



Rapid Environmental Impact Assessment: Haiti Earthquake - January 12, 2010



Photo by Allegra Da Silva

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The views expressed in this report represent those of the authors and not necessarily those of Sun Mountain International, CHF International or USAID.

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The authors hope the information provided in both the REA preliminary report circulated March 1, and this finalized version of March 15, 2010 provides decision-makers with a better understanding of how to approach the environmental impacts and implications of the January 12, 2010 earthquake. The tremendous number of Haitian citizens who suffered from this disaster deserve all our best efforts in assisting them to rebuild their country in the long-road ahead to recovery, rehabilitation and development.

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List of Acronyms

ACDI/VOCA –	Agricultural Cooperative Development International and Volunteers in Overseas Cooperative Assistance
CARE –	Cooperative for Assistance and Relief Everywhere
CCCM –	Camp Coordination and Camp Management
CHF -	CHF International
CDC –	US Government Center for Disease Control
CLA -	Community Level Assessment
CRS -	Catholic Relief Services
DART –	Disaster Assistance Response Team
DINEPA -	Direction Nationale de l'Eau Potable et de l'Assainissement
EGAT –	Economic Growth, Agriculture and Trade
EMMA -	Emergency Market Mapping & Analysis
FEMA –	Federal Emergency Management Agency (US Government)
GoH -	Government of Haiti
IASC -	InterAgency Standing Committee
OFDA -	Office of Foreign Disaster Assistance
OLA -	Organizational Level Assessment
MoE -	Ministry of the Environment
MSB -	Swedish Disaster Management Agency
PDNA -	Post Disaster Needs Assessment
PEA -	Programmatic Environmental Assessment
REA -	Rapid Environmental Assessment
SEA -	Strategic Environmental Assessment
SouthCom -	United States Southern Command
UNICEF –	United Nations Children's Fund
UNDP –	United Nations Development Program
UNEP –	United Nations Environmental Program
UNHCR –	United Nations High Commission for Refugees
USAID –	United States Agency for International Development
USACE –	United States Army Corps of Engineers
USG –	United States Government
WASH –	Water, Sanitation and Hygiene for All (campaign of the Water Supply and Sanitation Collaborative Council, Switzerland)
WASH POC –	Water, Sanitation and Hygiene for All – Point of Contact
WHO -	World Health Organization
WINNER -	Watershed Initiative for National Natural Environmental Resources

I. Executive Summary¹ (English Version)

The 2010 Haiti earthquake led to 230,000 deaths and considerable destruction and damage to the built environment and local geophysical changes. Recognizing that environmentally unwise relief and recovery decisions would lead to further negative impacts on disaster survivors, USAID commissioned a Rapid Environmental Impact Assessment (USAID REA) from 16 February to 5 March 2010. The USAID REA involved the collection and synthesis of information on relief and recovery operations, and from disaster survivors in Port au Prince, rural earthquake-affected areas and destination areas for earthquake affected. The preliminary USAID REA results were circulated within USAID, to USAID contractors and grantees, to the Shelter and CCCM Clusters in Haiti, to the Environment/Risk Reduction Working Group of the Post Disaster Needs Assessment, UNEP, and to other organizations for comment.

The assessment identified a range of major (life threatening) issues, and actions to address these issues. These immediate actions and additional medium term issues need to be considered in planning and implementing the shift from immediate relief operations to sustainable recovery. The critical issues and recommendations are summarized below.

1. **Coordination, Management and Information**: The need for an environmentally sound response is generally accepted in Haiti, but the scale and scope of earthquake impacts and assistance far exceed existing coordination and management mechanisms, leading to general inefficiencies, a weak focus on environmental issues and poor sharing of information.

