Green Response

Practice note report

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International Federation
of Red Cross and Red Crescent Societies

Strategy 2020 voices the collective determination of the IFRC to move forward in tackling the major challenges that confront humanity in the next decade. Informed by the needs and vulnerabilities of the diverse communities with whom we work, as well as the basic rights and freedoms to which all are entitled, this strategy seeks to benefit all who look to Red Cross Red Crescent to help to build a more humane, dignified, and peaceful world.

Over the next ten years, the collective focus of the IFRC will be on achieving the following strategic aims:

1. Save lives, protect livelihoods, and strengthen recovery from disasters and crises
2. Enable healthy and safe living
3. Promote social inclusion and a culture of non-violence and peace

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Cover photo: *Charcoal informal industry and dependency as cooking fuel in Haiti.*

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Executive Summary

This practice note of the RCRC "green" emergency response evaluation was conducted from April 30th to July 30th, 2013. The purpose of the evaluation was to evaluate the response support services (i.e., logistics: fleet management and procurement, and base camp modus operandi) and selected response programs (i.e., relief products, water and sanitation, and shelters) from an environmental perspective. Two case studies of recent operations of the Red Cross Societies in the Americas are evaluated for the first nine months of each operation: The Haiti Earthquake 2010 and Tropical Depression (TD12-E) in El Salvador representing a large and medium scale emergency operation. The Greenhouse Gas (GHG) protocol is adopted to evaluate environmental climate change impact of the two cases. By using GHG emissions to evaluate impact for climate change, this report also supports larger global vision of IFRC of reducing carbon footprint of its operations in the future as per IFRC Plan of Action Climate Change 2013-2016.

Key findings

a. Fleet management

- The resulting emissions from fuel consumed for the IFRC vehicles in the Haiti operation during the first nine months is 937 – 1069 tCO2-eq[1]. Almost 40 per cent of these emissions are allocated to the water trucks and more than 50 per cent to the light fleet.

- The GLS regional hub pre-position of vehicles is a good current practice, reducing potential emissions significantly compared to emergency central stock (i.e., IFRC-Global Logistic Service (GLS) Dubai Office Fleet Unit).

- The sourcing strategy (transportation mode) and type of vehicle should be orchestrated in the emissions balance of each fleet operation.

b. Electricity

- Solar panels can be considered as a renewable energy solution. However, their energy payback (from production) is between 1.7 – 2.7 years. Thus, it is justifiable for medium and long term RCRC projects or when it is guaranteed that the systems will be used and maintained for at least 2-3 years.

c. Relief items

- Major impact concerning the relief items is often transportation when pre-position stock is saturated. Air freight GHG emissions is two orders of magnitude higher than water freight. Focus should be on alternatives to mitigate this before changing the products (e.g., local procurement, cash transfer programs, etc.).

1 *equivalent to approximately 24,000 – 27,000 trees to sequester emissions.*
2 *http://ec.europa.eu/environment/emas/*

- Red Cross Societies and PNS should make use of the customer competitive advantage condition over the suppliers to demand/ encourage better environmentally sound and certified products. For instance, EU Eco-Management and Audit Scheme (EMAS)[2].

d. Water and sanitation

- Diversify solutions based on sustainability for the community and for the environment. In the Haiti operation, water trucking provided an immediate, and necessary, solution in the aftermath of the earthquake. Water trucking is however the most unsustainable method of water provision and support for the rehabilitation and extension of the existing infrastructure should have begun at an earlier stage. This was the case in El Salvador, where more than 300 wells were rehabilitated and communities are still benefitting from this solution.
- Waste is the biggest environmental problem in Haiti and El Salvador. Waste management programs should be a high priority in response operations.

e. Shelters

- The current rent program in Haiti was developed with the community and it is a very successful program. It provides a solution without using material resources (i.e., service-oriented). More programs should follow this line of sustainable thinking.

- A vast amount of timber was imported (mostly from North America) for the shelter program: Two to three million timber poles were used (40 to 60 km2 of plantation forest) for the first year. During the preparation phase, consider alternative sustainable building materials (e.g., bamboo) in vulnerable areas.

There are two major transversal recommendations for all response activities:

- Create of systems for performance measurement and monitoring. A good example is the shelter sustainability performance tool being developed in the office of Shelter and Settlements in Geneva.

- Increase environmental awareness to generate an environmental-friendly culture among delegates, volunteers, and beneficiaries. The first fundamental step is to start from within the organization. Hence, Delegates/volunteers can become agents of change to beneficiaries. For instance, invest as much as possible in educational programs for delegates and community about handle of waste.

Table 1. Complete list of recommendations by response activity consideration

Fleet Management	R1	Consider carbon footprint of fleet sourcing as one of the performance indicators in logistics response operations. Details on page 17.
	R2	Encourage data collection on combustible performance and type of vehicles when using local rental/purchased vehicles. Details on page 18.
	R3	In the preparation phase, advise National Societies on a collaborative approach with other entities, so that it can be considered in their own country government policies. Details on page 19.
Base Camp Management	R4	Implement a base camp performance indicator monitoring system in measures such as electricity and waste from the beginning of the operation. Details on page 19.
Renewable Energy	R5	When considering renewable energy solutions, make sure to take into account the environmental lifecycle impact of the system/product solution. Details on page 20.
Procurement / Shipments	R6	Consider procurement alternatives when pre-positioned stock is saturated. Favor local procurement if possible. Avoid long-distance air shipments. Details on page 22.
	R7	Create a “basic environmental calculator tool” for relief items. Details on page 23.
	R8	Require suppliers to be certified with a environmental management standard. Details on page 23.
	R9	Minimize/eliminate packaging material. Details on page 23.
	R10	Establish IFRC “exit guidelines” for distributed relief products. Details on page 25.
	R11	When considering long-term projects, consider investment in construction of recycling facilities. Details on page 26.
	R12	Avoid non-degradable materials. Make it a stretch goal! Details on page 27.
Solid Waste Solutions	R13	Engage in supporting solutions that respond to a country issue, but include community in the solutions and create a sustainable economic activity. Details on page 27.
Water and Sanitation	R14	Diversify solutions based on sustainability for the community and for the environment. Details on page 31.
Waste Management	R15	Involve waste collectors from the beginning of the operation. Make waste management a priority in response operations. Details on page 35.
	R16	Create performance measures and monitoring systems for waste management programs . Details on page 35.
	R17	Invest as much as possible in educating community about handle of waste. Strive to create a waste management culture starting from the household. Details on page 36.
	R18	Consider “best-of-two-worlds” approach for other recycling solutions. Details on page 36.
Shelter Programs	R19	During the preparation phase, consider alternative sustainable building materials in vulnerable areas. Details on page 40.
	R20	Stay updated with the latest humanitarian solution innovations. Details on page 40.
	R21	Develop programs that are community inclusive and include service-oriented strategies. Details on page 41.
	R22	Develop easy-to-use tools to assess sustainability of programs. Details on page 41.
Transversal suggestions	R23	Increase environmental awareness to generate an environmental-friendly culture among delegates and beneficiaries. Details on page 41.
	R24	Create systems of performance measurement and monitoring. Details on page 42.

Acronyms

BOM	Bill of Materials
BREEAM	BRE Environmental Assessment Method
CO2	Carbon Dioxide
CO2-eq	Carbon Dioxide Equivalents
Haiti EQ	Haiti Earthquake
ERU	Emergency Response Unit
EOL	End-of-Life
FRCS	French Red Cross Society
GLS	Global Logistics Services
GWP	Global Warming Potential
GRRT	Green Recovery and Reconstruction Toolkit
GHG	Greenhouse Gas
HRC	Haitian Red Cross
HFCs	Hydrofluorocarbons
IPCC	Intergovernmental Panel on Climate Change
ICRC	International Committee of the Red Cross
IFRC	International Red Cross and Red Crescent Societies
kVA	kilovolt ampere
kW	Kilowatt
LEED	Leadership in Energy and Environmental Design
LCA	Life Cycle Assessment
LDPE	Low-density Polyethylene
MIT	Massachusetts Institute of Technology
CH	Methane
DINEPA	National Directorate for Water Supply and Sanitation
N2O	Nitrous Oxide
PADRU	Pan-American Disaster Response Unit
PNS	Participating National Society
PFCs	Perfluorocarbons
PV	Photovoltaic
PVC	Polyvinyl chloride
QSAND	Quantifying Sustainability in the Aftermath of Natural Disasters
RCRC	Red Cross and Red Crescent
SF6	Sulfur Hexafluoride
SMCRS	Service Métropolitain de Collecte des Résidus Solides
tCO2-eq	Tones of Carbon Dioxide Equivalents
T-Shelter	Transitional-shelter
T & D	Transmission and Distribution
TD 12E	Tropical Depression 12E
UNEP	United Nations Environment Programme
UNHCR	United Nations High Commissioner for Refugees
URD	Urgence Réhabilitation Développement
WatSan	Water and Sanitation

1. Introduction

Humanitarian operations deliver fast assistance to disaster affected populations around the world. They include relief and response in form of food and non-food items (e.g., hygiene kits, tarpaulins, medical care and temporary shelter materials).

Environmental sustainability practices during response operations are often ignored or left behind, primarily for the nature of humanitarian operations where saving lives and reducing human suffering is the priority. However, it is important to incorporate sustainable behaviour and practices within humanitarian operations: ultimately, actions taken by the relief agency are affecting the same communities being assisted, as well as potentially the global environmental at large.

The International Federation of Red Cross and Red Crescent Societies (IFRC) relief items and procedures include many areas of development that could be identified and improved to an environmentally-sound standardized way. The objectives of this study are:

- Evaluate the response support services (i.e., logistics: fleet management and procurement, and base camp modus operandi) and selected response programs (i.e., relief products, water and sanitation, and shelters) from an environmental perspective.

- Identify and characterize historical procedures and methodologies used in past Red Cross and Red Crescent (RCRC) operations to advise best practices in sustainable disaster response and early-recovery.

- Provide recommendations for a disaster response model that reduces the negative middle and longer term environmental impact and promotes sustainability

2. Methods

Case Study

Two case studies of recent operations of the Red Cross National Societies in the Americas are evaluated. The Haiti Earthquake (EQ) in 2010 and Tropical Depression (TD12-E) in El Salvador in 2011 representing a large and a medium scale operation. Each case study was evaluated during the first nine months of the operation. The case study was financially supported by the Swedish Red Cross.

The Haiti EQ operation has been the largest single country response in the history of the RCRC. Haiti EQ took the life of more than 220,000 Haitians (IFRC 2010), leaving more than 310,000 injured, and 1.3 million homeless[3]. TD12-E in El Salvador caused a serious impact on 69 per cent of the municipalities in El Salvador, affecting more than 500,000 people, 35 people dead and more than 50,000 people in emergency shelter (UN 2011).

Haiti EQ operations were supported initially by the Emergency Appeal MDRHT008 that targeted 20,000families affected by devastating earthquake. The earthquake compounded the already very difficult humanitarian conditions in the country. Sanitation services were practically non-existent and some 70-80 percent of Haitians had no access to clean water, whilst a reported 80% of all diseases in Haiti were water-borne. Furthermore, according to the International Crisis group, as of 2008, 75% of the population had no access to any kind of health care. There were virtually no emergency wards in the country, and only one doctor for every 3,000 citizens, with private hospitals charging fees that put medical care out of reach for everyone but the wealthy. With massive and widespread damage to buildings and infrastructure, Port-au-Prince was limited to water trucking, and water production and relief distributions for population through specific distribution points. Although the emergency situation usually begins to stabilize some three to four months into an operation, this was not the case in Haiti where the rainy season overlapped with the operation's and extended emergency with secondary hazards. The EA was revised as to reach 80,000 households with the provision of emergency shelter materials namely tents and/or tarpaulins, shelter kits, and ropes; to provide healthcare to some 95,000 people in Red Cross/Red Crescent health care facilities; and to provide some 314,000 people with 90,000 cubic metres of water throughout 118 water points in settlements and communities. throughout the earthquake affected area.

