cultural traditions.
Another plant than can be used in similar ways as sea grass is water hyacinth. Below is a picture of the water hyacinth weave. This plant however needs to be grown in a contained area as it has a tendency to be invasive.

Sea Grass Weave

Dutch Twist Weave

Water Hyacinth Weave



The Damar Forest Example

The purpose of this document is to find ways to promote peace by fostering community interaction. Indonesian society is filled with examples of people working together to build things, farm, and improve the quality of life. This first page contains one Sumatran example in which community bonds are created through shared labor and shared space. The following pages discuss ways to identify opportunities, find resources, and build community by creating common space.

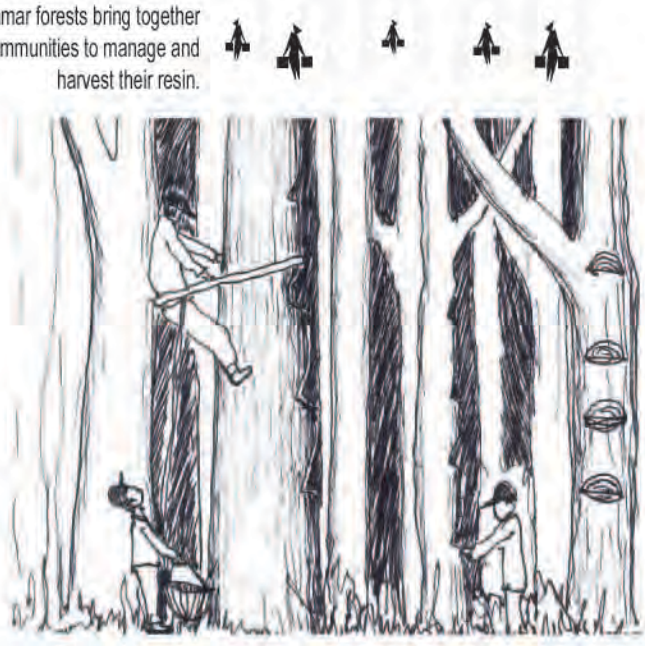
precedents of common ground: damar forests

In southern Sumatra, Damar forests sustain many villages. The resin from trees is harvested in moderation by all the villagers and supplements school, food and other expenses. The trees are able to survive, and the forests support a healthy amount of biodiversity. They aren't as diverse as virgin forests, but damar forests are more ecologically beneficial than normal crop lands.

The forest is called "hutan marga" by the villagers, which means common property, and is controlled and managed by the nearby communities. This form of farming, or agroforestry, is ecologically sustainable, and depends on the cooperation of people within and in between communities. The function of shared forest land evolved over many generations and continues today.

Consider creating this system of forestry from nothing. If these agroforest industries were to be started from virgin forests by people who had never farmed, a great deal of planning, organizing and resource gathering would be necessary. How would you go about this? Consider this problem as a prototype: The decision making processes used to address it could also be used to address any other problem discussed in this pamphlet.

Damar forests bring together communities to manage and harvest their resin.



Damar is processed by notching trees and collecting their resin. Damar forestskeep many of their ecological functions.

from concept to completion

Now that you have learned about the potential of one form of community space, consider the steps necessary to instigate a damar forest community. . .

1. Identify resource:
available forest land, people who need money and work

2. Identify support that can be found locally:
organization by locals, growing damar trees

3. Identify needs to be met by outside assistance:
horticultural assistance, land acquisition, environmental impact

4. Put into action:
community process, implementation plan, implementation

Now consider the benefits of such a farm system to the health and well being of a community: more income, renewed livelihoods, community members working together, improved quality of life.

Is a more fecund, integrated community less prone to violence? Could all these benefits help provide some shelter from the strife and fighting in Aceh and other areas of civil war?

financial
human
social
physical
natural

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Steps to Finding Common Ground

Thousands have died in the 30-year conflict between GAM and the Indonesian military. The conflict continues, and will no doubt obstruct the tsunami reconstruction process. In this and other conflicts, one way to create peace is to nourish communities from the bottom up. This document outlines ways for Aceh citizens, NGO and aid workers, and government officials to consider paths of peace through grass-roots, community-based processes by creating places, opportunities and metaphors for peace.

damar forest example+
steps to finding common ground+
common resources, opportunities+
community garden prototype+

four steps to finding common ground in your community

START HERE: Have you seen that social and political conflicts in Aceh are a real problem? Following these steps can help you arrive at decisions that may inform your actions and give you the ability to bring about real change.

1 Consider challenges and opportunities:
- -Conflict within local communities
- -Conflicts between local people and government
- -Need for community gathering space
- -Need for farm space and equipment
- -Need for drinking water
- -Need for transportation

FIND RESOURCES: Once the challenges have been identified, look at what resources might be helpful in the promotion of peace, what elements of existing society can be drawn upon for inspiration and support.

2 Identify community resources:
- -Spiritual
- -Economic
- -Environmental
- -Spatial
- -Cultural
- -Natural
- -Community
- -Other local resources?
- -Other regional, national or international resources?

GAINING SUPPORT: With goals in mind, begin promoting your idea locally, regionally and nationally. Utilize word-of mouth, inter-net, or whatever resources you have to share ideas and promote your plan.

3 Identify supporters:
- -Friends and family
- -Community members
- -Local governments
- -NGO's and aid workers
- -International community

REAL SOLUTIONS: Now you can begin looking at how you and your group can utilize needs resources and supporters to organize tangible solutions.