Recommendations

- 1.1. *Immediately assign Environmental Officers to USAID/Haiti and the USAID/Washington Haiti Task Team to ensure USAID-funded operations meet USG environmental regulations and negative impacts are minimized.*
- 1.2. *Immediately incorporate a dedicated environmental review and management capacity into the USG command structure for the humanitarian response to the Haiti earthquake.*
- 1.3. *Ensure the GoH MoE is part of earthquake relief and recovery structure and has the resources to conduct appropriate environmental reviews and monitoring.*
- 1.4. *Enable UNEP to accomplish its UN Cluster coordination and support mandate.*
- 1.5. *Conduct a strategic environmental impact assessment of recovery plans.²*

2. **Sanitation and Waste**: Sanitation is very poor in many of the 400+ rural and urban camps occupied by earthquake survivors. Sewage is not properly managed. There are indications that safe-to-drink water is being contaminated due to improper household-level handling. Vector numbers and vector-related disease (e.g., malaria) appear to be increasing. Liquid and solid waste disposal is anarchistic and contributes to short and long term environmental degradation and health issues. There is a risk (somewhat moderated) that the inappropriate use of portable toilets (e.g., chemical toilets) will result in negative environmental impacts. Hazardous waste, particularly bio-hazardous waste, does not appear to be well managed (despite efforts to this end). Some proposed solutions for waste management, particularly sewage ponds, may not be viable and could contribute to further environmental damage.

Recommendations

- 2.1. *Increase the number of properly managed and designed latrines and toilets.*
- 2.2. *DINEPA, with USAID support, should create of a system for monitoring of waste generation and sanitation conditions, and adjust collection schedules accordingly.*
- 2.3. *DINEPA, with USAID support, should conduct an environmental impact assessment of existing disposal, settling ponds, and other options for sewage treatment/disposal.*
- 2.4. *Alternatives for sewage management should be investigated in the USAID PEA, including the potential for USAID support to value added sewage disposal (e.g., fertilizer production).*
- 2.5. *If chemicals are to be used in toilets or latrines for any purpose, USAID must collaborate with DINEPA, MSB, the WASH Cluster, and other partners on an immediate environmental assessment. If the chemicals used pose an unacceptable environmental risk, use of these chemical should be discontinued immediately and replaced by acceptable alternatives.*

¹ Drafted by C. Kelly, USAID REA Team Leader, Sun Mountain Intl. email: disasterkelly@yahoo.com

² The planned USAID PEA can be incorporated into the larger SEA effort.

- 2.6. *Assess the effectiveness of current biohazard disposal and control programs and implement improvements meet minimum environmental and safety standards.*
 - 2.7. *Monitor MoH/CDC disease surveillance efforts as changes in health conditions may have an impact on the environment and vice versa.*
 - 2.8. *Distribute safe storage containers and point-of-use chlorination products if household drinking water storage is routinely contaminated.*
 - 2.9. *Use an integrated pest management approach for all vector control efforts.*
 - 2.10. *USAID should collaborate with DINEPA and MSB to ensure that consistent environmental and health advice is given to the WASH Cluster and other groups.*
3. **Geophysical and Hydro-Meteorological Hazards Monitoring**: Geological and hydro-meteorological hazards have likely become more dangerous since the earthquake, with the likelihood of increased landslides, flooding and similar impacts with the onset of seasonal rains. These hazard events will be affecting populations without basic shelter and who may have moved to more hazardous locations than before the earthquake. **While there is justified concern about hurricanes, the threat posed by seasonally normal precipitation, and associated flooding, and should be not be underestimated.**