3 *http://haiti.humanitarianresponse.info/*

In El Salvador, TD 12E operations supported initially through DREF funds 800 families that were affected by heavy flooding. 1,200 wells have been affected. The road infrastructure was disrupted, with 14 roads obstructed by 577 landslides. Three main highways were blocked: the Sonsonate-San Salvador; the Santa Tecla-Puerto de la Libertad, and the one connecting San Salvador to the eastern side of the country which made reaching some communities difficult.

Case study development included field visits during the month of May 2013 (See Appendix 1 for a complete list of interviewees in each site).

Environmental Impacts

There are several ways to assess the environmental impact of a given system, process or product. A well-known approach is the Life Cycle Assessment (LCA). This assessment is carried out on the basis of the inventory analysis data. The inventory flows are classified according to their potential impact on the environment, human health, or resources in so-called impact categories. These categories provide indicators of potential environmental impacts. For instance, a current well-known impact category is climate change as shown at the top of the list in Figure 1. All emissions which produce a potential contribution to the Greenhouse Gas (GHG) effect are assigned to this category. For the purpose of this study, climate change has been chosen as a preferred category to quantify some of the impacts from the response operations. Other categories such as land use (including the impact of waste), water, and resource depletion are qualitatively discussed in this report even if not quantification was performed mainly due to lack of data and limited time of the study.

4 *http://lct.jrc.ec.europa.eu/assessment/*

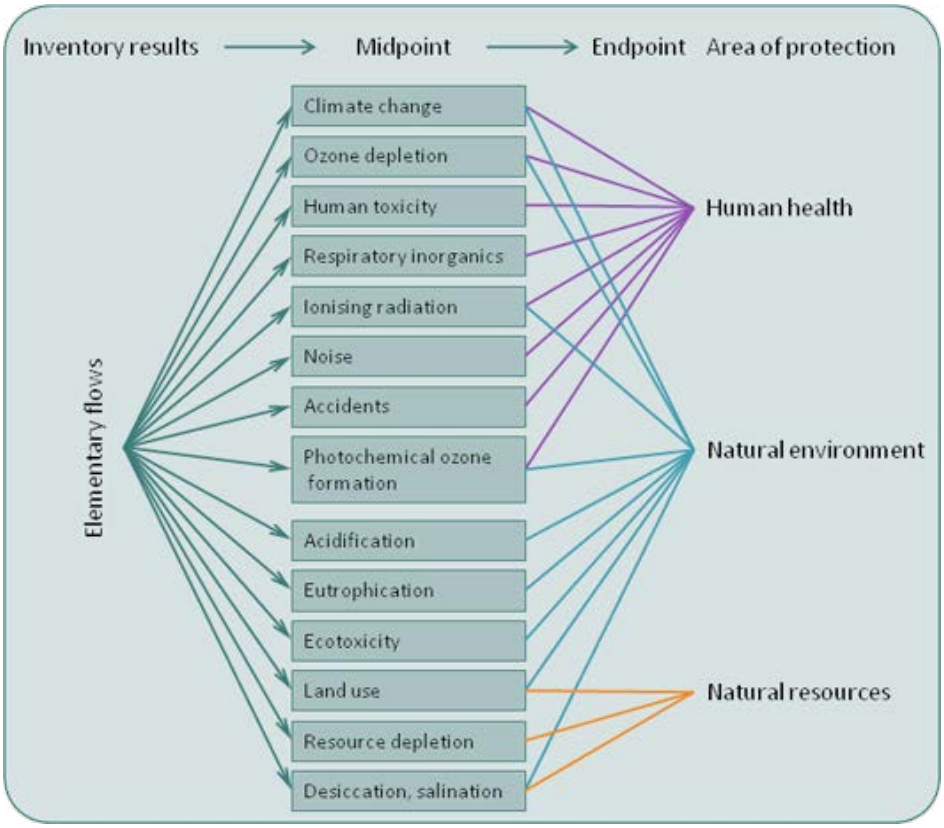

Figure 1. Environmental impact categories[4]

Greenhouse Gas (GHG) protocol

In order to evaluate climate change impact of the two cases presented, the GHG protocol, a corporate accounting and reporting standard (WBCSD-WRI 2004), has been adopted. The protocol defines the scope boundaries as follows:

- *Scope 1: Direct GHG emissions: Occur from sources that are owned or controlled by the organization (e.g., vehicles, boilers, furnaces, etc.)*
- *Scope 2: Indirect – Electricity GHG emissions: Accounts for GHG emissions from the generation of purchased electricity*
- *Scope 3: Value chain GHG emissions: Other indirect emissions such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned by the reporting entities, outsourced activities, waste disposal, electricity-related activities (e.g., T&D [transmission and distribution] losses) not covered in scope 2, etc.*

Figure 2 illustrates the operational boundaries which define the scope of indirect and direct GHG emissions.

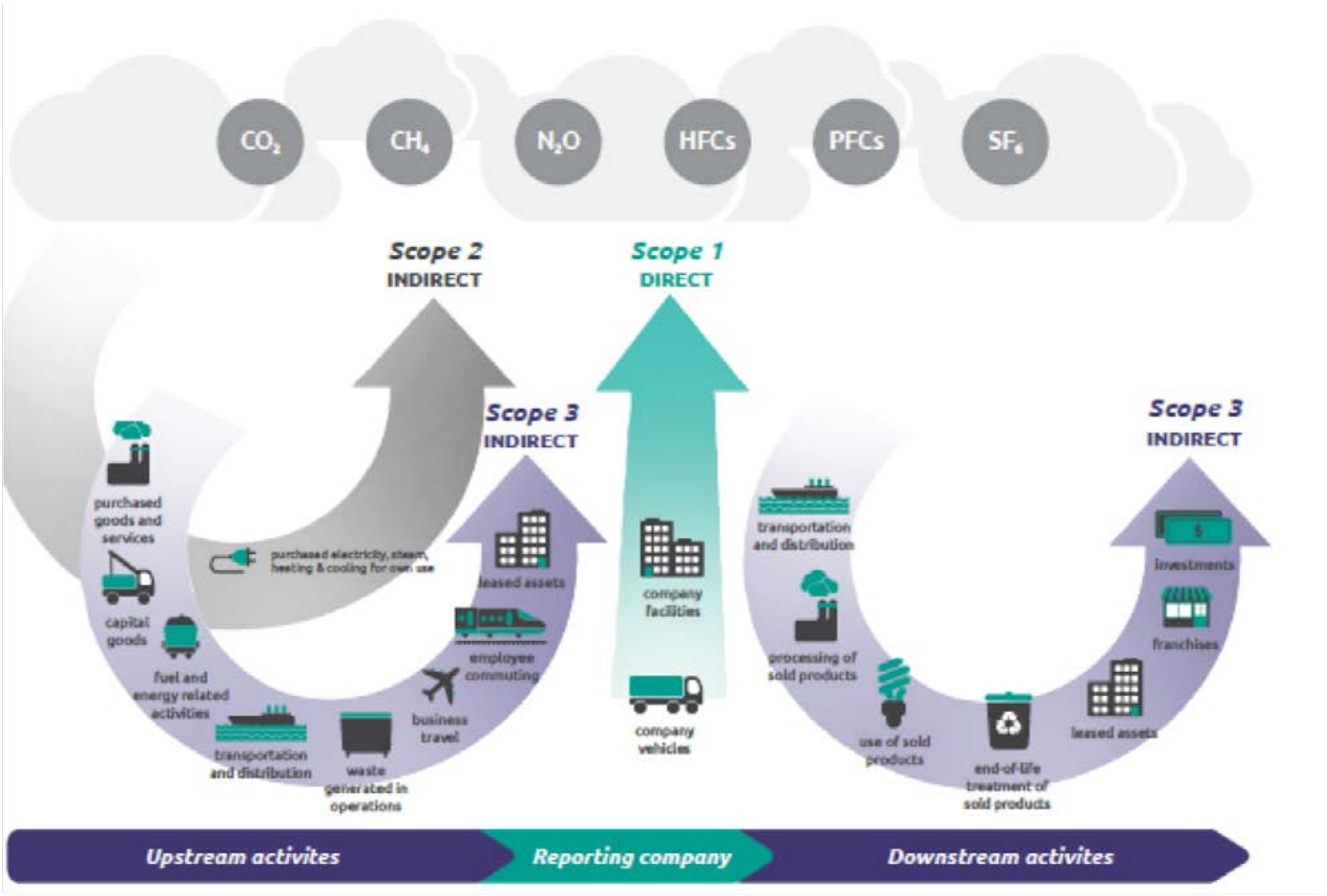

Figure 2. GHG Protocol scopes and emissions across the value chain (WBCSD-WRI 2004)

GHG emissions are measured in carbon dioxide equivalents (CO2-eq), representing the equivalent mass of CO2 needed to produce the same global warming effect. The Intergovernmental Panel on Climate Change (IPCC) guidelines provided the conversion mechanism of six main greenhouse gases: carbon dioxide (CO2), methane (CH) nitrous oxide (N2O), sulphur hexafluoride (SF6), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs). This conversion is based on Global Warming Potential (GWP) figures that specify the amount of warming caused by the gas relative to CO2. Carbon footprint is the methodology to determine the GWP of a system/product.

GHG protocol in the IFRC response operations context

Table 2 shows the IFRC response operation activities for each GHG emissions scope that apply to the two case studies: Haiti EQ 2010 and TD12-E in El Salvador.

Table 2. GHG Scope emissions for IFRC case study response operations

Scope 1	Scope 2	Scope 3
Fleet fuel consumption	Non Applicable	Relief (Procurement/Shipments)
Base camp Electricity		Water and Sanitation
		Shelters

Scope 1 emissions are largely dominated by the resulting emissions from the use of fuel of the fleet. Scope 2 emissions should include indirect emissions from purchased electricity grid. However, in the case of Haiti, electricity was generated through diesel power generators. The diesel combustion used for base camp electricity, is therefore included in scope 1 emissions. In the case of El Salvador, there was no base camp nor electricity used during the response operation can be neglected.

Scope 3 activities are selected according to their importance for the organization. Data availability and reliability for such activities is more challenging as they are often further upstream or downstream in the supply chain. Therefore, it is accepted that data accuracy is lower. It is more important to understand the relative magnitude of and possible changes to scope 3 activities (WBCSD-WRI 2004). For the purpose of this study, IFRC response operation scope 3 activities include: relief products that are procured and shipped to the emergency zone, the different systems/approaches adopted for water and sanitation (WatSan), and shelter programs.

The emergency response Green Scorecard

Table 3 compiles the different impact activities that should be considered to measure the environmental performance of a response operation. In an ideal assessment, each of these activities should be quantified or estimated. In this report, GHG emissions impact is quantified (where data permitted) for each of the selected response activity; End-of-Life (EOL) impacts are mostly qualitatively discussed; and other impacts are not included, but they should be considered in the environmental assessment of future studies.

Table 3. The emergency response Green Scorecard

Response Operation Activity	GHG Emission Impact	End-of-Life (EOL) Impact	Other Impacts
Fleet Management	Scope 1: vehicles fuel consumption Scope 3: shipments transportation, vehicles sourcing	Fuel waste	Resource depletion (fossil fuel used)
Base camp management	Scope 1: generators fuel consumption	Fuel waste, solid waste management	
Relief - Procurement and Shipments	Scope 3: shipments transportation mode, relief items sourcing, products carbon footprint	Relief Items waste (Packaging & Products EOL)	
Water and Sanitation	Scope 3: water solutions carbon footprint	Medical waste, beneficiaries camp waste management	Water use, Sewage solutions (human health)
Shelters	Scope 3: building materials and sourcing	Building materials EOL	Resource depletion (natural resources used)

3. Findings and Recommendations

Given the broad international context in which the operations are taken place, response activities included in this study are all contextual and dependable on many externalities. There are many guidelines and studies already developed and published by various organizations on environmental sound practices and some layout available technologies for each response activity. Even with the Sphere Guidelines (Sphere-Project 2011) in place and others such as the UNHCR Environmental-dedicated Guidelines for humanitarian operations (UNHCR 2005), still measures have included unsustainable ad hoc strategies.