4 Explore potential solutions
- -Community gardens and resource sharing program
- -Land restoration and reclamation
- -Common space and neutral, peaceful ground
- -Swap shops and market places
- -Inter-community gathering areas
- -Physical metaphor for peace

financial
human
social
physical
natural

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From Resource to Opportunity

This diagram works from left to right and shows how a specific resource in a community can yield many opportunities for a community. This is a framework for only a handful of ideas; there may be more resources, and there are certainly more opportunities. This can be a starting point for identifying resources in your community and identifying what opportunities for common ground lie ahead. The far right column is describes a "specific opportunity" such as a community garden.

damar forest example+
steps to finding common ground+
common resources, opportunities+
community garden prototype+

linking common resources to community opportunities

common resources	things found locally	outside assistance	potential benefits	specific opportunity
cultural	knowledge of tradition	tools, marketing, distribution, organization	cultural recognition, education of new generations, profit	producing arts and crafts
community	garden types, plant materials, labor	organization, design, tools	food production, profit, community interaction	community garden
economic	labor, eventual management	business administration, organization, management	land stewardship, property rights, profit	commercial farming
environmental stewardship	environmental values, organization, labor	land acquisition, political maneuvering restoration and environmental impact	land stewardship, restoration, re-acquisition of property	environmental restoration projects
natural (physical)	management, labor	forestry management, processing	building materials, profit, jobs	timber for houses
religious	knowledge of tradition, new adaptations	construction, community design process	promotion of religious tradition, community gathering	mosques and religious gathering places
social	construction, community process	community design process	social interaction, child interaction, networking	community gathering places

this community garden prototype continued on the next page . .

financial
human
social
physical
natural

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Community Garden Prototype

This garden began an identified resource: the tradition of community gardening. It then used local abilities to organize and design a plan for a community garden. There are many benefits from a community garden or any community-organized project. One is the benefit of food and profit for the community. Also, the social opportunities here are great: people working together to accomplish something and then enjoying the benefits.

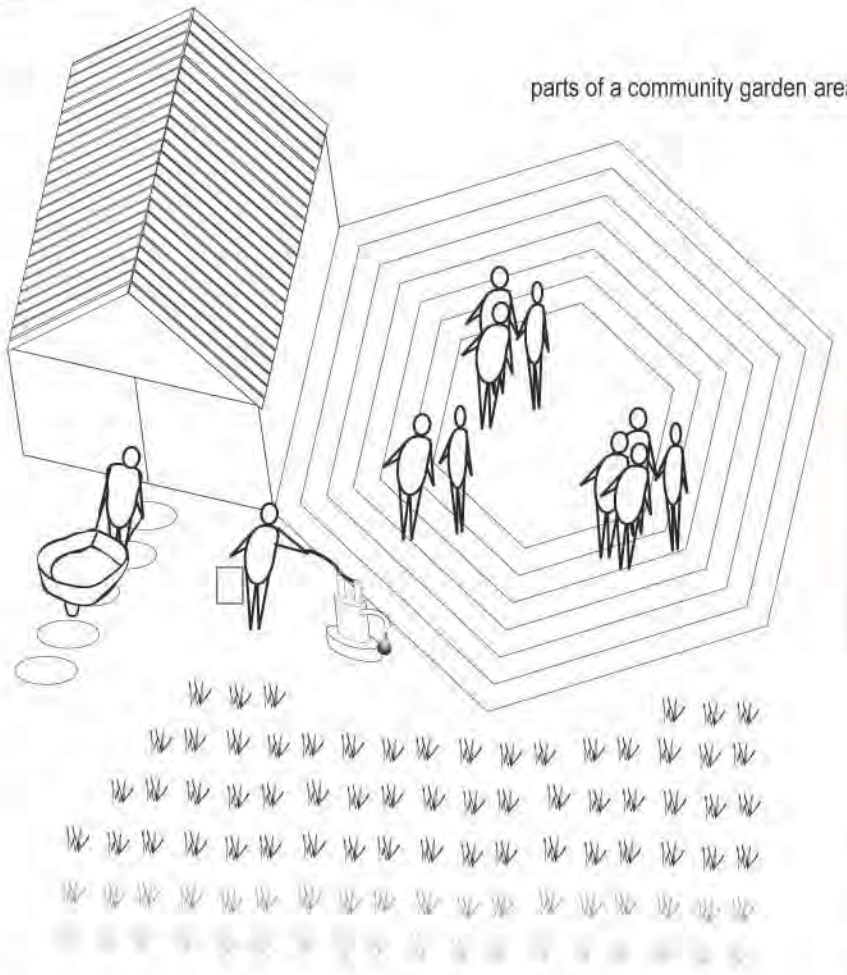
ideas for a community garden

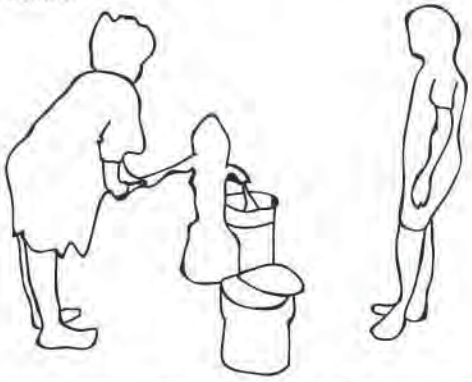
First, try to place the community garden in the center of the village, or at least provide access for all citizens. Next, place social structures near it, as well as other important infrastructure, like a well, to create a social hub. Some communities plant an area which is communal, and is given to poor or struggling families. Consider ways to share resources in the maintenance and care of your community garden.

It might be worth while to organize a group compost pile or compost tea bucket. Also, tool sharing or a community tool shad could help the garden run more smoothly while also keeping costs down. During harvest season, people will be working hard, and when it's over, a celebration will reward hard work and bring the community together to acknowledge it.