Recommendations

- 3.1. *Undertake comprehensive geophysical and hydro-meteorological hazard assessment and mapping for flooding and landslides in the earthquake-affected areas, with specific assessments done for each existing or new shelter site.*
 - 3.2. *Develop and implement site specific warning and evacuation plans for all new and existing settlement sites.*
4. **Shelter and Shelter Sites**: Most shelter sites did not meet minimum standards, with specific problems with sanitation, overcrowding, poor quality and a lack of shelter, safety, and potential for fire. Ad hoc shelter sites are being established on the outskirts of Port au Prince, in ecologically fragile areas, near wetlands and with limited resources for construction. Shelter in most shelter sites does not meet standards for transitional shelter needs (e.g., 3-5 years use). Plans to build transitional shelter will require upwards of 20,000 tons of wood, to be delivered in the next 45 days. Unless this wood is imported, significant additional damage to the already stressed Haitian environment is expected. The possible damage from shelter sites and transitional shelter is avoidable or can be significantly reduced. However, an increase in squatting on hillsides (e.g., in location of previous, earthquake destroyed, buildings) or new lands identifies an obvious immediate need for improved planning and management of transitional and permanent shelter assistance.

Recommendations

- 4.1. *All shelter sites should have a fire management plan.*
- 4.2. *Use of open flame or cooking near shelter units should be prevented.*
- 4.3. *Lighting should be provided for all shelter residents. (Rechargeable battery powered lights allow for safe movement after dark.)*
- 4.4. *Drainage at and near shelter sites should be improved to reduce flooding and post-storm standing water. (Shelter sites in extremely flood prone areas should be moved.)*
- 4.5. *All new shelter sites should receive an environmental impact review and have impact mitigation and local environmental management systems established.*
- 4.6. ***No site construction should begin until a site environmental review is completed, a site environmental impact management plan is implemented and the prospective residents consulted about the site.***
- 4.7. ***Transitional shelters should not be used for shelter during hurricanes or severe weather and occupants should be evacuated to proper storm shelters.***
- 4.8. ***The wood for transitional shelters should come from sustainable forests and provided at the same time as other shelter materials.***
- 4.9. *Chemical treatment of wood to limit rot or insect damage is not needed for transitional shelters.*
- 4.10. *The excessive harvest of poles for emergency shelter should be mitigated in recovery programming.*

4.11. *The GoH should immediately develop a land classification system for greater Port au Prince which designates areas which can, and cannot, be used for housing, and take action to enforce this classification.*

5. **Debris Management**: Between 20 and 25 million cubic yards of debris need to be appropriately managed to avoid damage to the environment, livelihoods and recovery efforts. Debris disposal has been anarchistic, and a proper management process is just beginning to be established through a GoH-USG-UNDP task force. This effort has received an environmental review, but further monitoring and reviews are needed as operations expand to deconstruct thousands of government and privately-owned buildings.

Recommendations

- 5.1. *The Debris Task Force plans needs to ensure earthquake debris is managed to avoid or minimize negative impacts on the environment and human health. The MoE should approve the debris management plan.*
- 5.2. *An IEE is needed for all debris management plans, and follow-up impact mitigation plans implemented and monitored.*

6. **Livelihoods and Food Security**: Livelihoods and food security have been significantly affected with hundreds of thousands of household losing productive assets, having social networks disrupted and facing widespread challenges in meeting food and other basic needs. Disaster survivors must now consider livelihood and food security options which can have a negative impact on the environment (e.g., increased charcoal production) and which can be extremely unsafe (e.g., recovering reinforcing rod from destroyed building). At the same time, livelihood strategies are in flux and food markets unstable, presenting challenges in directing assistance to minimize negative environmental impacts.

Recommendations

- 6.1. *Collect information on current and expected livelihood strategies and assess for negative impacts on the environment.*
- 6.2. *Identify and promote environmentally-positive livelihood strategies.*
- 6.3. *Monitor food supply and nutrition conditions to identify whether worsening conditions could lead to increased demands on natural resources.*
- 6.4. *Expand shelter site level food production (e.g., use of barrel gardens) to increase micro-nutrient intake.*
- 6.5. *Review cooking options in shelter sites to identify whether fuel supplies should be increased to improve food intake, and whether these supplies or their use can be more sustainable.*

