

# Shelter and Environment Haiti 2010

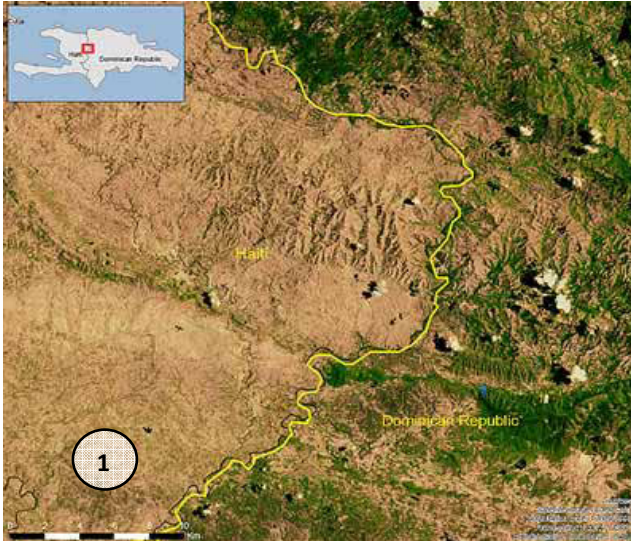


[www.shelterhaiti.org](http://www.shelterhaiti.org)

**IASC** Inter-Agency  
Standing Committee  
**HAITI SHELTER CLUSTER**

## Common environmental problems of Haiti

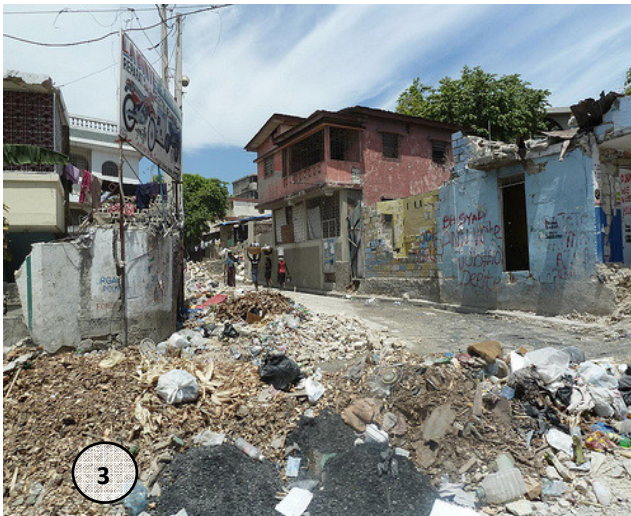
The environment of Haiti had been in a fragile state from early 1980s. The country has only 2-3% coverage of primary vegetation, many of the hill slopes are dangerously exposed or eroded, the rivers and streams are highly polluted and relentlessly exploited for sand and gravel. Deforestation, land degradation, pollution of streams and rivers, solid waste related pollution, excessive mining /mineral extraction and coastal degradation are sighted as serious environmental problems in Haiti. The Haiti Mission Report published by UNEP after the earthquake states that Haiti's environment was on a precarious state prior to the earthquake and this situation might be immensely exacerbated by the impacts of the disaster as well as the development needs following it [1].



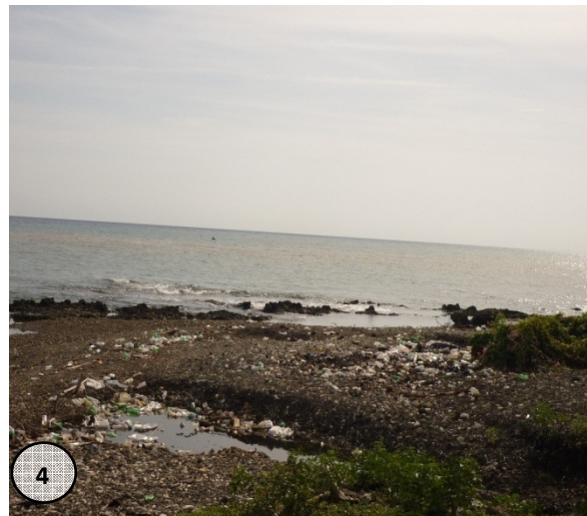
Pic : UNEP Mission Report



Pic : UNEP Mission Report



Pic : Timo Luege



Pic : Missaka Hettairachchi

1. Deforestation in Haiti against the forest cover of DR
2. Bear mountains and eroding slopes
3. Solid waste heaps in Port au Prince
4. Polluted beaches (Petit Guave)