Though seeming small these community-based events and practices strengthen individuals and villages and in some small way foster peace by providing people with sustenance for survival as well as human interaction. Following the examples of this paper can inspire other common places and promote community welfare.

parts of a community garden area:





Water and other community needs can be oriented around a central, common place.

elements of a community garden

+water source
+gathering space
+tool shed & sharing program
+market space
+community/shared plot
+private plots
+compost area\
+harvest teamwork program

site planning

relief + recovery + care + growth

Child Survivor

boarding school tradition +
community connection +
agriculture & islam +
levels of interaction +

financial

human

social

physical

natural

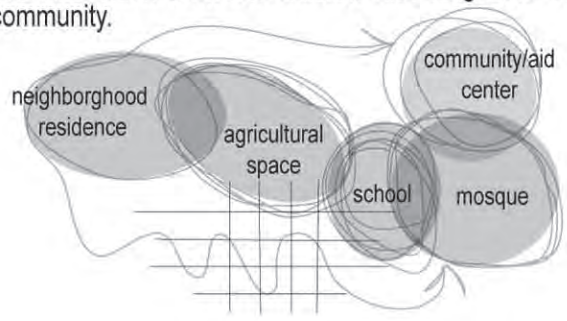
Many children lost both parents, and extended family members in the Tsunami disaster. In the aftermath both mosque and boarding schools have provided shelter and relief to victims. With an estimated twenty to thirty thousand orphans, and broadly felt concerns over child trafficking, there has been discussion of the construction of more boarding school facilities to care for these displaced children. Inspired by the traditional use of boarding schools within Aceh, this project explores, through prototypical design, the ways in which community interaction and connection, may be fostered through spatial design and social programs. The main goal being, to provide children and adults, who've lost every social and familial connection, with the opportunity to regrow those vital relationships.

Spaces and structures

School. The school acts as the central 'child focused' element of each design, connecting the various children's residence through a program of education.

Mosque. The community Mosque acts as the main outlying community connection within each design. Providing children frequent interaction with their larger outlying community.

Agricultural Space. Community agricultural space within each design creates common space for daily exchange and interaction between children and neighbors of their community.



Community/Aid Center. The community/aid center within each design provides connection to the broader outlying community, and may facilitate family aid programs.

Streets. In some cases the street is used as one of the primary community elements, in which children may experience a more public focused community interaction.

Design Considerations

Based on Grid. The first three prototypes are designed using a grid for basic organization, in an attempt to provide easy translation of space to differing urban context, and to provide legibility of construction to a broad audience.

Flexible Pattern. By developing repeating patterns of space, these facilities could be easily extended or reduced to accommodate larger or smaller populations in need.

Use Over Time. Prototypes are designed in a manner which may accommodate different uses over time. Structures may be adjusted to suit family housing, or continue to serve as a community centered' boarding school.

Architecture. These prototypes provide an arrangement of outside space and structures in an attempt to encourage community interaction. The specific design of structures and their architectural elements are left flexible to suit differing cultural preferences, and building materials, specific to the region and individual site.

Private vs. Public. The first three prototypes have been designed with differing levels of public and private space. The first prototype being the most privately focused, the third being the most publicly focused, in an attempt to provide flexibility for different cultural preferences of community interaction, and children's lifestyle.

for more information please visit http://courses.washington.edu/larescue

relief + recovery + care + growth Child Survivor

Social Programs

Community/aid center. The community/aid center may provide family aid programs to those families within the community who need help becoming self-sufficient again. Aid programs may also help those older members of the community who have been left with few family connections.

Agriculture. Shared agricultural space may provides an opportunity for the children's school and community residence to be self-sufficient through food production. As well as providing another component to the children's daily activity.

Relative's weekend. Visiting weekends may provide any remaining relatives of the children (who are not able to provide long term care) an opportunity to remain a part of the child's life, keeping remaining family connections in tact.

Residential community housing. Community housing within close proximity of the aid center and shared agricultural space, may provide living space for elderly people who have lost their family and social connections. Shared community activities and daily interaction with younger generations may allow them to re-establish relationships they have lost.

Design Types

A range of outside spaces are provided within these designs to facilitate different aspects of community life.

Spaces

Private-enclosed prototype. Design is inspired by sheltered interaction, which provides various levels of private and semi-private space.

Semi-inclusive prototype. Design is inspired by a balance of public and private space, which provides a range of public and semi-private space.

Inclusive network prototype. Design is inspired by fitting into a more typical neighborhood setting, which provides levels of public and semi-public space.

Remaining Pattern Prototype. Street layout is inspired by remaining patterns surrounding a surviving mosque structure in Banda Aceh. This prototype provides a range of semi-private to public space.

Private space. Children residence centered around a small courtyard provide an outside sheltered space which may foster the activities of a family household.

Semi-private space. Children's residence facing a shared courtyard more open to the residential community, may still find the feeling of family, as well as have more visual and perhaps social connection to their outlying community.

Shared courtyard. Both shared courtyard of school/children residences and school/children residences/mosque, may provide an important sheltered community space in which children are able to create a larger private community connection.

Shared agricultural space. Shared public garden space provides children with a larger semi-public sheltered area, in which they may have daily interaction with older members of their community while playing or participating in shared agricultural activities.