II. Executive Summary (French Version)

Note de Synthèse³

Le tremblement de terre d'Haïti de 2010 a fait 230 000 morts et causé une destruction considérable et des dégâts importants au niveau de l'environnement construit ainsi que des modifications géophysiques. Partant de l'idée que des solutions environnementales mal pensées et des décisions hâtives de reconstruction pourraient avoir des effets négatifs sur les populations survivantes, l'USAID a entrepris une étude succincte d'impact environnemental (USAID REA) du 16 février au 5 mars 2010. Cette étude d'impact a consisté en un recueil et une synthèse des informations disponibles sur les opérations de secours et de reconstruction et sur les survivants de Port au Prince, les zones rurales affectées par le séisme et les zones de destination des personnes touchées par le tremblement de terre. Les résultats préliminaires de l'Etude USAID REA ont été diffusés auprès de l'USAID, des prestataires et bénéficiaires de l'USAID, auprès des camps d'abris et des Clusters CCCM (Camp Coordination and Camp Management Haiti Cluster) à Haiti, au Groupe de Travail en charge de l'Environnement/Réduction des risques pour l'Analyse post-désastre, au Programme des Nations Unies pour l'Environnement (PNUE) ainsi qu'à plusieurs autres organisations à fin qu'ils apportent leurs commentaires.

L'Etude a repéré un large éventail de problèmes majeurs qui constituent des menaces pour la vie, et a identifié des actions pour répondre à ces problèmes. Ces actions immédiates et d'autres mesures à moyen terme doivent être prises en compte pour planifier et mettre en œuvre les opérations de reconstruction dans une logique de reconstruction durable plutôt que dans une logique de secours immédiat. Les problèmes majeurs ainsi que les recommandations sont résumés ci-dessous.

1. **Coordination, Management et Information** : Le besoin d'une réponse axée sur l'environnement est généralement acceptée en Haïti, mais l'échelle et la portée des impacts du séisme et les réponses en termes d'aide ont largement dépassé les mécanismes de coordination et de management existants, entraînant beaucoup d'inefficacité, un faible accent sur les problèmes environnementaux et un mauvais partage de l'information.

Recommandations

- 1.1 *Affecter immédiatement du personnel chargé de l'Environnement à USAID/Haïti et une équipe de travail USAID/Washington afin de s'assurer que les opérations financées par l'USAID répondent aux normes environnementales du Gouvernement Américain et que les impacts négatifs sont minimisés.*
 - 1.2 *Incorporer immédiatement une unité dédiée au contrôle et à la gestion environnementale dans la structure de commande de la réponse humanitaire au séisme d'Haïti du gouvernement américain.*
 - 1.3 *S'assurer que le Ministère de l'Environnement du Gouvernement Haïtien fait partie intégrale de la structure de secours du séisme et de reconstruction et qu'il possède les ressources nécessaires pour conduire les études environnementales ainsi que leur suivi.*
 - 1.4 *Permettre au PNUE d'accomplir son rôle de coordination et d'appui dans le cadre du programme UN Cluster*
 - 1.5 *Mener une étude d'impact environnementale stratégique des plans de reconstruction.*⁴
2. **Hygiène et Assainissement**: Il existe un très mauvais système sanitaire et d'assainissement dans la plupart des 400 camps ruraux et urbains occupés par les survivants du séisme. Le traitement des déchets n'est pas géré convenablement. Certaines sources d'eau potables se voient contaminées à cause d'une mauvaise gestion au niveau des ménages. Le nombre de vecteurs et de maladies vectorielles telles que la Malaria sont en croissance. Le traitement des déchets liquides et solides est anarchique favorisant la dégradation environnementale à court et à long terme et les problèmes de santé. Il existe un risque (bien que modéré) qu'une utilisation inappropriée des toilettes portables (par exemple toilettes chimiques) puisse avoir des conséquences néfastes sur l'environnement. Les déchets dangereux, particulièrement les déchets présentant un danger biologique, ne sont pas bien gérés malgré les efforts dans ce sens. Plusieurs

³ Préparé par C. Kelly, Chef d'équipe, USAID REA, Sun Mountain Intl. email: disasterkelly@yahoo.com

⁴ Le PEA planifié par USAID peut être incorporé dans le processus plus large du SEA.

solutions proposées pour la gestion des déchets, en particulier les bassins de traitement des eaux usées, ne seront peut-être pas viables et pourront même contribuer à des dégradations environnementales futures.