## The shelter initiative

The post earthquake response called for an unprecedented shelter response. It has been estimated that about 250,000 buildings were destroyed in earthquake which rendered approximately 1.5 million people homeless. Over 700,000 plastic sheeting (tarpaulins) and 100,000 tents have been distributed in the aftermath of the earthquake as emergency shelter provisions over the past seven months. At the secondary stage which is already well underway, 135,000 transitional shelters are planned to be constructed.

## Shelter and Environment

### Material for Shelter

The environmental challenges arise in both sourcing and disposal of material in shelter projects. During the emergency phase majority of the shelters were built using tarpaulin and wooden staffs. Although tarpaulins were almost entirely imported, the wooden staffs were mainly sourced from Haiti and in some cases from the locality of the camp itself. Assuming a moderate 12 staffs per shelter it is estimated that between 2 to 3 million timber polls would have been used during the emergency stage. The impact of locally sourcing these staffs is yet unknown. Large stacks of wooden staffs are still brought for sale to the many urban areas.



Pic : Missaka Hettiarachchi

Another main material related challenge connected to the emergency shelter stage is the disposal of tarpaulins once the IDPs are move to T-shelters or Yellow Houses. Given the high rate of reuse in any construction related material observed in Haiti, it is reasonable to assume that most of the tarps – even in a damaged state – will be reused many times before disposal. However it should be understood at the same time that the number of tarpaulins distributed (700,000) by different agencies could be far beyond the full reuse demand of plastic sheeting in the country. This might compel the individuals and agencies to dispose part of them in environmentally problematic ways such as burning and discarding in, streams, canals or coastal areas. Any such material should be diverted to the recycling process in Haiti and detailed information on recycling plastic sheeting is provided in the shelter cluster website.

The transitional shelter stage also gives rise to problems of material sourcing and disposal. However the potential environmental impacts of sourcing the construction material may far exceed the sourcing problems faced in the emergency stage. Box 1 gives an insight into the estimated material need for T-shelter construction.

#### **BOX 1: Material need for T-shelters: in a Nutshell**

##### **The T-Shelter Types**

In very general terms, the T-Shelter designs can be categorized in to 5 groups as Follows;

**Type 1:** T-Shelter with Timber frame, Cement floor, CGS roof, Plywood walls and Concrete foundations

**Type 2:** T-Shelter with Timber frame, Plywood floor, CGS roof, Plywood walls and Concrete foundations

**Type 3:** T-Shelter with Timber frame, Compacted earth floor, CGS roof, Tarpaulin covering and no concrete foundations

**Type 4:** T-Shelter with Timber frame, Cement Floor, CGS roof, CGS Walls and Concrete Foundations

**Other :** Miscellaneous T-Shelter designs with alternate material such as steel frames, Zn-Al clad walls etc (not considered in material calculations)

**BOX 1 Contd....**

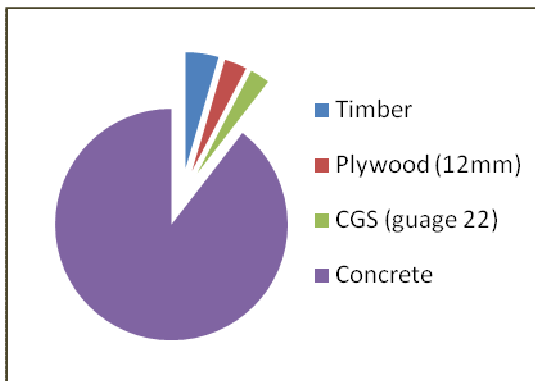
**Material need for each design**

	Type 1	Type 2	Type 3	Type 4	Total material* Wt. (MT)
Projected Number of T-Shelters	20250	20250	40500	27000	
<b>Material requirement</b>					
Timber (Kg)	225.0	225.0	225.0	225.0	24,300.00
Plywood (Kg)	154.0	269.5	135.0	-	14,043.38
CGS (Kg)	135.0	135.0	-	235.0	11,812.50
Concrete (Kg)	5,500.0	2,500.0	-	5,000.0	237,600.00
Tarpaulin (Kg)	-	-	5.50	-	222.75