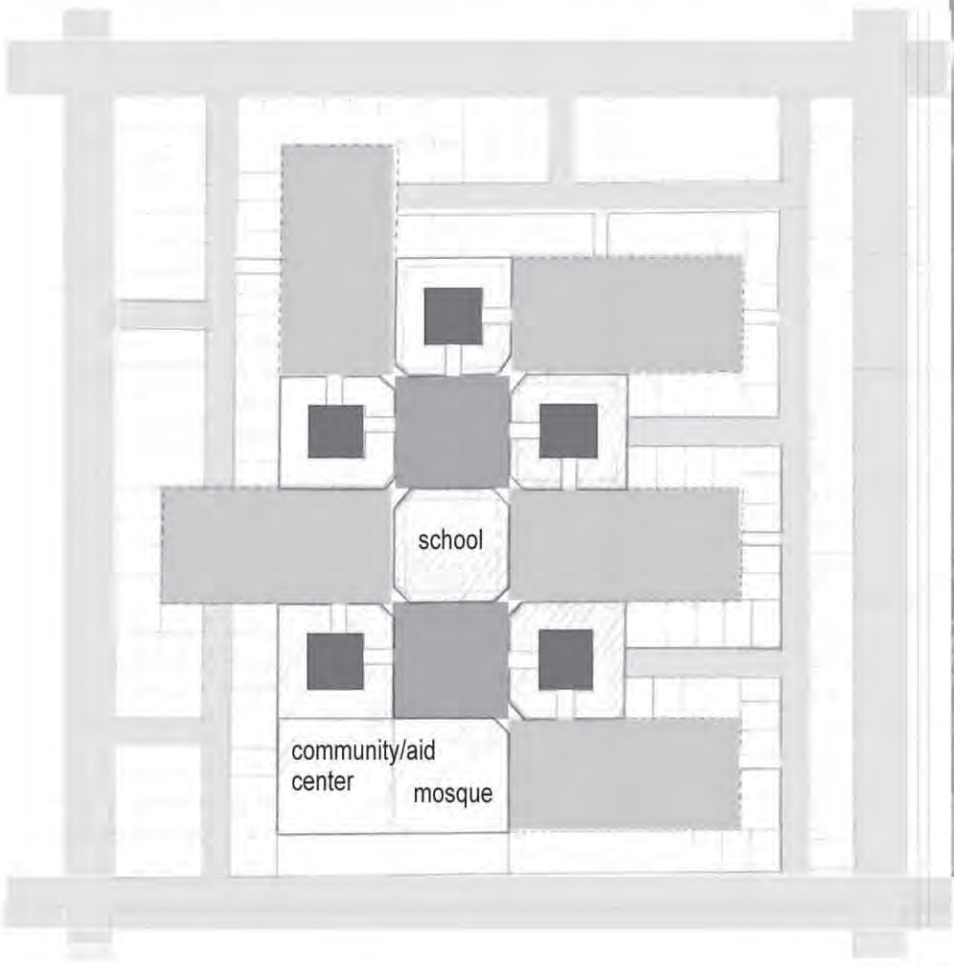
Public open space. Large public open space which may provide sports activities or a market place, may provide children with a closer connection to outlying community activities and events.

Neighborhood streets. For children's residences located along neighborhood streets, the street may become one of the primary community spaces.

relief + recovery + care + growth Child Survivor

Private-enclosed prototype

Inspired by the creation of sheltered community space, the goal of this prototype is to provide a variety of private and semi-private space.



Children's residence courtyard. A private 'small community' space in which a close eye may be kept on children playing outside, may provide a stronger feeling of family household setting. One direct connection is given to an agricultural space. Encouraging regular interaction with a defined portion of the neighborhood residence may create a larger sense of family

Shared courtyard space. Both school and mosque boarder medium sized shared courtyards in which larger community interaction can be found, while still keeping sheltered semi-private space.

children's residence courtyard

shared courtyard space

community agricultural space

secondary and primary streets

children's housing structure

communtiy residence housing structure

Community agricultural space. One of the primary neighborhood community connections, this space may provide daily community interaction through agricultural activities.

Secondary and primary streets. Narrow secondary streets are found throughout the close community residences, while primary roadways are left to the perimeter.

'Children's housing structures (zone). Intended as single story structures, architectural design to be decided by regionally specific cultural preference and available building materials. Children's homes are centered around small courts.

Community residence housing structures (zone). Intended as single story structures, architectural design dependent on regional preference. Neighbors homes and small streets provide a community buffer to large outlying roadways.

financial

human

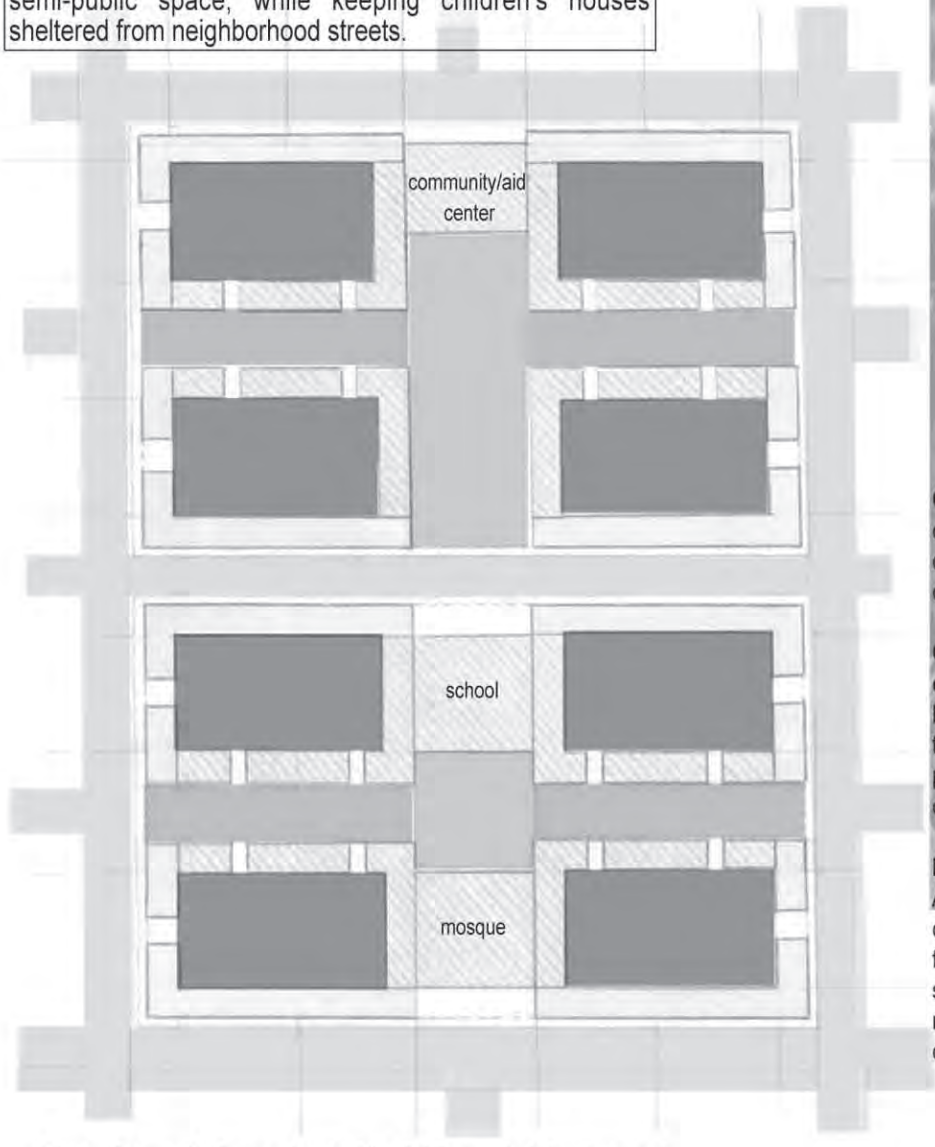
social

physical

natural

Semi-inclusive Prototype

Inspired by a balance of private and public interaction, the goal of this prototype is to provide a variety of flexible semi-public space, while keeping children's houses sheltered from neighborhood streets.