Recommandations

- 2.1. *Augmenter le nombre de latrines et toilettes bien gérées et conçues.*
- 2.2. *DINEPA, avec l'appui de l'USAID, devrait créer un système de surveillance de la prolifération de déchets et des conditions sanitaires, et ajuster les horaires de collecte en conséquence.*
- 2.3. *DINEPA, avec l'appui de l'USAID, devrait effectuer une évaluation d'impact environnemental des méthodes d'élimination existantes, des bassins de décantation et d'autres options pour le traitement des eaux usées ou d'élimination.*
- 2.4. *Des alternatives pour la gestion des eaux usées devraient être étudiées dans le REA, y compris le potentiel de soutien de l'USAID à d'autres options d'évacuation des eaux usées qui auraient une valeur ajoutée (par exemple, la production d'engrais).*
- 2.5. *Si des produits chimiques doivent être utilisés à toute fin dans les toilettes ou les latrines, l'USAID devrait collaborer avec DINEPA, la MSB, le Cluster WASH, et d'autres partenaires pour mener une évaluation environnementale immédiate. Si les produits chimiques utilisés présentent un risque inacceptable pour l'environnement, l'utilisation de ces produits chimiques devrait être immédiatement interrompue et remplacée par des alternatives acceptables.*
- 2.6. *Évaluer l'efficacité de l'élimination des dangers biologiques et des programmes de contrôle actuels et faire des ajustements afin d'agréer aux normes minimales en matière de l'environnement et de sécurité.*
- 2.7. *Suivre les efforts de surveillance des maladies par MS /CDC, compte tenu de l'impact des changements des conditions de santé sur l'environnement et vice versa.*
- 2.8. *Distribuer des récipients pour le stockage de l'eau qui soient sûrs et des produits de chloration d'eau à usage instantané si l'eau potable stockée par les ménages est habituellement contaminée.*
- 2.9. *Utiliser une approche intégrée de gestion des pesticides pour tous les efforts de lutte anti-vectorielle.*
- 2.10. *L'USAID devrait collaborer avec DINEPA et MSB pour assurer la cohérence des conseils sur l'environnement et la santé qui sont donnés au Cluster Wash et aux autres groupes.*

3. Le Suivi des Dangers Géophysique et d'Hydrométéorologique: Des risques géologiques et hydrométéorologiques seraient devenus plus dangereux depuis le tremblement de terre, ayant augmenté le risque de glissements de terrain, d'inondations et d'impacts similaires avec l'arrivée des pluies saisonnières. Ces dangers toucheront les populations sans abris de base et ceux qui ont déménagé vers des endroits plus dangereux qu'avant le séisme. **Malgré les inquiétudes justifiées des ouragans, la menace posée par les pluies saisonnières et les inondations associées ne devrait pas être sous-estimée.**

Recommandations

- 3.1. *Entreprendre une évaluation globale des dangers géophysiques et hydrométéorologiques et cartographier les risques d'inondations et glissements de terrain dans les zones touchées par le séisme, avec des évaluations spécifiques réalisées pour chaque site d'abri, qu'il soit déjà existant ou nouveau.*
- 3.2. *Élaborer et mettre en œuvre des plans d'évacuation propres à tous les camps existants et nouveaux.*