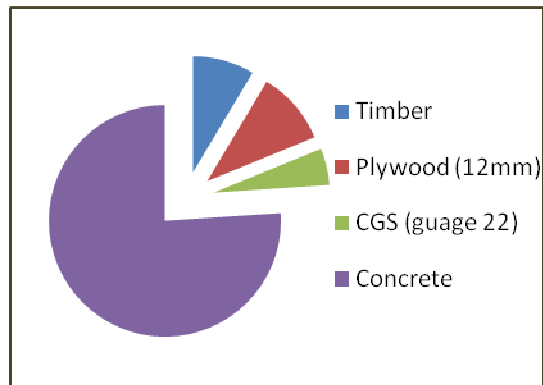
**\*NOTE: This is excluding "Other" category. Covers only around 80% of the T-Shelters planned**

**Wt. percentage of materials according to T-Shelter type**

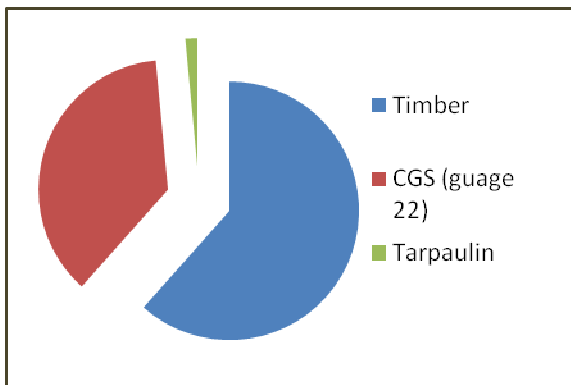
**Type 1**



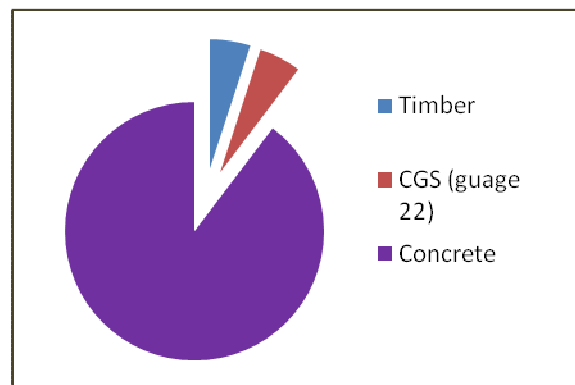
**Type 2**



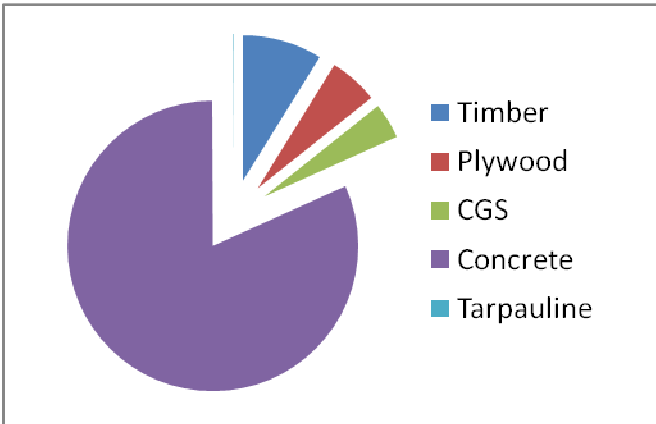
**Type 3**



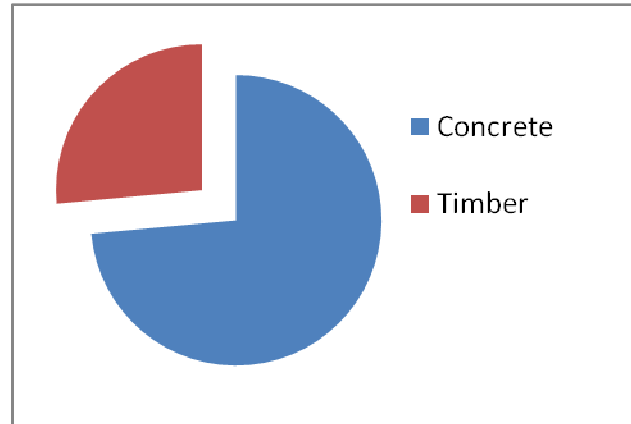
**Type 4**



**Wt. percentage of materials for the total number of Type 1- 4 T-shelters planned**



**Volume percentage of Concrete and Timber for the total number of Type 1- 4 T-shelters**



**END of BOX 1**

**Timber:** An estimated 25,000-30,000mt of timber (soft wood) and around 15,000mt of plywood is required for the planned 135,000 T-shelters. There is no organized timber industry in Haiti apart from occasional felling of some hardwood trees such as Mahogany. All softwood available in the market are imported mainly from North America. Therefore purchasing of timber from a large scale supplier is unlikely to induce adverse impacts on the environment in Haiti. However the absence of a local impact will not ensure sustainability of timber sourcing unless care is taken to verify the legality of the sources and environmental conditions of the country/place of origin of each consignment imported by the implementing agencies. More information on legal and sustainable timber procurement is available on [www.shelterhaiti.org](http://www.shelterhaiti.org) environmental reference page.

**Sand , Gravel and Aggregate:** The estimated need of sand and aggregate for T-shelter construction will be 40,000 – 50,000m<sup>3</sup> and 80,000 – 100,000m<sup>3</sup> respectively. Sand and gravel constitutes the largest portion of the material need with regard to both weight and volume. 2 million cubic meters of sand and gravel per year are currently produced from weathered rock on mountain slopes and river sediment. About 75% of this volume is produced and consumed in the Port au Prince area [2]. Mountain slopes in Port au Prince are patch worked with scars where they were cut to mine sand and gravel. The streams are extensively dredged for bed material, causing further deepening and acute bank erosion. This situation will only worsen with the exponential increase in material demand to put up the proposed 135,000 transitional shelters and ultimately reconstruct 200,000-300,000 buildings that were damaged during the earthquake.

**Other material :** Material such as corrugated galvanized roofing sheets, Zn-Al roofing sheets and cladding and tarpaulin would be almost entirely sourced from large scale suppliers in industrial countries where demand will be negligible compared to annual outputs.



Pic : Chris Howe