To start with, there is a quick guide on how disaster managers and humanitarian workers can reduce the impact of environment of their recovery operations (UNEP-OCHA 2007). (See Appendix 2 for recommended essential guidance for humanitarian actors)

For more comprehensive resources, the Green Recovery and Reconstruction Toolkit (GRRT)[5] and the UNEP-URD environmental training toolkit[6] are very pragmatic and contextual-oriented. Each toolkit has modules on each of the activities in this section providing guidelines, a trainers' guide, and compiling key supporting documents from various organizations of different options for sustainable practices (See Appendix 3 the outline of each of these tool kits linked to their website for downloads).

The following sections present each of the response activities including the environmental impact analysis and the respective recommendations triggered by the lessons learned from the two case studies are presented. Throughout the document main recommendations are provided for each section in the following format:

R# → where R stands for Recommendation and # the ordered number.

Fleet management

Haiti Earthquake EQ10

During the first nine months of operation the emissions from the fleet came mainly from the fuel consumption of the vehicles. There were a total of 709 vehicles in the RCRC movement fleet for the first year of Haiti Earthquake operation. The scope of the fleet study is only the IFRC vehicles, as they are the vehicles controlled by the organization, which are a total of 216 vehicles as shown in Figure 3. The IFRC-owned vehicles are 145 and 71 are locally rented.

5 *http://green-recovery.org/*

6 *http://www.urd.org/Environment-training-toolkit*

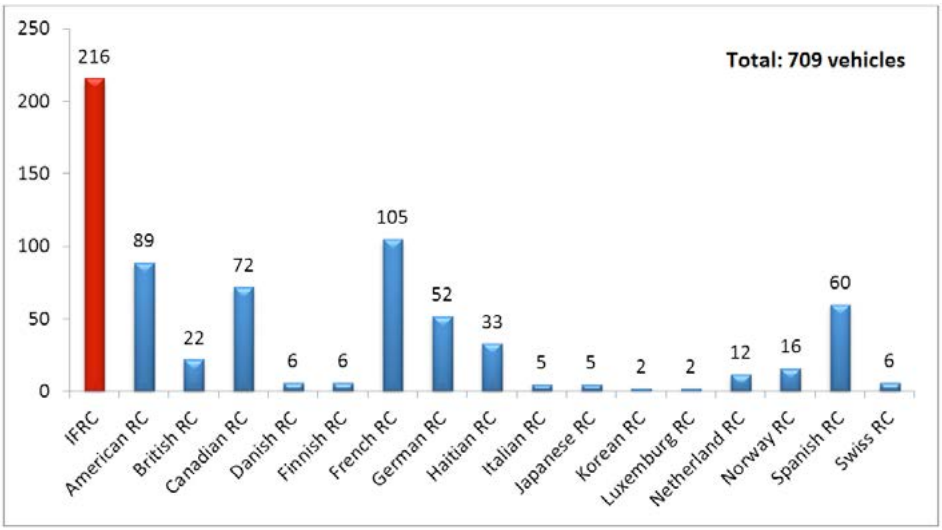

Figure 3. Vehicles for the Red Cross Red Crescent Movement in Haiti 1st year of operation

The composition of the fleet is 123 vehicles in the light fleet and 93 trucks in the heavy fleet.

The heavy fleet included the following vehicles (Salac 2011):

- 25 cargo trucks
- 58 water trucks (40 locally rented)
- 8 vacuum trucks (3 locally rented)
- 1 dump truck
- 1 recovery truck

The light fleet was mainly composed of the type of vehicles listed in the IFRC procurement catalogue (IFRC 2013) under the category "cars" (e.g., Land rover station wagon, Toyota land cruiser). Since accurate data on the specific type of cars is not available, some uncertainty on the analysis has been incorporated to account for this. The parameters used as emissions factors for the vehicle type represent the range of higher and lower emissions efficient vehicles.

Emissions were calculated based on the reported average distance traveled by each of the fleet type for the IFRC own vehicles and a an estimated average monthly mileage for rented cars during the nine-month period[7] (Salac 2013). Other fuel-based methodologies specified in the GHG protocol exist, which may be preferred over the methodology adopted in this study. However, based on the data availability, the distance-based method was adopted. As for the emissions factors[8], default data from Ecoinvent, a lifecycle inventory database was used (Ecoinvent 2013). The resulting in total the emissions from fuel consumed for the operation during the first 9 months is 937 – 1069 tCO2-eq, which is equivalent to approximately 24,000 – 27,000 trees to sequester the emissions (US-EPA 2013). Figure 4 presents the breakdown emissions by vehicle fleet category.

7 *Based on 1st year fleet report data, accounting only for impact of 9 months (i.e., 9/12 of year impact)*

8 *well-to-wheel emissions*

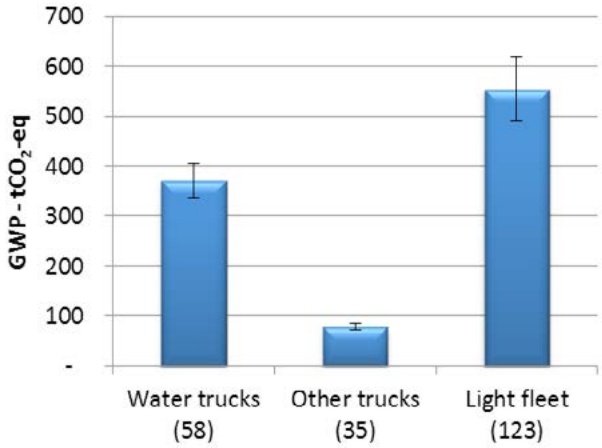

Figure 4. GHG Emissions Haiti EQ Fleet - 9 month period

El Salvador Tropical Depression TD12-E

The fleet at the Salvadorean Red Cross for the operation was composed of 10 trucks and 14 light fleet vehicles. The total emission from the fuel consumed during 9 months period of the operation is 15 - 18 tCO2-eq. Figure 5 presents the breakdown emissions by fleet category.

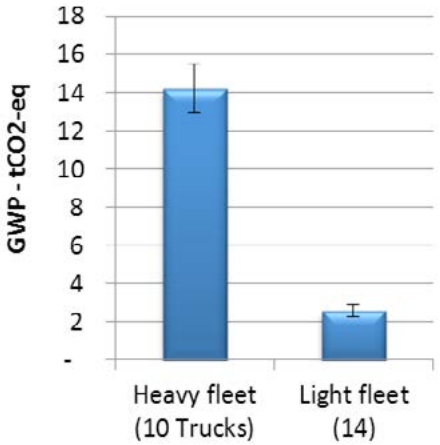

Figure 5. GHG Emissions TD 12E El Salvador Fleet - 9 month period

Comparing fleet options

In order to reduce the environmental impact caused by the fleet in a response operation, fleet sourcing modalities can be considered. In this section some selected identified fleet sourcing options are discussed regarding their respective impact on carbon emissions.

a. Global Logistics Services (GLS) vehicle rental program
- Central stock - holding hub: Dubai
- Regional hub: pre-positioning of vehicles

b. Local rental or purchase

c. Cooperation with other entities (e.g., Government committees - El Salvador model)

R1 ➜ Consider carbon footprint of fleet sourcing as one of the performance indicators in logistics response operations.

It is clear that the RCRC movement supply chains are design for speed of response time for the nature of its purpose of saving lives. Nonetheless, in the long term their impact on the environment (e.g., through transportation emissions) should also be a concern given its connection with climate change and its effect on vulnerable catastrophe prone regions. For each response operation, there should be a thorough analysis that weights response time, cost, and carbon footprint. The necessary analysis should be done in advance as during response, time is not on responders side as to save lives and relief immediate suffering. Here is some starting discussion for each of the fleet sourcing options in terms of carbon footprint.

a) GLS vehicle rental program

The GLS vehicle rental program provides its services with two modalities of sourcing (i) from central stock-holding in Dubai (ii) from one of the regional hub near to the operation. This rental program was widely used in the Haiti operation. The type of transport mode, as it is obvious, is highly correlated with the amount of emissions for the shipment. Figure 6 graphically illustrates the difference of GWP for air and water freight. The GWP Impact of air freight can be two orders of magnitude higher than water freight. Clearly, neither from a cost nor from a response time or carbon footprint point of view, a single mode should be used. The right way of coordinating this is by considering the three performance measures in decisions and creating strategies for optimizing their effect in cost, emissions and time.

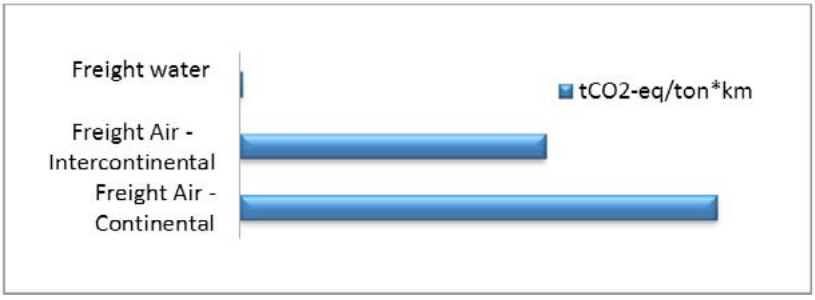

Figure 6. GWP Water and Air Freight impact factors order of magnitud

As an example of strategy tackling the three issues is the already in place pre-positioning strategy of GLS. In the Haiti EQ operation, the first 20 vehicles sent to Port au Prince with this program were the vehicles that were pre-positioned at the regional hub in Panama. These vehicles were shipped by air charter in 6 different flights. Figure 7 shows the carbon cost of this shipment: 123 – 136 tCO2-eq compared to what this same shipment would have been if sent from the central stock-holding hub in Dubai. By pre-positioning this stock, the potential emissions had been reduced significantly.

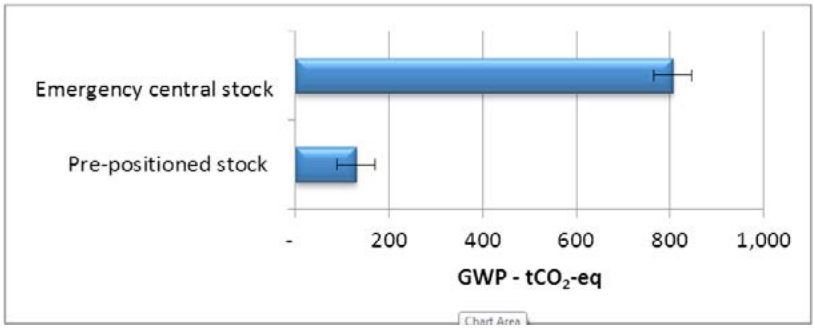

Figure 7. GHG Emissions GLS emergency stock vs. pre-position stock of vehicles

While pre-positioning stock is a good strategy to reduce carbon footprint on the shipment of the vehicles, the following three options (local rental or purchase and cooperation with other entities) are strategies that will almost eliminate the need for these emissions. However, these options may not always be convenient and have some constraints in the context of each operation. Moreover, the type of vehicle that is available in the local country is a non-trivial variable to consider. Some local vehicles may or may not offer lower emissions efficiency per unit of distance or per combustible unit as the GLS vehicles guarantee. Therefore, strategy of sourcing (transportation mode) and type of vehicle best suitable in the country and for the specific operations, should be orchestrated s in the emissions balance of each operation.

b) Local rental or purchase

The option of local rental or purchase is indeed suitable to avoid the shipping emissions of the vehicles. In the case of Haiti, this option was more unavoidable than planned. There was a need of immediate vehicle supply as the scale of the emergency would not be able to afford to wait for vehicles that would take weeks in arrival (not to mention the registration lead time that vehicles had to undergo). However, it is unclear and untraceable how these vehicles performed in terms of emissions efficiency as no data on type of vehicle and fuel consumption was collected for these vehicles that compromised one third of the IFRC fleet (i.e., 71 vehicles). Due to this fact, there is no possibility to give clear recommendations for type of vehicle that should be used in Haiti in future operations.