Community agricultural space. Acting as one of the primary semi-public community connections, this space is bordered by both children's and neighborhood housing.

Children's residence semi-private courtyard. Each courtyard space is bordered by access to agricultural space and the outlying community. Courtyards may provide visual connections to the outlying community, while remaining primarily private.

Public open space and shared courtyard. A large area of public open space my hold community functions such as soccer sports field, or community market space. While the school and mosque share a courtyard which may provide sheltered space for smaller community activities.

Secondary and primary streets. The dividing central street may act as a typical neighborhood street, which is more slow and safe for children to cross. While the outlying mosque street may act as a busier street. This prototype is designed to fit more easily into an urban street layout.

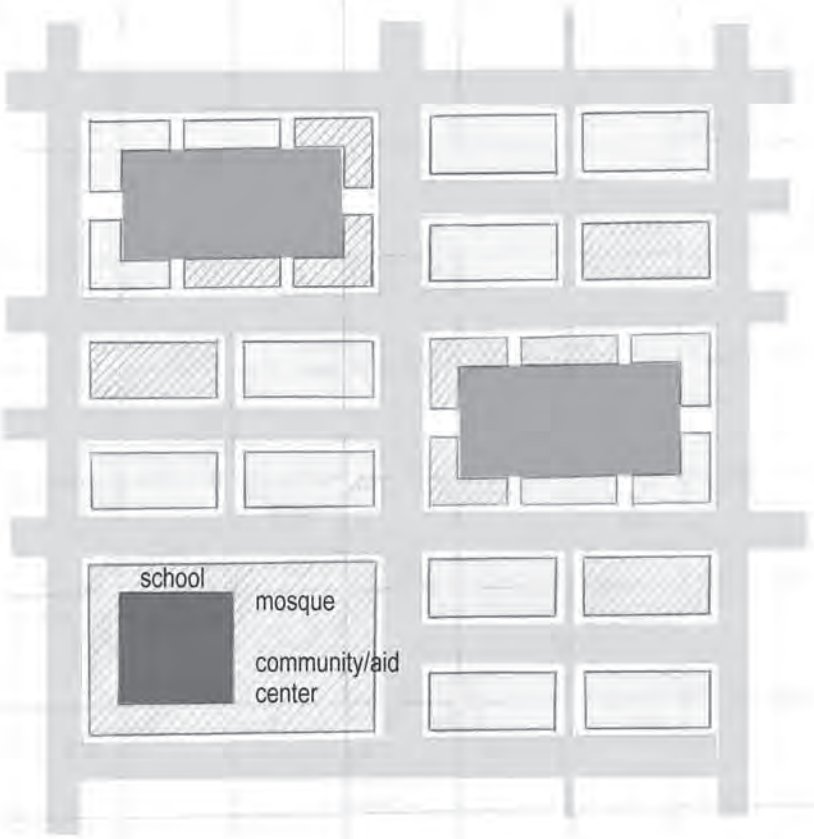
Children's house structures (zone). Intended as single story structures, architectural design to be decided by regionally specific cultural preference and available building materials. These houses are located near the center of the blocks, providing shelter from outlying streets.

Neighborhood residence house structures (zone). Intended as single story structures, architectural design decided by regional preference and available building materials. These houses are located along the perimeter of the blocks.

- community agricultural space
- children's residence semi-private courtyard
- public open space and mosque/school shared courtyard
- secondary and primary streets
- children's house structures
- community residence house structures

Inclusive network prototype

Inspired by the incorporation of urban street pattern, the goal of this prototype is to disperse children's homes in the form of a neighborhood network, side by side with neighborhood residence. Primary community interaction found within daily neighborhood routines.



Shared school/mosque courtyard. This space may provide an inclosed sheltered space for school children at play, or outdoor mosque community functions.

Community agricultural space. Agricultural space is sheltered by both neighborhood and children's homes. Several pathways to the outlying community exist between houses, providing stronger access for outlying house holds, perhaps making the space feel more public.

Secondary streets and alleys. Secondary streets may provide a primary community interaction space between children and their neighbors. These internal streets are intended to be slow paced settings which provide moderate safety for children.

Children's house structures (zone). Intended as single story structures, architectural design is to be decided by regionally specific cultural preference, and available building materials. Children's houses are grouped together among neighborhood houses, which may provide a more typical neighborhood feeling and atmosphere.

Neighborhood residence house structures (zone). Intended as single story structures, architectural design is to be decided by regionally specific cultural preference, and available building materials. Neighborhood residence housing is evenly distributed among children's housing.