Pic : Missaka Hettiarachchi



Pic : Missaka Hettiarachchi



Pic : Missaka Hettiarachchi

The disposal of the construction material used for T-shelters at the decommissioning stage is less likely to give rise to major environmental problem as in the case of emergency shelter. Most of the T-shelters stand functional for 3-5 years at minimum and will be taken down in a piecemeal way over few months or years, if they are going to be decommissioned at all. However selecting durable and reusable material for T-shelter construction will significantly lessen the problems disposal at the decommissioning stage.

### **BEST PRACTICE GUIDELNES: Material Sourcing**

1. Give attention to environmental consequences of material sourcing locally and off-shore
2. Follow a careful procedure/standard guideline in procurement of timber. (Refer Timber Position Paper available at <https://sites.google.com/site/shelterhaiti2010/technical-info/enviromental-reference> )
3. Sand and aggregate sourcing is likely to have the greatest impact on the environment of Haiti during the transitional shelter construction stage
  - a. Minimize the use of concrete and cement mortar in t-shelter designs where possible
  - b. Make the maximum use of debris available at site as construction material (Refer 'Debris as Construction Material.pdf' available at <https://sites.google.com/site/shelterhaiti2010/technical-info/enviromental-reference> )
  - c. Source the sand and gravel from established suppliers and do not encourage procurement form *ad hoc* suppliers at the site level
4. Use durable and reusable material in T-shelter construction to ensure reuse possibilities at decommissioning
5. Have a sustainable decommissioning and disposal plan for material which cannot be reused

## Proper selection of sites and construction of T-shelters

Proper sighting of shelter schemes and using appropriate and environmentally safe construction methods and procedures is a key environmental concern in providing shelter following a disaster. UNHCR Environmental Guideline [3] identifies this as a key issue.