R2 ➜ Encourage data collection on combustible performance and type of vehicles when using local rental/purchased vehicles

c) Cooperation with other entities

This model involves many governmental, non-governmental and some private entities within the country to form committees. These committees support each other during emergency situation. This model is existent in El Salvador and such committees are called National technical committees of civil defense. There are seven: (i) Emergency services (ii) Security (iii) Health (iv) Infrastructure and basic services (v) Logistics (vi) Shelters (vii) Technical-scientific (see Appendix 4 for complete list of organizations in El Salvador and their respective affiliation to each committee). The

Salvadorean Red Cross belongs to four of the seven committees. One of them is logistics. Members of the logistics committee, in a response operation, are coordinated to manage their fleet as if there was one for all. In this way, the fleet of each organization is available to the committee members as needed in the emergency.

This approach is moving towards a more environmentally sound way of managing the fleet in a response operation. It would certainly not replace any of the previous fleet options, but it is an excellent complement for the each of them.

R3 ➜ In the preparation phase, advise National Societies on a collaborative approach with other entities, so that it can be considered in their own country government policies

Base camp management

Electricity generation

Another source of fuel consumption is the diesel used to power the generators in the base camp. The first months of operation two 100 to 110 kVA generators (80kW) were used (Simon 2013). For the purpose of the calculations and confirmation from the base camp maintenance supervisor, it was assumed that generators ran for 24hrs/day at 75%-100% power load. Figure 8 presents the results of fuel consumption in terms of GWP for the 9-month period of the scope of this study and presented as a relative measure by delegate.

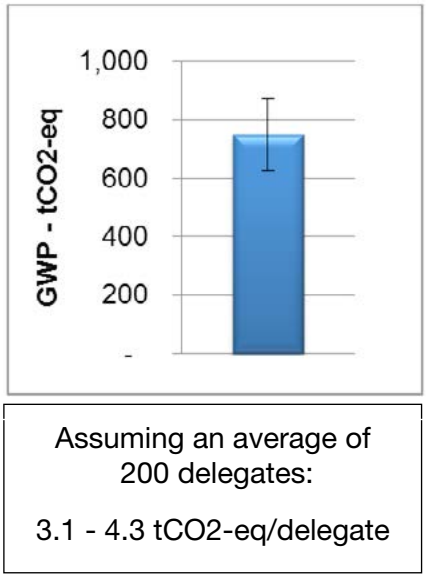

Figure 8. Haiti base camp electricity emissions 9-month period

R4 ➜ Implement a base camp performance indicator monitoring system in measures such as electricity and waste from the beginning of the operation

No data of performance on this equipment was collected the first year of operation. The current base camp coordinator has implemented a system of tracking several different performance indicators (e.g., electricity production including the fuel consumption monthly, breakdowns, etc.) (Svane 2013). This is a good practice that should be into place from the beginning response/early-recovery phase.

For large scale operations such as in Haiti, non-trivial generation of waste is also present in the base camp. A number of delegates interviewed manifested the discontent on the exaggerated amount of waste generated. During the field visit, the bins for the separation of waste were observed to be located on the base camp. However, it is unclear how efficient this waste separation has been.

Considering renewable energy solutions

It is highly recommended to consider renewable energy technologies when possible, after making a thorough assessment on the feasibility, sustainability, and scalability of the technology in the country. A relevant study published by the Institute for Environmental Security in The Netherlands (Nair 2009) provides a good "quick" overview of nine potential technologies:

- Earth (geothermal, micro fuel cells, biogas)
- Wind (turbine, windbelt)
- Fire (concentrated solar power, photovoltaic solar power, solar cooking and water pasteurization)
- Water (micro-hydropower)

It compiles the advantages, disadvantages, costs, challenges, and the potential for Africa. Even though the report is addressing the needs for Africa, it is an easy-to-grasp recompilation of preliminary key information of these technologies also applicable to countries with low energy developments.

R5➜ When considering renewable energy solutions make sure to take into account the environmental lifecycle impact of the system/product solution

When considering these technologies, it is important to consider lifecycle of the system in terms of energy requirements. For instance, solar photovoltaic (PV) systems i.e. solar panels, have a high energy production phase. Energy payback time of PV systems for invested funds in initial phase range from 1.7 - 2.7 years (Peng, Lu et al. 2013). However, GHG emission rate 29 - 45 gCO2-eq./kWh, which is an order of magnitude smaller than that of fossil-based electricity. Therefore, in the case of emergency response/early recovery phases of operations, PV systems i.e. solar panels will be a benefit as long as system stays in place for at least two years. In Haiti, some PVs were implemented in the camps to power street lights as shown in Figure 9.

Figure 9. Solar panel street light at a Haiti T-Shelter camp

Relief Procurement and Shipments

Haiti Earthquake EQ10

Most IFRC shipments (including relief items and vehicles) came from Panama based on data from GLS. The total emissions from transportation via air and water is presented as breakdown in Figure 10.

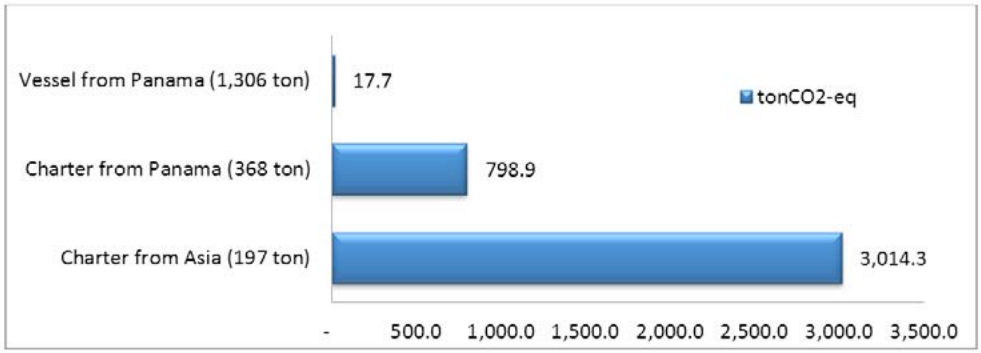

Figure 10. IFRC Relief items and vehicles shipments Haiti EQ - 9 months

Figure above shows as expected that with shipments coming from Asia, emissions are significantly higher. At some point of the emergency operation, there were two charters sent from Shanghai. There is no further information from these shipments. It is recommended to follow up with GLS and determine whether these two shipments were crucial to sent from Shanghai. For future operations, these types of shipments should be avoided especially if the procurement can be done locally or regionally.

R6 ➜ Consider procurement alternatives when pre-positioned stock is saturated. Favor local procurement if possible. Avoid long-distance air shipments.

Note that the resulting emissions reported in Figure 9 are accounting for the one-way flight to Haiti. It does not include emissions from the back haul, which are mainly empty. It is not accounted for here as it is difficult to quantify due to lack of data. The air charter business is like a "taxi service", as these do not always go back directly from where they originally departed (Andersen 2013). Therefore, the reported emissions from air transportation are very conservative estimations of the actual emissions.

Relief items

In terms of single relief items, the recommended way to estimate their environmental impact is by using the Carbon Footprinting methodology and evaluate from "cradle to grave" each product which includes production, transportation, warehousing, and disposal. In a recent study (Oberhofer, Blanco et al. 2013), researchers have evaluated the environmental impact of three typical IFRC relief items (i.e., tarpaulins, jerry cans, and cotton blankets) using this methodology applied to the Haiti 2010 EQ operation with evidence from the National French Red Cross Society (FRCS). In Figure 11 the resulting emissions for a tarpaulin from pre-positioned stock compared to one from emergency stock.

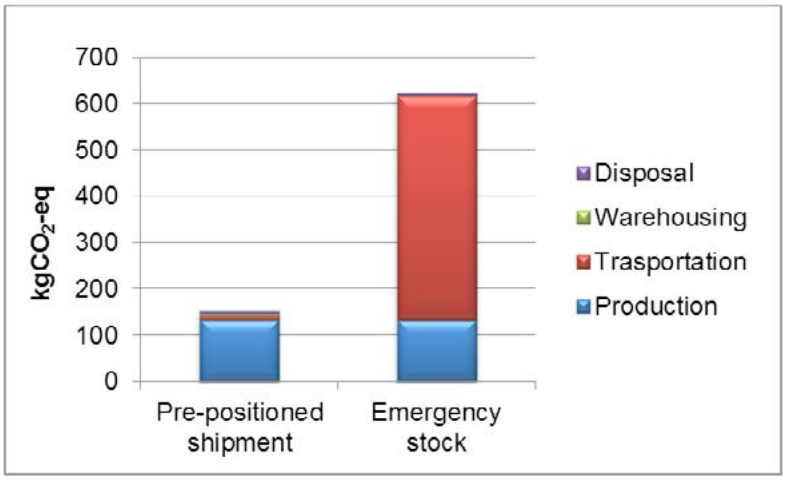

Figure 11. Emissions of a tarp for Haiti EQ. Adopted from (Oberhofer, Blanco et al. 2013)

The use of emergency stock is usually practiced in large-scale operations and given the urgency of response it is sometimes unavoidable. In small-scale operations, it is less of an issue as the pre-positioned stock is sufficient. In El Salvador TD12-E, Pan-American Disaster Response Unit (PADRU) pre-positioned stock was enough and other relief items were mostly procured locally or neighbor countries (e.g., water filters were procured in Guatemala).

R7 ➜ Create a "basic environmental calculator tool" for relief items

In order to be able to compare one product to another in terms of it emissions, it is desirable to perform the carbon footprint of each product. However, this activity can be very resource intensive. A basic calculator tool could be a "good enough" approach at least to have an idea and a starting point to introduce the concept of considering the environmental impact of products in the organization's decisions. This exercise can aid the decision making process and when some of the "hot spots" of a product are found a more detailed analysis can be performed in the desired phase of the product cycle.

R8 ➜ Require suppliers to be certified with an environmental management standard. For instance, with EU Eco-Management and Audit Scheme (EMAS)[9]

The impact of the production of relief items is usually next highest in importance. IFRC, National Societies and Partner National Societies (PNS) should make use of the customer competitive advantage condition over the suppliers to demand/encourage better environmentally sound and certified products. One option is select green relief items and suppliers in advance. Then standard products that have advance calculated carbon footprint, certification and price would be easier to present as an option for normal less greener relief items.

Packaging

R9 ➜ Minimize/eliminate packaging material. Rethink packaging standards, most plastic bags and Styrofoam packaging peanuts are unnecessary.

About 236,500 hygiene kits were distributed among all PNSs and Haitian Red Cross (HRC) during the first 9 months of the Haiti operation (i.e., until October 30, 2010). Figure 12 illustrates the content and packaged hygiene kits for the operation. The GWP impact of the production of the amount of cardboard alone that these kit entail is a non trivial 337 – 347 tCO2-eq. That is right; we are talking about almost (93%) as much as the 58 water trucks' impact from fuel consumption during the same time period.

Figure 12. Hygiene kits distributed content and packaging - Haiti EQ10

9 *http://ec.europa.eu/environment/emas/*

During the same time frame, approximately 113,700 plastic buckets were distributed by PNS and HRC (about half as many hygiene kits distributed). These buckets could have been used as the "packaging" for the hygiene kits as shown in Figure 13 where Medicos sin Fronteras (Doctors without borders) adopted this practice for the Haiti EQ10. In this way, the cardboard packaging could have been eliminated (at least for half of the hygiene kits). This is an example of how to look for solutions within the current practices without changing standard procedures completely.

Figure 13. Hygiene kits distributed by MSF in Haiti EQ10[10]

In a number of interviews relief items' packaging came up time after time as a clear area where the societies could improve significantly their environmental footprint. Many delegates interviewed in both of the case studies mentioned that the amount of packaging waste generated (e.g., cardboard, LDPE bags, styrofoam packaging peanuts, etc.) is quite impressive. Rethink packaging standards, most plastic bags and peanuts are unnecessary. This is definitely a "low-hanging fruit" opportunity to green IFRC's operations.

Products End-of-Life

Usually, if the catastrophe takes place in low-income countries, the proper recycling facilities to treat the used items or waste from them are non-existent. In this way, the assistance that is provided to solve immediate emergency situation is creating another secondary problem in the long-term perspective for the community assisted. Often, waste is one of the biggest and chronic problems in these countries. In Haiti and El Salvador, waste management is identified as one of the main unsolved issue in each country. As it is well-known, uncontrolled waste management or non-existing waste management affects drastically the environment and public health. Figure 14 shows an example of distributed tarpaulins among other waste left behind as beneficiaries move out from emergency camps.