- school/mosque shared courtyard
- community agricultural space
- secondary streets
- childrens house structures
- community residence house structures

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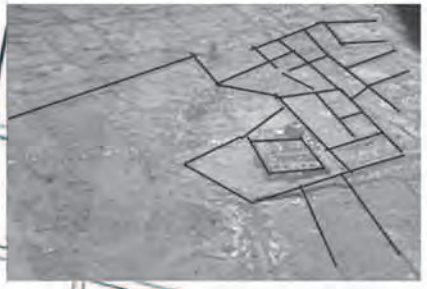
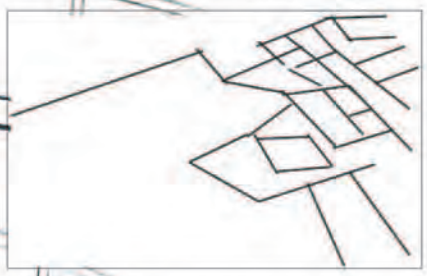
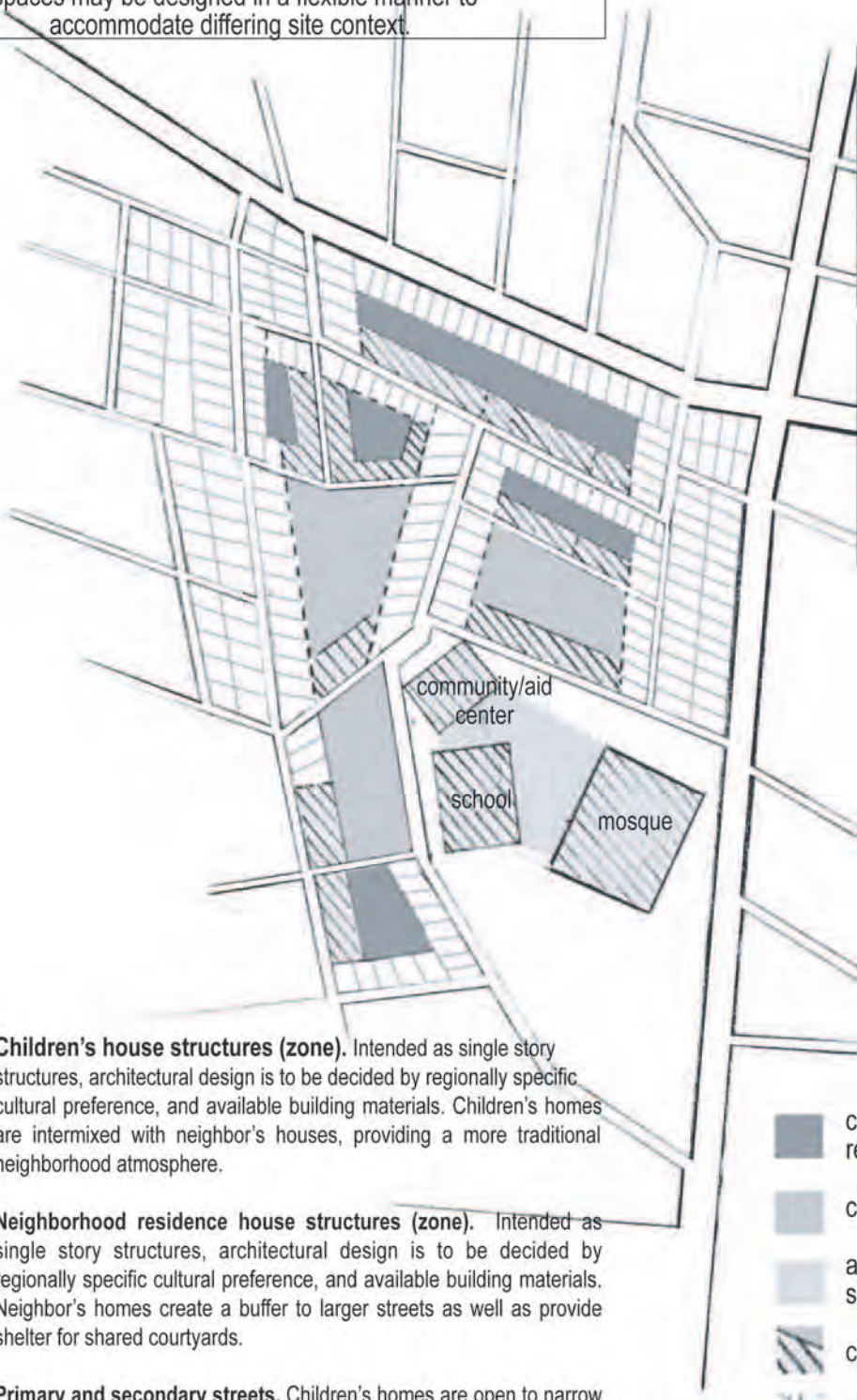
Remaining Pattern Prototype

Inspired by remaining patterns surrounding a surviving mosque structure in Banda Aceh. This prototype works to incorporate traces of past development in the form of a street network, while using the surviving mosque as the center of reconstruction. It serves as an example of how spaces may be designed in a flexible manner to accommodate differing site context.







Children's & neighbor's residence courtyard. These sheltered spaces may provide areas of children's play as well facilitate casual interaction of community.

Community agricultural space. Areas of agricultural space are within close proximity of the school and mosque, sheltered by both children's and neighbor's houses.

Aid center / school / mosque shared courtyard. This large shared courtyard may facilitate both school and mosque outdoor activities, offering a larger community gathering space.

Children's house structures (zone). Intended as single story structures, architectural design is to be decided by regionally specific cultural preference, and available building materials. Children's homes are intermixed with neighbor's houses, providing a more traditional neighborhood atmosphere.

Neighborhood residence house structures (zone). Intended as single story structures, architectural design is to be decided by regionally specific cultural preference, and available building materials. Neighbor's homes create a buffer to larger streets as well as provide shelter for shared courtyards.

Primary and secondary streets. Children's homes are open to narrow secondary streets of the neighborhood, spaces which may provide the primary public interaction for community residence.

- children's/neighbor's residence shared courtyard
- community agricultural space
- aid center/school/mosque shared courtyard
- children's house structures
- neighborhood residence house structures

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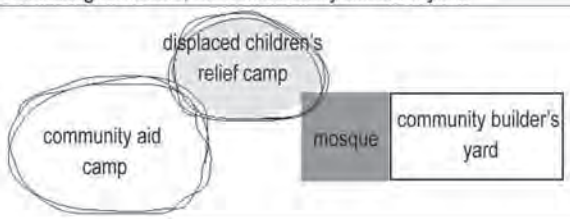
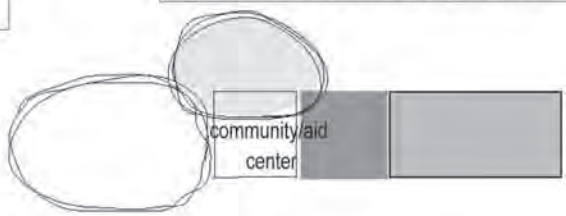
relief + recovery + care + growth Child Survivor

Construction Phasing Process centered around surviving mosque structure, based on private-enclosed prototype.