Environmental problems may arise at both emergency and transitional shelter stages. In the aftermath of the earthquake many emergency shelter camps had to be located without proper environmental assessment due to the sheer magnitude of the task. There are many emergency shelter camps located in environmentally sensitive areas or causing a multitude of environmental problems through their functioning. Filling of lowlands, blockage of natural drains and waterways, indiscriminate solid waste dumping/ wastewater discharge and increased erosion are common environmental problems associated with emergency camps.



Indiscriminate solid waste dumping in the vicinity of the camps cause unhygienic conditions and blockage of natural drains (Canape Verte, Port au Prince)



Pic : Missaka Hettiarachchi

IDPs filling a wetland to extend the camp area (Cite Soleil, Port au Prince)



Pic : Missaka Hettiarachchi

### Solid waste blocking street drains (Port au Prince)



Pic : Missaka Hettiarachchi

### Shelters built in unsafe slopes (Canape Verte, Port au Prince)



Pic : Missaka Hettiarachchi

Care should be taken by the agencies not to allow these situations be repeated in transitional shelter stage. It should be noted that the impacts could be more significant and long-term with T-shelter projects. The effects related to construction practices could be substantial in T-shelter projects when compared to emergency shelter work. The impacts could take place in the site of construction as well the places where T-shelters are fabricated (fabrication yards and warehouses). The environmental issues related site selection apply more to relocation type T-shelter schemes where many people are settled in new land, however issues such as sanitation, waste disposal and landslide/erosion potential should be taken into account even for t-shelter projects taking place on the own lands of the beneficiaries. Locating T-shelter schemes near environmentally sensitive areas such as protected forest, river/stream banks, marshes, mangroves, lagoons and coastal areas may contribute to their degradation through exploitation of natural resources as well as pollution. The UNEP Haiti Mission Report [1] states that 'sustainable development in Haiti is almost entirely dependent on the sustainability of the natural resource base, upon which 80 percent of the population depends for its livelihoods and sustenance'. Special attention should be given to provisioning of cooking fuel as charcoal burning has already severely contributed to deforestation and land clearing in Haiti. In site selection care should be taken to minimize the environmental impacts of the upcoming settlements as well to minimize the potential impacts of the existing environmental conditions of the area on them (i.e: flooding, landslides, rockfalls, mudslides, previous contamination of the sites etc.). More than 25 areas have been already identified for transitional shelter in Port au Prince and surroundings alone. , special attention should be given to the GAL area strategically identified by the government as an extension of the Port au Prince metropolis.

### **BEST PRACTICE GUIDELINE: Site Selection and Construction**

1. Carry out a project environmental assessment to identify the possible environmental impacts associated with siting, construction and functioning of a T-shelter project. (Refer Project Self-assessment Form at <https://sites.google.com/site/shelterhaiti2010/>)
2. Carry out a Site Environmental Assessment to identify site specific environmental issues of a given T-shelter project (Refer Project Self-assessment Form at <https://sites.google.com/site/shelterhaiti2010/>)
3. Adhere to SPHERE guidelines and any local regulations (where applicable) in designing and site planning of T-shelter schemes
4. Refer the UNCHR Environmental Guideline for additional information on tools and procedures for incorporating environmental concerns in disaster recovery (<http://onerresponse.info/crosscutting/environment/publicdocuments/UNHCR%20Environmental%20Guidelines.pdf>)