9 *www.humanitariansuppliers.org*

Figure 14. Waste from emergency shelters as beneficiaries move out of a camp in Haiti

R10 ➜ Establish IFRC "exit guidelines" for distributed relief products

There are currently no IFRC guidelines for end-of-life of products distributed. Taking the example of plastic tarpaulins, their average lifetime is between five to six months. In Haiti conditions, it is reduced to about three months (Cabrera 2013). Figure 15 presents the tarpaulins weekly distribution in Haiti operation for approximately 18 months. In theory, this means that at least four to five times during this period there was the opportunity to consider end-of-life options for these relief items (i.e., reuse, recycling, disposal).

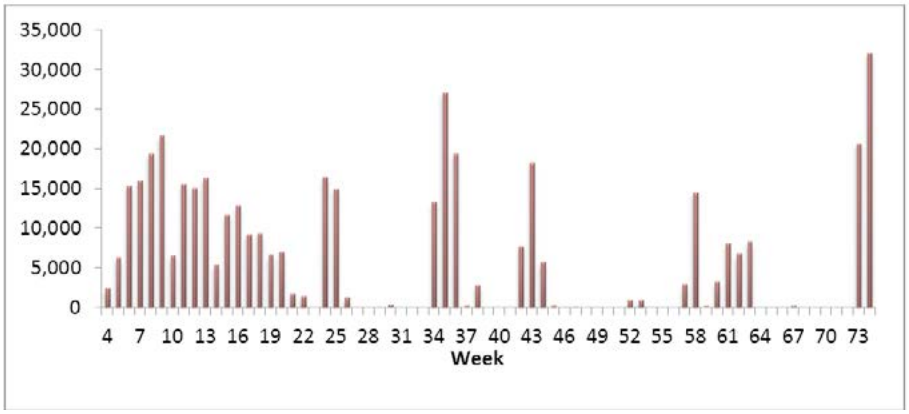

Figure 15. Tarpaulin weekly distribution rate - Haiti EQ10

This issue was identified by the shelter cluster in Haiti and recommended disposal guidelines[11] (Appendix 5). This option identifies a recycler based in Haiti. The recycling process appropriateness is yet to be confirmed. IFRC started distributing tarpaulins replacement in August 2010. Perhaps, this could have been an opportunity to have a "recollection program" and require beneficiaries to bring old tarps in order to get a new one. Of course, this type of programs can become very complicated with the community and the local conditions and need to be well planned and have their own line of funding to be sustainable.

11 *https://www.sheltercluster.org/Americas/Haiti/Haiti Earthquake 2010/Documents/Plastic%20sheeting%20disposal%20guidelines.pdf*

328,390 tarpaulins in total were distributed among all IFRC, PNSs and HRC during the first nine months of the Haiti operation (i.e., until October 30, 2010). Having a "no action" approach (e.g., landfill) costs the environment 1,970 tCO2-eq emissions, which is equivalent to approximately 50,000 trees to sequester the emissions (US-EPA 2013). To set this figure into perspective, this is double the emissions from the IFRC fleet (which accounts for 216 vehicles out of the 709 total vehicles of the RCRC movement Haiti EQ first year fleet) evaluated in the fleet management section of this report. The study mentioned earlier (Oberhofer, Blanco et al. 2013) also performed a relevant evaluation of three end-of-life fictitious scenarios, presented in Table 4, for the relief items (approx. 25,000) sent to Haiti from the FRCS. It presents the resulting emissions of each scenario in comparison with the status quo (i.e., baseline scenario - "no action"/landfill).

Table 4. Relief items End-of-life scenarios and their environmental impact

End-of-life scenario	Emissions change vs. status quo	Considerations
a) Recycling in response area	83% reduction	Provision of facilities necessary
b) Transportation to another country with recycling practices in place	1% increase	Negligible impact change. Needs transportation arrangement
c) Incineration in response area	2400% increase	Absolutely avoid

While option (a) will result in high investment costs, it should be greatly considered that it will activate new industrial and economic activities in the country as well as the process for recycling behavioral change.

R11➜ When considering long-term projects, consider investment in construction of recycling facilities

The recycling business is a profitable one in the long run and it should be considered in the development strategies for affected areas and especially in countries where vulnerability to catastrophes in the region is so high such as the Caribbean and Central American countries.

In the El Salvador case, the case of end-of-life of relief items is very similar to the one above described in Haiti. Figure 16 points out one of the relief items (a mattress) distributed during the TD 12E in the floods affected area. These rural areas do not receive waste management service of any kind. The section on "solid waste management" of this report describes this issue and some recommendations further.

Figure 16. Relief item end-of-life in El Salvador

R12 ➜ Avoid non-degradable materials. Make it a stretch goal!

This should be the ultimate RCRC goal in terms of product standards. As long as the function of the product allows bio-degradability, this should be the goal to move towards.

Solid waste solutions

To address the solid waste generation and its management, contextual solutions need to be identified so that on one side, it reduces the impact of disposed material; and on the other, turns it into resources and solutions required in the operation area, hence generating multiple benefits.

R13 ➜ Engage in supporting solutions that respond to a country issue, but include community in the solutions and create a sustainable economic activity

For example, a very relevant local issue that impacts both environmentally and socio-culturally in Haiti is deforestation. Charcoal and wood fuel have always represented the main source of energy for cooking. Along decades, this industry contributed significantly to the current deforestation level of Haiti, estimated at 97%. Figure 17 shows the difference of forest cover at the border between Haiti and Dominican Republic.

Figure 17. Haiti - Dominican Republic aerial view[12]

The charcoal industry as a whole in Haiti is a much more complex problem to be addressed as it represents the main industry, as well as the major employer. However, considerations proposed here are worth mentioning as to find alternatives to mitigate its related environmental impact in the society by looking not only at its technical feasibility, but also at the economic and social impact of other solutions.

In Figure 18, the issue is represented as the informal industry for people selling charcoal in streets of Port-au-Prince and as a common everyday fuel for cooking determining the dependency on this product with high impact on deforestation.

Figure 18. Charcoal informal industry and dependency as cooking fuel in Haiti

12 *source: NASA*

In this section, an example of a proposed solution that follows "R13":

The aim is to address the solid waste problem with creating a program in which a "special Kit" is provided to a group of beneficiaries to develop micro-businesses focused on the recycling of paper in order to produce fuel briquettes.

This "Kit" should contain the required material and equipment to start a small factory for sorting out paper from solid waste, process waste paper, and finally produce the fuel briquettes. Such approach would provide benefits from several perspectives:

- Beneficiaries would be involved in actively generating economical developments for themselves, stimulating a more proactive behavior.
- A significant environmental issue represented by the huge quantity of solid waste spread around the operation camps would start to be addressed.
- New jobs would be generated improving the social and economical situation in the camps.

This solution of generating fuel briquettes from paper waste has already been proven as successful from a project made by the United Nations Development Program (see Figure 19). However, in the long term it showed difficulties due to competition with the charcoal industry and the missing support form policy-makers. Independently from the success of this program, the solution seems to have highly positive impacts and could be implemented within the operation areas, by closely considering issues that could rise from its implementation when developing in detail the "Kit" solution for RCRC.

Figure 19. Fuel briquettes from waste paper[13]

13 *http://www.ens-newswire.com/ens/jun2010/2010-06-07-03.html*

14 *http://www.unhcr.org/51190fb99.html*

Solid waste needs to be addressed identifying ways to reuse them in a fruitful and intelligent way. In another example, the reuse of plastic bottles as building material is demonstrated. This idea has already been tested by the UN Refugees Agency (UNHCR) in Ecuador to build a computer center and digital library building as showed in Figure 20.

Figure 20. Plastic building in Ecuador[14]

In later recovery phase, IFRC programme Integrated Neighborhood Approach (INA) included participatory approach with communities. For example, in Carrefour - Feuilles community-based approaches included i.e. plastic recycling in the schools and renewal of pedestrian network within the community was done using bricks that were made from collapsed buildings rubble.

Terracing of bamboo in Haiti after EQ 2010. http://haitireconstruction.ning.com/page/bamboo-stop-erosion-in-steep

Recycling in the schools for plastic bottles in Haiti. IFRC.

Water and Sanitation systems

For each operating response, different approaches were taken to respond to water and sanitation needs of the populations under emergency. Sources such as The Green Recovery and Reconstruction Toolkit (GRRT)[15] and UNEP-URD environmental training toolkit[16] among many others have modules on Water and sanitation providing guidelines, a trainers' guide, and compiling key supporting documents from various organizations of different options for water management and ecological sanitation.

R14 ➜ Diversify solutions based on sustainability for the community and for the environment

Water systems

El Salvador TD12-E: Water wells and water filters

The most affected communities were assisted by reconstruction and repair of more than 300 water wells. Water wells are made mainly with cement, PVC tubes, and some iron parts (See Appendix 6 for complete water well Bill of Materials (BOM) as seen in Figure 21. An environmental assessment is not possible to provide at this moment due to the lack of BOM quantities data. However, an interview was conducted to investigate the cement processing technology regulations in El Salvador and it was confirmed that the Red Cross cement supplier is certified and has latest emissions abatement process technology. The water wells are operated manually, so there are no use phase emissions and the beneficiaries perform the required maintenance that involves mainly cleaning of the walls of the concrete pipe. The related emissions for this system can be assumed to very low compared to the benefit that is bringing to the communities during its 10 – 15 years of lifetime.

Figure 21. Water wells construction and rehabilitation in El Salvador TD12-E

15 *http://green-recovery.org/*

16 *http://www.urd.org/Environment-training-toolkit*

Water purification filters were also distributed during the operation. These filters are shown in Figure 22. These filters were procured in Guatemala (local/regional procurement). Beneficiaries interviewed stated their satisfaction with this filters. The water systems used in this operation go beyond the response phase and communities are still using these systems to supply themselves with drinking and other purpose water.

Figure 22. Drinking water filters – relief distributed in El Salvador TD12-E

Haiti: Water trucks

In Haiti, during the initial response period, some options were discussed i.e. strengthening the local capacity of the National Directorate for Water Supply and Sanitation (DINEPA) and the deployment of treatment plants. However, it was then decided to distribute water using water trucks as seen in Figure 23. In 2010, 678 million liters of water were supplied (IFRC 2010) using 58 trucks, each of them driving on average of 2,780 km/year (Salac 2013). This results in a GWP impact of 0.663 – 0.794 kgCO2-eq per liter of water delivered.

Figure 23. Water truck distribution in Haiti EQ10 operation

The decision of delivering water to camps using trucks was an acceptable practice in Port-au-Prince, and was particularly relevant during the initial phases of the emergency response. However, the most sustainable solution after a certain period of time should be to focus IFRC water delegates and economic resources in economic resources in supporting possible existing infrastructure or innovative solutions for areas that are without water systems.

An alternative solution is to deliver to the operation area enough treatment plant kits to supply the water. To illustrate the comparision, WatSan KIT 10 has been analyzed (chosen arbitrarily based on the amount of population supply – medium). To make it comparable with the trucking system, only the impact of the fuel consumed by the diesel pumps which are included as part of the kit, is considered. The resulting GWP impact is 0.016 – 0.019 kgCO2-eq per liter pumped. This is more than one order of magnitude of environmental impact improvement compared with the water through trucks.

Only the impact of diesel consumption by the pumps has been considered for this analysis. However, it should be noted that the GWP of the logistics of WatSan KIT 10[17] does not seem to be significantly different from the delivery of one truck (due to their similar weight – around 7 tons). There may be other constraints that need to be considered with these kits: they require a surface or ground water supply, require a certain amount of space, strategic positioning to minimize trucking from these treatment locations to beneficiaries, maintenance, and disposal of consumables needed to purify the water. Even if all these impacts cannot be neglected compared to water trucking, given the preliminary results presented (more than one order of magnitude of impact), it is worth considering this as a more sustainable option for water trucking within RCRC.