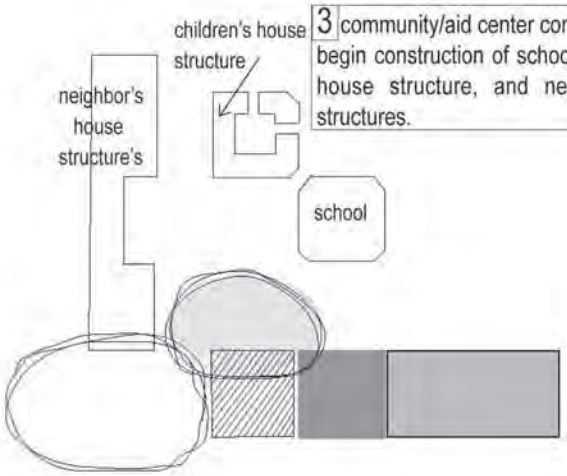
1 form community aid camp, and displaced children's relief camp around existing mosque structure. (displaced children, needing special attention, identification, and protection from child trafficking may be placed in a more secure camp setting slightly separate from the general community aid) gather building materials, form community builder's yard.



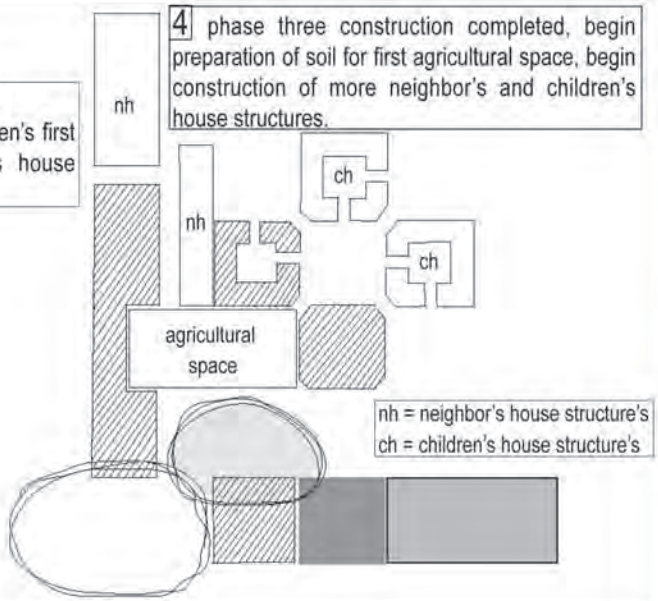
2 finish formation of builder's yard (where building materials have been gathered, and organized). begin construction of community/aid center.

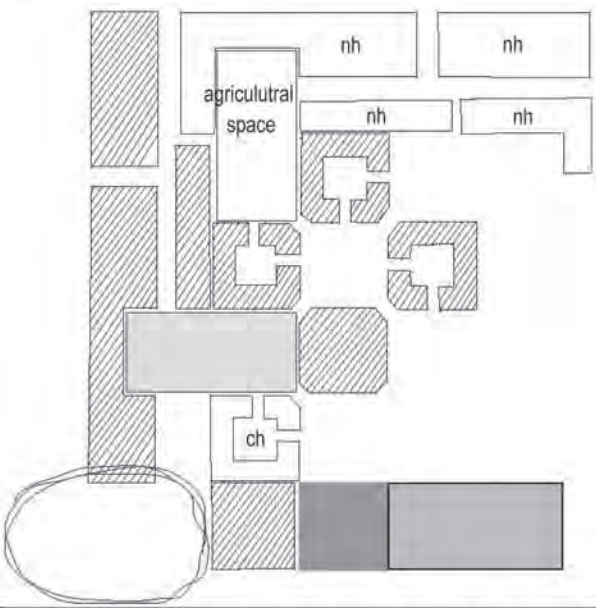


3 community/aid center completed, begin construction of school, children's first house structure, and neighbor's house structures.

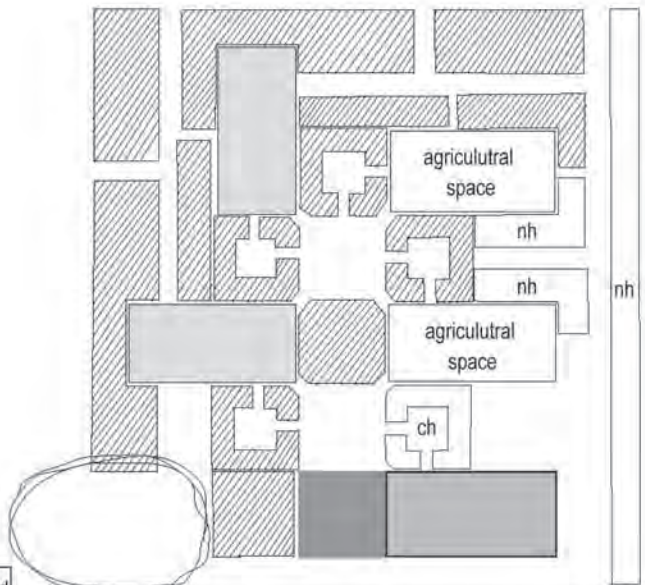


4 phase three construction completed, begin preparation of soil for first agricultural space, begin construction of more neighbor's and children's house structures.





5 phase four construction completed, begin preparation of soil for second agricultural space, begin construction of more neighbor's house structures, and a children's house structure. all children may live in the three out of five home structures, while last two are constructed.