## Handling of debris in construction sites

There is an estimated 20 million cubic meters of debris spread around the earthquake affected areas of Haiti. Some of this debris lying in the sites identified for building of T-shelters. Removal, transport and final disposal of this debris may give rise to many environmental problems such as air and noise pollution, damage to road ways, traffic congestion and destruction or degradation of environmentally sensitive areas if not properly disposed. At the moment there are no properly identified debris disposal sites. Most of the debris removed from Port au Prince is disposed at the open solid waste dump at Truitier; in other areas such as Leogane debris is disposed in a scattered manner in 'ad-hoc'ly selected locations. The study done by Sun Mountain International, CHF and CLEARs assessed few possible locations for debris disposal sites. However, proper environmental impact studies should be carried out before commissioning these sites in large scale. Some agencies are using part of the debris in site preparation and floor laying in T-shelter projects. There are many cash for work and volunteer based debris removal programs currently underway, operated or funded by shelter agencies. Some of these programs are specifically targeting clearing land for upcoming T-shelters. In addition to this some private operators are occasionally using debris for land filling purposes in construction work. At present the debris removal process in Haiti is a highly uncoordinated operation which is far beyond the scope of emergency or transitional shelter provisioning. Nevertheless the shelter agencies are still responsible for the sustainable management of debris in the sites developed or managed by them. Reuse and recycling of debris in site preparation or construction activities should always be preferred over land disposal wherever possible.



Pic : Clement Tingley



Pic : Missaka Hettiarachchi



Pic : Missaka Hettiarachchi

Cash for Work Programs (Leogane)

Volunteers removing rubble (Leogane)

### BEST PRACTICE GUIDELINE: Debris Management at Site

Refer <https://sites.google.com/site/shelterhaiti2010/debris-management> for Best Practice recommendations on debris management

## Complying with local laws, regulations and traditional best practices

Complying with local regulations in shelter projects is a difficult task in Haiti due to the mere absence of proper legislation and regulatory framework. However it should be noted that Haiti has an Environmental Act which was passed in 1995 (available for reference at <https://sites.google.com/site/shelterhaiti2010/technical-info/enviromental-reference>) and a Ministry of Environment which is increasingly establishing its sway over the recovery process of 2010 earthquake. The ministry of environment has appointed regional (departmental) directors who are currently observing the rebuilding process and working actively with the cluster system in some regions. All shelter agencies should support these initiatives and try to work hand in hand with the environment officials of the area.

There is no proper building code in Haiti but there are local government regulations practiced at commune level. The issue of the absence of National Building Code is now being taken into discussion by the government and international agencies and stronger and effective regulations might come in place by the time of the commencement of permanent shelter projects. UNHABITAT is working with Ministry of Public Works (MTPTC).

Any country has its own traditional best practices for building/shelter design and construction, which in most instances are environmentally preferable within the local context they are practiced. It should be noted that the careless and unprofessional habits of the builders induced by lack of training and resources are not traditional best practices. Most of traditional best practices may cater to the specific needs of the community and also make best use of the local material. Few organizations are currently trying to research into these practices and come up with guidelines for shelter agencies. However apart from few isolated cases no concerted efforts can be observed at present to incorporate such practices in to design or construction of T-shelters either by the government or shelter agencies.

### BEST PRACTICE GUIDELINE: Debris Management at Site

1. Follow the national and local regulations when ever available. Environmental Act of Haiti is available at <https://sites.google.com/site/shelterhaiti2010/technical-info/enviromental-reference>
2. Consult the Department (Regional) directorate of the Ministry of Environment regarding the regional/national environmental regulations, practices and action plans. (Address: Ministere de l'Environnement, Juvenat 5 #130 Phone: (509) 3766-7570)
3. Traditional best practices in design and construction are best understood by consulting the community.

## SUMMARY

Haiti has a history of chronic and acute environmental problems. These problems will intensify with the affects of the 2010 earthquake and the rebuilding/development activities that follows. In the absence of a strong regulatory and institutional structure for environmental governance in Haiti the responsibility of working hand in hand with the government and ensuring environmental sustainability of rebuilding process rests on the implementation agencies. This can only be achieved through well informed decision making and self disciplined operation. A series of technical reference material that will be helpful for the implementation agencies to environmental sustainability in transitional shelter and rebuilding activities are available at [ShelterHaiti2010.org](http://ShelterHaiti2010.org) and [onerresponse.info](http://onerresponse.info) websites.

## References

1. UNEP, (2010) Haiti Mission Report – January 2010, UNEP, Haiti
2. UNEP, (2010) GEO-HAITI 2010, UNEP, Haiti
3. UNHCR, (2005) Environmental Guidelines, UNHCR