17 *http://procurement.ifrc.org*

Waste management

This is the biggest environmental problem in Haiti and El Salvador. It was already an unrelieved issue before the catastrophes, as it has been the past years. With the emergencies in country, it became even more pronounced matter. Some dedicated Disaster Waste Management Guidelines are available (UNEP-OCHA 2011) along with the environmental toolkits mentioned in the previous section. These documents also include extensive background on waste management techniques and for potential technologies in response operations. The documents and their information could be used and put into action for proper waste management in highly populated camp conditions (e.g., metropolitan area in Haiti) and other rural severely affected areas (e.g., rural flooded communities in El Salvador).

Solid waste

Haiti

Figure 24. Waste culture in Haiti

There is very little or no waste management culture in Haiti. (Figure 24). Some people burn their garbage and for many others, the common practice is to throw garbage in the ravine or leave it somewhere where solid waste accumulates as seen in Figure 25. There is very low coverage organized public solid waste management system. The local authority responsible (i.e., SMCRS) has some collection points (skips) over the city where people dump their rubbish and it is then collected. However, in Port-au-Prince in the year of 2010, 75% of the waste generated was not collected (IFRC 2011).

Figure 25. Waste accumulating in a ravine in one of the camps in Haiti

R15 ➜ involve waste collectors from the beginning of the operation. Make waste management a high priority in response operations

One of the llesson learned from the operations is the need to involve waste collectors from the beginning of the response operation (Martinez 2013), the need to act proactively and have a strong waste tackling program. Solid waste is generated on a daily basis, non-stop. From the start of the response, if this issue is not managed, it gets out of control, triggering unsustainable behavior within communities thus affecting the social and physical well-being including health, food security, dignity, comfort, violence, etc.

R16 ➜ Create performance measures and monitoring systems for waste management programs

Some IFRC-led programs existed with efforts to establish recycling practices inside the camps, camps. This was done mainly through workshops i.e. establishing an "open day" to demonstrate recycling. However, it is unclear how these programs helped the communities and how the conditions after the program improved the status quo as no evaluation of impact was done. There is not a systematic monitoring of success on these projects (Lisa 2013). If the organization is aiming at having more of these programs funded, there is an urgent need to create these performance measurement systems.

R17 ➜ Invest as much as possible in educating community about handle of waste. Strive to create a waste management culture starting from the household

80% of the employment in Haiti is through small business. Solid waste can be used as a source for employment for hundreds of people if there are enough initiatives set in place. Raw materials of solid waste are generated daily. If community is sensibilized enough, they will start coming up with initiatives themselves. This is applicable not only for regular household waste, but also for other type of wastes such as for electronic waste and end-of-life vehicle waste as seen in Figure 26 and Figure 27.

R18 ➜ Consider "best-of-two-worlds" approach for other recycling solutions

Different options exist to treat electronic waste streams. For instance, a proven environmentally sound and cost effective strategy is the "best-of-two-worlds" approach (Manhart 2011), which consists in the international co-operation to combine strengths of manual dismantling in developing countries as "best" pre-processing and state-of-the-art in global market as "best" end-processing.

Figure 26. Electronic waste in a Haiti camp

Figure 27. End-of-Life vehicles in a Haiti camp

Another current waste-related issue in Haiti is the oil waste. IFRC delegates have not been able to find local providers that would treat oil waste. A oil treatment procedure needs to be identified as otherwise, this specific waste is transported to another country for recycling (Giraldo 2013). For additional solid waste solutions, refer to the product end of life section of this report.

El Salvador

Waste management in El Salvador is considered the greatest environmental problem of the country (Mojica 2013). Communities visited during the field trip have no knowledge nor capacity on how to recycle solid and organic waste. Practices used to handle the waste are not very different as the practices described in Haiti. Figure 28 illustrates the household waste management and in Figure 29 some of the solutions created by their own community leaders, for the waste that is not burned (e.g., plastic, glass, etc.) they created a non-engineered landfill.

Red Cross employees and delegates stated that there are usually very few funds for these efforts to educate communities as well as to create more pragmatic solutions for this issue.

Figure 28. Household waste accumulated to be burned in El Salvador

Figure 29. Non-engineered landfills created by a community leader in El Salvador

Sewage waste

Even before the earthquake, only about 25% of the people had access to sanitation services in Haiti. The status of sanitation made the sewage waste management aspects of the emergency response very chaotic, threatening public health in the aftermath of disaster (PAHO 2011), this even if number of guidelines exist such as the Field Manual - Excreta Disposal in Emergencies (UNCHR 2009). Data to analyze and present the problem into the environmental context was challenging to obtain for this section. Only observations of these systems during the field trip could be done. Figure 30 presents some example of latrines at a Transitional-shelter camp (right) and at an emergency shelter camp (left). Some interviews with the beneficiaries that were performed at the emergency shelter camp revealed that these latrines were only used by a few people that had key to enter. This is a common procedure that leaves high percent of population in the camps with no choice, but to use public areas for their needs. It is clear that from an environmental point of view, this is an issue that should be taken care of according to the guidelines mentioned above. Also, Module 7 of the The Green Recovery and Reconstruction Toolkit (See Appendix 3) describes different environmentally sound approaches such as the composting latrines and toilets, wetlands for wastewater treatments, among others.

Figure 30. Examples of sewage systems in Haiti camps

Medical waste

There are various comprehensive guidelines that include the environmental implications and guidelines of medical waste management such as the safe management of wastes from health-care activities (WHO 1999a), the guidelines for safe disposal of unwanted pharmaceuticals in and after emergencies (WHO 1999b) along with many others compiled in the healthcare waste website[18]. In addition, for the IFRC health delegates there is also the internal ICRC guidelines for medical waste management (ICRC 2011). Interviews revealed that i.e. for Rapid Deployment Hospital Emergency Response Unit (ERU), there is a need to create more specific standards for medical waste management that are exclusive to ERUs (Jouffroy 2013). The existing standard guidelines are too generic and delegates often have to adopt ad hoc solutions and make their own call on some medical waste procedures.

Given the large humanitarian impact with casualties in the first phase of response, the capacity of hazardous medical waste handling (mainly incinerators) equipment that was deployed in country was mentioned being saturated. Therefore, it is essential that during emergencies the capacity of equipment needs to be estimated well based on available information in advance. The healthcare waste website includes a section of technology systems where an extensive list of different available are classified with basic summary of cost, size, general technical systems specifications including a basic overview of advantages and disadvantages.

One incinerator unit is in particular worth highlighting in this regard. The De Montfort Mark 8a incinerator unit (See Appendix 7 for a graphic representation of this incinerator and reference to design specifications). It was developed by two engineering professors at De Montfort University in England and intended for use by rural clinics in low-income countries. It is not a pre-fabricated machine. It is low cost and simple to build on-site. It requires little to no imported materials, if brick making and metalworking are done locally. It is a solution that can be rapidly set up (3-4 days) and reduce the environmental impact of hazardous unattended waste in emergency operations.

18 *http://www.healthcarewaste.org/resources/documents/*

Shelter programs

The programming area of shelter. is very well documented in the international humanitarian community. The Cluster website[19] carries a number of international standards and good practice guidelines. The technical reference pages include the Sphere standards and guidance on construction of transitional shelter. The environmental reference pages carry best practice guidance on material sourcing, site selection and construction, and debris management. In addition, other relevant material on this subject include the sustainable building guidelines developed by the UNEP after the 2004 Indian Ocean tsunami (UNEP 2007). There are also a comprehensive shelter lessons learned from Haiti that were commissioned by IFRC (Rees-Gildea and Moles 2012).

The shelter program of RC was in place only in the studies operations in Haiti, but no in El Salvador operation.

The transitional shelter program is the largest IFRC program in Haiti operation. The shelter cluster included some great environmental initiatives such as the inclusion of an environmental advisor and and debris advisor that put in place sustainable practices such as the use of recycled earthquake rubble for building (IFRC 2011a). The different type of shelters being developed by the agencies in the shelter cluster were assessed by the environmental advisor back in 2010 (Navaratne 2010). According to this report, during emergency phase alone about two to three million timber poles were used (40 to 60 km2 of plantation forest) for shelters and most timber was imported from the USA with some imported from Canada and Dominican Republic. Data for timber certification was not possible to retrieve. The use of certified imported wood should be analyzed against the use of local resources, based on the scale of the emergency as well as the timeline for recovery phase operation.

R19 ➜ During the preparation phase, consider sustainable building alternative materials in vulnerable areas

During the preparedness phase, RC should consider the feasibility of sustainable alternative materials in case of shelter needs during an emergency. Up until 2010, there was no reforestation program supported by international agencies in Haiti. The IFRC guide of eight designs of transitional shelters (IFRC 2011b) shows the different successful blueprints implemented by the organization in different parts of the world using timber, steel, and bamboo. The use of bamboo in Haiti, as in other countries with deforestation problem, should be studied further as this can be a good alternative sustainable building material. The idea was supported by one delegate in Haiti operation. Haiti has an ideal soil and weather to grow bamboo that could be then used in housing solutions. Bamboo requires at least 3 years from plantation before it can be used as a building material so it would need to be planted as a preparedness action/reforestation or in large scale emergencies that require in next couple of years large amounts of building materials.

19 *www.shelthercluster.org*

In Haiti, one organization that has been working with bamboo has been Organization for the Rehabilitation of the Environment (ORE). They have created bamboo nurseries that provide seedlings to communities. The use of bamboo has been i.e. for wood poles for scaffolding of new buildings, bamboo houses, and handicrafts. By using terracing in already highly depleted forest slopes of Haiti. By usig fast growing varieties of bamboo which have offered fast protection against soil erosion on deforested hillsides, and also improved the situation of watersheds, protecting at the same time environment but providing livelihoods aspects for population.

For more information, see; http://www.oreworld.org/bamboo.htm

R20 ➜ Stay updated with the latest humanitarian solution innovations

Globally, innovative ideas are being developed on a daily basis. For instance, one of the ways to be informed of these developments is to stay tuned with innovation awards in academia, global platforms (i.e. ALNAP urban response platform, climate change platform of RCRC). Last year, for example, a response project that looked specifically at architectural needs in humanitarian emergency: a prototype of floating housing units for flooded areas with low level of natural resources.

R21 ➜ Develop programs that are community inclusive and include service-oriented strategies

The current rental program in Haiti was developed with the community and is a very successful program. It is ideal because it provides a solution without using material resources (i.e., service-oriented). More programs should follow this line of sustainable thinking.

R22 ➜ Develop easy-to-use tools to assess sustainability of programs

Lastly, a good initiative is being developed in the office of Shelter and Settlements in Geneva. It is an IFRC Shelter sustainability performance tool: Quantifying Sustainability in the Aftermath of Natural Disasters (QSAND) - a kind of "BREEAM" or "LEED" certification type of assessment procedure, but which is adopted to a post-disaster shelter assessment context (Serdaroglu 2013). The tool is work-in-process and some piloting including external experts review and field tests are under development (See Appendix 8 for a list of some of the aspects being considered in the tool for evaluation and guidance of sustainable approaches to recovery and reconstruction operations). This is a good example of sustainability-related initiatives that are on their way in IFRC.

Transversal recommendations

Independently from specific measures focused on on pre-selected sectors and issues described above, some recommendations that address transversally the problem of the environmental impact of the operations have been identified. These deal with increasing the awareness of both

20 *http://www.technologyreview.es/tr35colombia/profile.aspx?trid=1280*

delegates and beneficiaries towards the environmental issues and in establishing a dedicated monitoring system that support transparent evaluation and identification of environmental aspects within operations.

R23 ➜ Increase environmental awareness to generate an environmental-friendly culture among RCRC delegates, staff, volunteers and amongst beneficiaries

To improve the environmental awareness, the first fundamental step is to start from within the organization. Continuous sensitization that boost environmental sensibility ofdelegates/volunteers are even more important due to the typical high turnover of personnel of the IFRC, requiring continuous education awareness raising and communication . Solutions in this direction can be the design of innovating training initiatives specific tailored for environmental issues, as well as the inclusion into standard trainings of the key messages and practices towards improvement of environmental impact. Moreover, brief guidelines, checklists, and/or dedicated awareness signs can be developed and used to make sure key messages are spread among the delegates and volunteers. PADRU has already included to emergency operation planning template,selection of options for more sustainable approach. These methods can be "picked" based on status of area affected and country. Also, Regional Intervention Team (RIT) training will include aspects of more sustainable approach for operations and key messages to trainees.