6 phase five construction completed. begin preparation of soil for two other agricultural spaces. begin construction of more neighbor's house structures, and last children's house structure.

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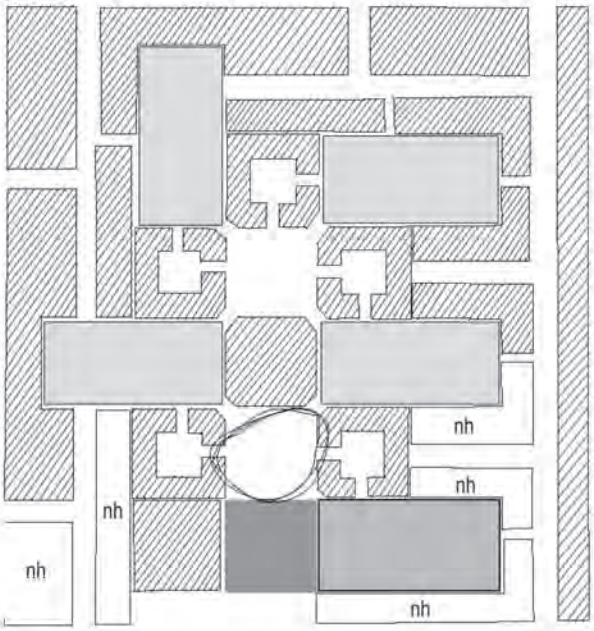
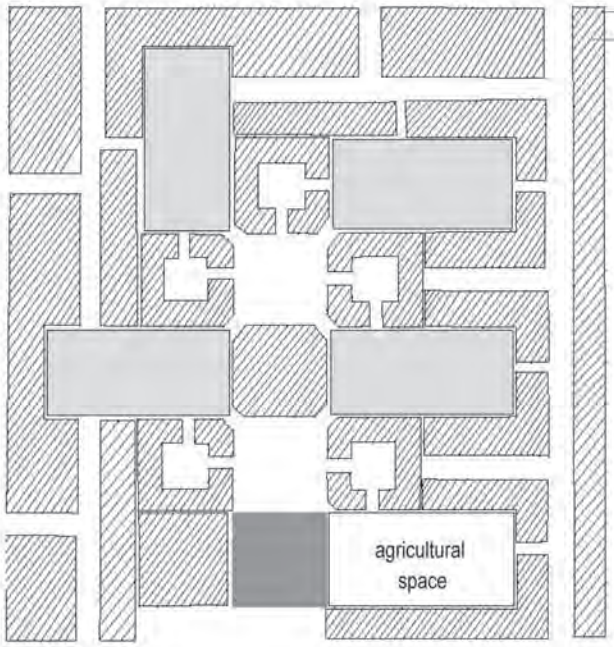
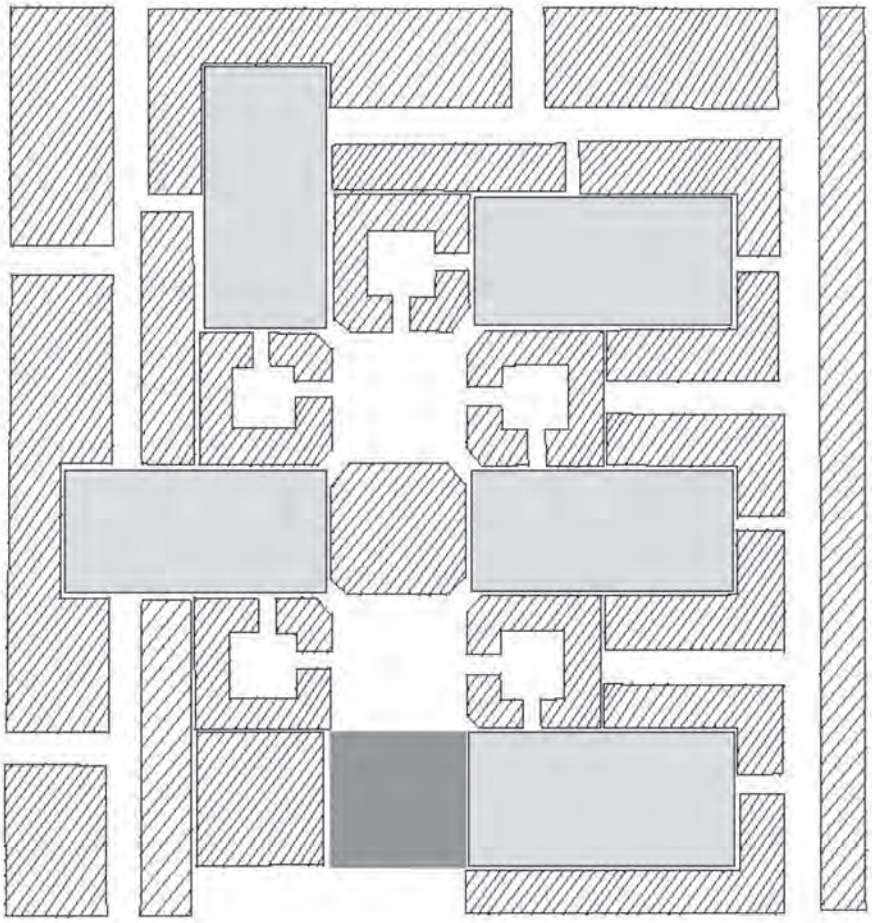
7 phase six completed. begin construction of remaining neighbor's house structures. remaining community aid camp residents may move into the shared courtyard of mosque and school.





8 phase seven completed. begin clean-up of community builder's yard. begin preparing its soil for agricultural use.

9 phase eight completed, finished construction of all structures and agricultural spaces, as well as forming of courtyards.



note:

no length of time was assigned to a phase. construction process time is dependent on the areas existing resources, and building power.

builder's yard may have helped build surrounding neighbor's houses as well, which outlay this community structure.

planting of courtyards, and maintenance of productive agricultural space remain as part of an on-going stage of reconstruction.

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