Another idea could be by adopting "environmental champions" chosen among delegates and volunteers of an operation. These "champions" are delegates that eventually after specific training, take the role of supporting the improvement of the environmental impact of the operation. This would increase environmental awareness in operations and collect information of environmentally related issues.The "champions" could be used also for beneficiaries that would represent environmental model within the community affected. All of these champions could be used as a source of information and reference point for other emergency operators.

Once awareness has been achieved among RCRC staff, delegates and volunteers, they can become agents of change by informing and engaging beneficiaries to more environmentally-friendly behavior.

It is important to underline that to achieve proper impact through education and awareness initiatives, specific budget should be dedicated to environmental-driven projects. Some delegates during the interviews conducted for this study stated that "If donors ask us to do it, we will". In fact, since "Donors specify funds" they should also ask for specific initiatives towards environmental-related matters. Hence, a recommendation in this regard is to clarify with the donors the relevance of the environmental impact of the operations aand specify funds for the initiatives that support more environmentally friendly aspects of response operations.

R24 ➜ Create systems of environmental performance measurement and monitoring

A famous quotation from Lord Kelvin states that "If you cannot measure it, you cannot improve it". The definition of key information that need to be measured and monitored from time to time is fundamental to generate transparency about environmental impact of operations and to support the identification of potential for improvement. In long-term, a specific role should be defined for person, whose responsibility is to establish ways to accurately collect and record relevant information that is based on environmental indicators.

Apart from being useful to identify issues and improve them, a performance measurement system that includes environmental sustainability aspects are the base to show and prove the impact of initiatives. This is an important aspect that seemed to be missing in the operations analyzed. For example, in the Haiti a recycling program was implemented in the beneficiaries' camp, but no information about its impact on environmental or social aspects. However, accountability is an important prerequisite to be able to ask donors for specific funding. At present, a vicious cycle is in place: funds to environmental-related programs are difficult to be obtained since it is difficult to measure the impact of any possible action, because no reliable measurement systems are in place. However, these funds could be used to generate measurement systems that will support more funds in the futures since impacts would be then seen and communicated; hence moving from a vicious to a virtuous cycle.

General methods and approaches for measurement systems and accountability reporting to stakeholders are available and can be adopted. As a reference "The Good Enough Guide" (ECB 2006) provides project officers and managers with tools that are safe, quick, and easy to implement, by adopting a simple approach to impact measurement and accountability.

Monitoring tools have been also made on environmental aspect for camp conditions i.e. FRAME tool kit: environmental indicator framework (UNHCR and CARE 2007) that could be used with RCRC as operational guidance.

4. Conclusions

This practice note provides RCRC staff, PNSs and partners with selected facts, analyses, and recommendations as a learning exercise and a baseline for their upcoming and future environmentally driven initiatives for response and early-recovery operations. In Table 5 some of the recommendations proposed throughout this report are gathered in the context of preparation and during operation phase.

Table 5. Selected environmentally-driven recommendations for the preparedness, response and early-recovery phase of an IFRC operation*

Response Operation Activity	Preparation phase	During response
Fleet Management	Continue and enhance pre-positioning practices Evaluate sourcing strategy and type of vehicles in the emissions balance of each fleet operation	Avoid long-distance air shipments Favor local vehicles procurement if possible and convenient
Base camp management	Identify adequate land for the potential location of base camps in vulnerable areas	Implement performance monitoring system for electricity and waste
Relief - Procurement and Shipments	Identify EMAS certified suppliers, non-degradable materials products. Create a "basic environmental calculator tool" Revise standard packaging practices. Look for opportunities to Minimize/ eliminate shipments Create "exit guidelines" for relief products	Favor local procurement if possible Avoid long-distance air shipments
Water and Sanitation	Identify solutions based on sustainability for the community and for the environment	Consider investment in construction of recycling facilities (long term projects) Involve waste collectors from the beginning of the operation.
Shelters	Consider alternative sustainable building materials Stay updated with the latest humanitarian solution innovations	Develop programs with community
Transversal	Delegates/volunteers sensibilisation Create of systems for performance measurement and monitoring Encourage National Societies on a collaborative approach with other local entities	Collect data on relevant defined measures from Coordinate with other international organizations to find synergies

* *The above recommendations should be used so that disaster affected people's lives are not endangered during the response operations life-saving phase when fast assistance is needed.*

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RödaKorset

5. Appendix

1. List of interviewees – PADRU – Panama / Haiti IFRC Base camp – Port au Prince / El Salvador / Other
2. UNEP-OCHA Essential guidance for humanitarian actors
3. The Green Recovery and Reconstruction Toolkit (GRRT) and the UNEP-URD environmental training toolkit outline
4. El Salvador National technical committees of civil defense
5. Plastic recycling in Haiti
6. Water well Bill of Materials for El Salvador TD 12E
7. Medical waste - De Montfort Mark 8a incinerator

1. List of interviewees – PADRU – Panama / Haiti IFRC Base camp – Port au Prince / El Salvador / Other

Interviews/personal Communication in Panama, IFCR PADRU	
Anna Beloff	IFRC PADRU Disaster Management Delegate
Lorenzo Violante	IFRC Haiti Support Team Coordinator
Benoit Porte	IFRC PADRU Coordinator
Omar Robinson	IFRC Haiti EQ Operation Delegate - WatSan
Alberto Cabrera	IFRC Haiti EQ Operation Delegate - Relief distribution management. PADRU Innovation Delegate
Douglas Baquero	IFRC Zone Logistics Coordinator, Global Logistics Service - Americas Zone
Benjamin Andersen	IFRC Zone Logistics Delegate, Global Logistics Service
Imre Barany	IFRC Zone Logistics Delegate, Global Logistics Service
Paco Maldonado	IFRC Delegate for Haiti EQ and TD12E El Salvador
Omaira Vergara	IFRC Delegate - General logistics for personnel in Haiti EQ
Interviews/personal Communication in Haiti IFRC Base Camp	
Siobhan Kennedy	IFRC Haiti EQ Operation Delegate - Water & Sanitation Movement Coordinator
Poul Svane	IFRC Haiti EQ Operation Delegate - Administration and Base Camp Coordinator
Patric Simon	Haiti EQ Operation - Base Camp Maintenance Supervisor
Agali Salac	IFRC Haiti EQ Operation Delegate - Fleet Coordinator
Jose F. Giraldo	IFRC Haiti EQ Operation Delegate - GLS Logistics Coordinator
James Bellamy	IFRC Haiti EQ Operation Delegate - Head of Integrated Neighborhood
Britt Christiaens	IFRC Haiti EQ Operation Delegate - INA Project Manager - Architect
Ascension Martinez	IFRC Haiti EQ Operation Delegate - Senior Community Development Coordinator
Frederica Lisa	IFRC Haiti EQ Operation Delegate - Community Development Project Manager
Alexandre Claudon	IFRC Haiti EQ Operation Delegate - Country Representative
Damien Prillieux	IFRC Haiti EQ Operation Delegate – Waste Management
Interviews/personal Communication in El Salvador	
Pabel Ángeles	IFRC PADRU Central America Disaster Management Coordinator
José Benjamín Ruiz	Salvadorean Red Cross - President
Mirna Zelaya	Salvadorean Red Cross - Executive Secretary
Humberto Gallardo	Salvadorean Red Cross - General Manager
Alex Reyes	Salvadorean Red Cross - Warehouse management
Jesús Rivera	Spanish Red Cross Delegate coordinator in El Salvador
Anna Bickel	Swiss Red Cross Delegate coordinator in El Salvador
Roy Venegas	Salvadorean Red Cross - Operation Director
Aldo Gonzalez	Salvadorean Red Cross - Operations Manager

Juan Vásquez	Salvadorean Red Cross - Operation Sub-Director
Mario de León	Salvadorean Red Cross - Psyco-social Program Coodinator
Adam Rivas	Salvadorean Red Cross - WatSan Director
Nancy Ramírez	Salvadorean Red Cross - Community Heath program
Marlene López	Salvadorean Red Cross - WatSan program
Carlos Juares	Salvadorean Red Cross - Water wells Technician
Juan Sibrian	Salvadorean Red Cross - Volunteers Director
Ramón Pérez	Salvadorean Red Cross - Shelters Coodinator
Luis Quezada	Salvadorean Red Cross - Representative National Logistics Technical Committee of Civil Defense
Ana Mojica	Director of the environmental management program - Universidad Centroamericana
Leila Zelaya	Former environmental quality manager at the Central American Committee for the Environment and Development
Gregorio Zelayandia	Minister, El Salvador Ministry of Interior - Ministerio de Gobernación
Sonia Baires	El Salvador Ministry of Environment and Natural Resources - Ministerio de Medio Ambiente y Recursos Naturales
Ana Deisy López	El Salvador Ministry of Environment and Natural Resources - Ministerio de Medio Ambiente y Recursos Naturales
Elbyn Ramírez	World Food Program Officer in El Salvador
Other Interviews/personal Communication online	
Ela Serdaroglu	IFRC Senior Officer, Shelter and Settlements in Geneva
Sebastien Jouffroy	Canadian Red Cross Senior ERU Officer. Emergencies and Recovery, International Operations

2. Essential guidance for humanitarian actors[1]

Cluster	Environmental impacts that can affect humanitarian activities	Humanitarian activities that can cause new environmental impacts
Health	· Contamination by chemicals, hazardous waste and weapons · Release of asbestos from collapsed buildings · Presence of debris and carcasses · Unsafe chemicals management	· Improper management of healthcare waste and expired medicines · Improper management of chemicals required for health protection (e.g., water treatment) · Improper management of waste, debris and carcasses
Water, Sanitation and Hygiene	· Contamination of water sources by chemicals, hazardous waste and weapons · Damage of water and sanitation infrastructure, leading to cross-contamination · Presence of debris and carcasses	· Over-pumping of groundwater aquifers · Improper rehabilitation and decommissioning of wells · Water contamination from sewage disposal · Inappropriate / energy-intensive WASH systems (e.g., septic tanks, desalination plants)
Shelter	· Contamination of land by chemicals, hazardous waste and weapons · Environmental hazards (e.g., floods, landslides, volcanoes) · Loss of forests resulting in reduced access to fuel wood and building materials	· Unsustainable supply of shelter construction materials · Inappropriate design for a specific need, site, community or culture, leading to misuse or non-use · Unsustainable use of timber and fuel wood in shelter construction · Deforestation and soil erosion · Inadequate disposal of construction and packaging waste
Camp Coordination and Management	· Contamination of land by chemicals, hazardous waste and weapons · Environmental hazards (e.g., floods, landslides and volcanoes)	· Land degradation and biodiversity loss · Improper management and decommissioning of pit latrines · Unsustainable use of natural resources (e.g., timber, fuel wood) · Contamination by fuel spills and disposal of chemicals · Improper decommissioning of camps · Inadequate disposal of construction and packaging waste
Logistics	· Environmental hazards (e.g., floods, landslides and volcanoes)	· Improper management and disposal of fuel, waste oil and tires · Chemicals and waste from logistics base operations · Procurement of goods produced through unsustainable practices
Early Recovery	· Damage to natural resources that support livelihoods · Loss of government capacity for natural resources management	· Unsustainable use of natural resources for reconstruction and livelihoods · Improper land use and urban planning · Failure to conduct strategic environmental assessments and environmental impact assessments · Inappropriate building designs or choices of reconstruction materials · Unequal access to natural resources and changes in tenure · Development of unsustainable livelihoods

1 Source: http://postconflict.unep.ch/publications/IASC_leaflet.pdf

3. The Green Recovery and Reconstruction Toolkit (GRRT)[2] and the UNEP-URD environmental training[3] toolkit outline

A. Green Recovery and Reconstruction Toolkit (GRRT)

Module A: Guide to the Toolkit

Module 1: Opportunities for Green Recovery and Reconstruction: An Introduction

Module 2: Project Design, Monitoring and Evaluation

Module 3: Environmental Impact Assessment Tools and Techniques

Module 4: Green Guide to Strategic Site Selection and Development

Module 5: Green Guide to Materials and the Supply Chain

Module 6: Green Guide to Construction

Module 7: Green Guide to Water and Sanitation

Module 8: Green Guide to Livelihoods

Module 9: Green Guide to Disaster Risk Reduction

Module 10: Greening Organizational Operations

B. UNEP-URD environmental training toolkit

UNEP and Groupe URD have developed a training toolkit to assist humanitarian actors to integrate environmental considerations into their policy development, planning, programme design and operational activities.
The training toolkit consists of 11 modules, with each substantive module containing a summary, PowerPoint presentation, trainer's guide, training materials and key supporting documents:

Module 1: Training overview (.ZIP 8,5 Mb)
Module 2: Key environmental concepts (.ZIP 1,5 Mb)
Module 3: Humanitarian action and the environment (.ZIP 8,7 Mb)
Module 4: Sustainable water management and ecological sanitation (.ZIP 88,4 Mb)
Module 5: Waste management (.ZIP 50 Mb)
Module 6: Reduction of and alternatives to the use of firewood (.ZIP 50 Mb)
Module 7: Livelihoods and the environment in rural contexts (.ZIP 17,5 Mb)
Module 8: Humanitarian logistics and the environment (.ZIP 4,4 Mb)
Module 9: The environment and the project cycle (.ZIP 7 Mb)
Module 10: Adopting an environmental approach throughout an organization

2 http://green-recovery.org/
3 http://www.urd.org/Environment-training-toolkit

4. El Salvador National technical committees of civil defense

COMISIONES SECTORIALES	Técnica-Científica	Servicios de Emergencia	Seguridad	Salud	Infraes-tructura y Servicios Básico	Logística	Albergues	
INSTITUCIONES								∑
DG.SNET	*C (Coor-dinator)							1
Policía Nacional de Civil	X	X	C				X	3
MOP, Transporte, Vivienda y Desarrollo Urbano					C	X		1
Cruz Roja Salvadoreña		X		X		X	X	4
Universidad de El Salvador	X							1
Universidad Centroamericana	X							1
Com. Ejecutiva del Río Lempa	X							1
Dirección General de RRNN	X							1
Dirección Gral. de Protección Civil	X	X	X	X	X	X	X	7
ANDA	X			X	X	X		4
Geólogos del Mundo	X							1
Cuerpo de Bomberos de El Salvador	X	C						2
ISSS	X			X				2
MSPYAS	*C			C		X	X	4
MAG	X	X			X			3
Autoridad Marítima Portuaria	X							1
ISRI				X				1
FOSALUD				X				1
Bienestar Magisterial				X				1
Cruz Verde Salvadoreña		X						1
Comandos de Salvamento		X						1
Ministerio de Gobernación						C		1
MARN	*C	X						2
Corte de Cuentas de la República						X		1
ANEP						X		1
MAG		X				X		2
CEPA						X		1
Fuerza Armada	X	X	X	X	X	C		6
Fiscalía General de la República		X	X					2
ANSP			X					1
D.G de Seg. Ciudadana del MSP			X					1
IML "Roberto Masferrer"				X				1
FUSAL				X				1
Visión Mundial				X		X	X	3

SIGET					X			1
Vice-ministerio de Vivienda					X			1
Dirección General de Aduanas						X		1
CASALCO					X			1
ASIA					X			1
Dirección General de Migración y Ext.						X		1
DIGESTYC					X			1
FISDL					X			1
Secretaría Nacional de la Juventud							X	1
Compañías de Distribución de Energía Eléctrica					X			5
Compañías de Servicio de Telefonía					X			4
Viceministerio de Transporte						X		1
SNF						X		1
INDES							X	1
Scout de El Salvador						X	X	2
Ministerio de Educación							X	1
Asoc. Nacional de Muchachas Guías						X	X	2
CARE						X	X	2
CARITAS							X	1
TOTAL								94

5. Plastic recycling in Haiti[4]

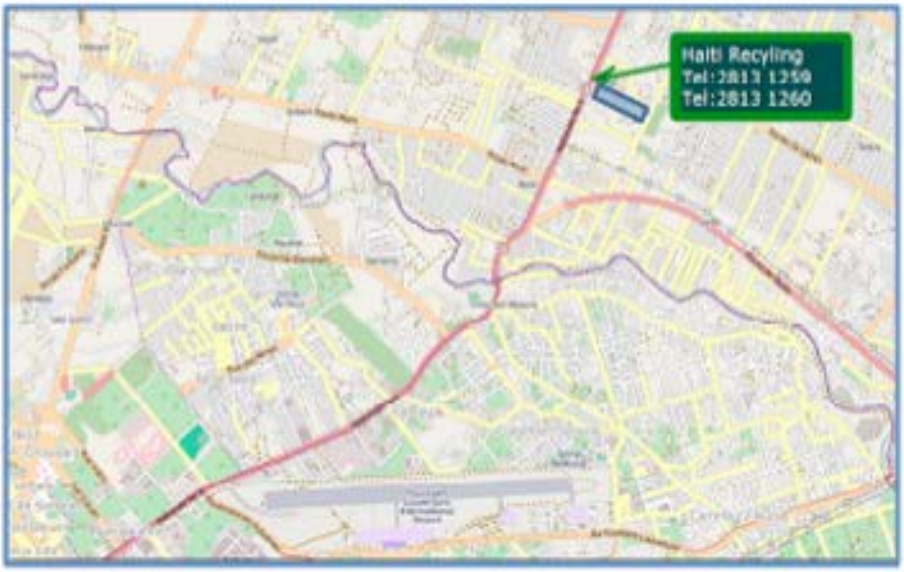
Recycling

Chemically processing plastic sheet to recover materials is not usually practicable and depends on the capacity of the local recycling industry. In Haiti, the plastic recycling industry is willing and fully supportive of recycling the plastic sheeting material.

Key polythene recycler in Haiti:

Haiti Recycling
Mr. Stephan Sajous - CEO
Bon Repos, Lathan (Usine G.S. Industries en Plaine)
Port-au-Prince, Haiti
T: 509-2813-1259 / 509-2813-1260
C: 509-3701-2833

Map to Haiti Recycling:



Directions: HAITI RECYCLING is on the **right side** of the **Rue National 1, 1 km** from the Texaco Fuel station junction, when driving towards the North

What you need to do to recycle plastic sheeting?

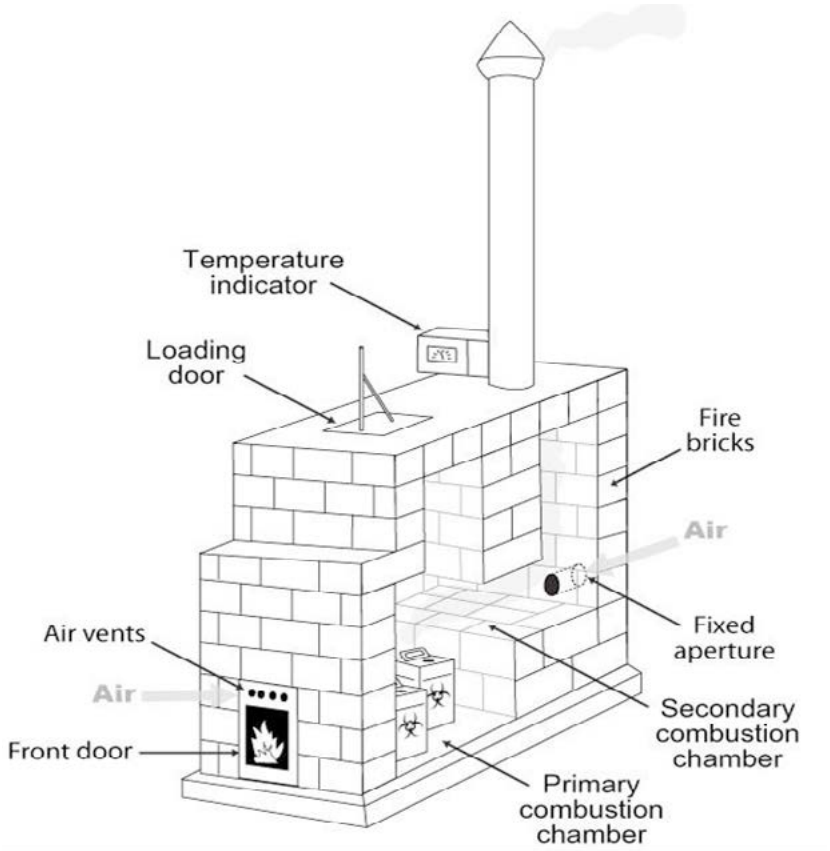
1. Remove plastic sheeting from emergency shelter sites
2. Wipe them and remove any dirt from the sheets
3. Fold the plastic sheets neatly and pile them to make a bail
4. Transport the plastic sheeting to Haiti Recycling in Lathan off Rue National 1

5 https://www.sheltercluster.org/Americas/Haiti/HaitiEarthquake2010/Documents/Plastic%20sheeting%20disposal%20guidelines.pdf

6. Water well Bill of Materials for El Salvador TD 12E

- Cement
- Sand
- Spark
- Gravel
- PVC pipes
- White soil
- Bricks
- Concrete pipe (hole diameter)
- Smooth Iron ¼ “
- Mooring wire
- Rubber gloves
- Glasses
- Drills for drilling concrete and steel
- Corrugated iron ½ “and 3/8”
- Iron smooth ½ “
- Iron angles
- Galvanized sheet metal
- Painting
- Solvent (mineral)
- Stone (fourth)

7. Medical waste - De Montfort Mark 8a incinerator



Design and technical specifications can be found at:
http://www.mw-incinerator.info/en/303_Mark_8a.html
http://www.mw-incinerator.info/en/pdf/Mark8a_construction.pdf

8. IFRC Shelter sustainability performance tool: Quantifying Sustainability in the Aftermath of Natural Disasters (QSAND)

Note: This is a preliminary list of aspects to be considered. Tool is in development phase

Shelter & Community	Privacy
	Internal Environment
	Community-sensitive Design
	Construction Specification
Settlement	Site Selection
	Security of Tenure
	Spatial Planning
	Infrastructure
Materials & Waste	Post-disaster Waste Management
	Construction Waste Management
	Operational Waste Management
	Material Properties/Selection
	Material Sourcing
Energy	Energy Demand & Supply
	Energy Consumption
Water	Water Demand
	Water Supply
	Water Quality
Communications	Telecommunications
Natural Environment	Human Relationship to Ecological Services
	Ecological Protection
	Ecological Regeneration
Cross-cutting Issues*	Participation
	Education/Skills
	Livelihoods
	Access & Non-discrimination
	Safety & Security
	Economic Viability
	Community Ownership & Sustainable Management
	Resilience

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The Fundamental Principles of the International Red Cross and Red Crescent Movement

Humanity The International Red Cross and Red Crescent Movement, born of a desire to bring assistance without discrimination to the wounded on the battlefield, endeavours, in its international and national capacity, to prevent and alleviate human suffering wherever it may be found. Its purpose is to protect life and health and to ensure respect for the human being. It promotes mutual understanding, friendship, cooperation and lasting peace amongst all peoples.

Impartiality It makes no discrimination as to nationality, race, religious beliefs, class or political opinions. It endeavours to relieve the suffering of individuals, being guided solely by their needs, and to give priority to the most urgent cases of distress.

Neutrality In order to enjoy the confidence of all, the Movement may not take sides in hostilities or engage at any time in controversies of a political, racial, religious or ideological nature.

Independence The Movement is independent. The National Societies, while auxiliaries in the humanitarian services of their governments and subject to the laws of their respective countries, must always maintain their autonomy so that they may be able at all times to act in accordance with the principles of the Movement.

Voluntary service It is a voluntary relief movement not prompted in any manner by desire for gain.

Unity There can be only one Red Cross or Red Crescent Society in any one country. It must be open to all. It must carry on its humanitarian work throughout its territory.

Universality The International Red Cross and Red Crescent Movement, in which all societies have equal status and share equal responsibilities and duties in helping each other, is worldwide.

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