4. L'abri et les camps d'abris: La plupart des camps d'abris ne répondent pas aux normes minimales: problèmes d'assainissement, de surpeuplement, mauvaise qualité et manque de logement, et risques d'incendies. Des camps ad hoc sont établis à la périphérie de Port-au-Prince, dans des zones écologiquement fragiles, près des milieux humides et avec des ressources limitées pour la construction. Les abris dans la plupart des camps ne répondent pas aux normes pour les logements transitoires (par exemple, 3-5 ans d'utilisation). Les projets de construction d'abris provisoires nécessiteront plus de 20,000 tonnes de bois dans les 45 prochains jours. A moins que ce bois ne soit importé, des dommages supplémentaires et considérables sur l'environnement haïtien sont attendus. Le dommage causé par les abris provisoires est évitable ou peut être considérablement réduit. Toutefois,

une augmentation de squatters sur les collines (par exemple, dans des bâtiments détruits par le séisme) ou sur les nouveaux terrains, présente un besoin immédiat pour une meilleure planification et gestion de l'aide dans la distribution des logements transitoire et permanents.

Recommandations

- 4.1. *Tous les sites d'abri devraient avoir un plan de gestion des incendies.*
- 4.2. *L'utilisation de flammes nues ou la cuisine près des unités de logement devrait être évitée.*
- 4.3. *L'éclairage doit être prévu pour tous les résidents des abris. (Des batteries rechargeables par la lumière permettent une circulation en toute sécurité la nuit.)*
- 4.4. *Le drainage à proximité des sites et des abris doit être amélioré pour réduire les inondations et la stagnation de l'eau. (Les camps qui se trouvent dans des zones exposées aux inondations devraient être déplacés.)*
- 4.5. *Tous les nouveaux sites d'abri devraient faire l'objet d'une étude d'impact environnemental et bénéficier d'un système de mitigation d'impact et de gestion environnementale.*
- 4.6. ***Aucune construction de site ne devrait commencer avant qu'une révision environnementale du site n'ait été terminée, qu'un plan de gestion d'impact environnemental du site n'ait été mis en œuvre, et que les résidents potentiels du site n'aient été consultés.***
- 4.7. ***Les abris transitoires ne devraient pas servir d'abri pendant les ouragans ou les phénomènes météorologiques violents et les occupants devraient être évacués vers des abris de tempête appropriés.***
- 4.8. *Le bois pour les abris transitoires devrait provenir de forêts durables et être fourni en même temps que les autres matériaux pour les abris.*
- 4.9. *Le traitement chimique du bois pour limiter la pourriture ou attaques d'insectes n'est pas nécessaire pour les abris transitoires.*
- 4.10. *La récolte excessive de mâts pour les abris d'urgence devrait être réduite dans les programmes de rétablissement.*
- 4.11. *Le GOH devrait immédiatement mettre au point un système de classification de terres pour Port au Prince et ses environs, qui désigne les zones qui peuvent et ne peuvent pas être utilisées pour le logement, et prendre des mesures pour faire appliquer cette classification.*

5. La Gestion des Débris: Entre 20 et 25 millions de mètres cubes de débris doivent être gérés de façon appropriée pour éviter tout dommage à l'environnement, aux moyens de subsistance et à la récupération du pays. L'élimination des débris a été anarchique, et un processus de bonne gestion commence à peine à être établi par un groupe de travail composé du GoH-USG- PNUD. Cette initiative a reçu une évaluation environnementale, mais des évaluations supplémentaires sont nécessaires pendant que les travaux de démolition de milliers de bâtiments gouvernementaux et privés sont en cours.

Recommandations

- 5.1. *Les plans du Groupe de Travail chargé des débris doivent assurer la bonne gestion des débris à fin d'éviter ou de minimiser les impacts négatifs sur l'environnement et la santé humaine. Le MEO devrait approuver le plan de gestion des débris.*
- 5.2. *Une IEE est nécessaire pour tous les plans de gestion des débris, et des plans de suivi et d'atténuation de l'impact doivent être mis en œuvre et suivis.*

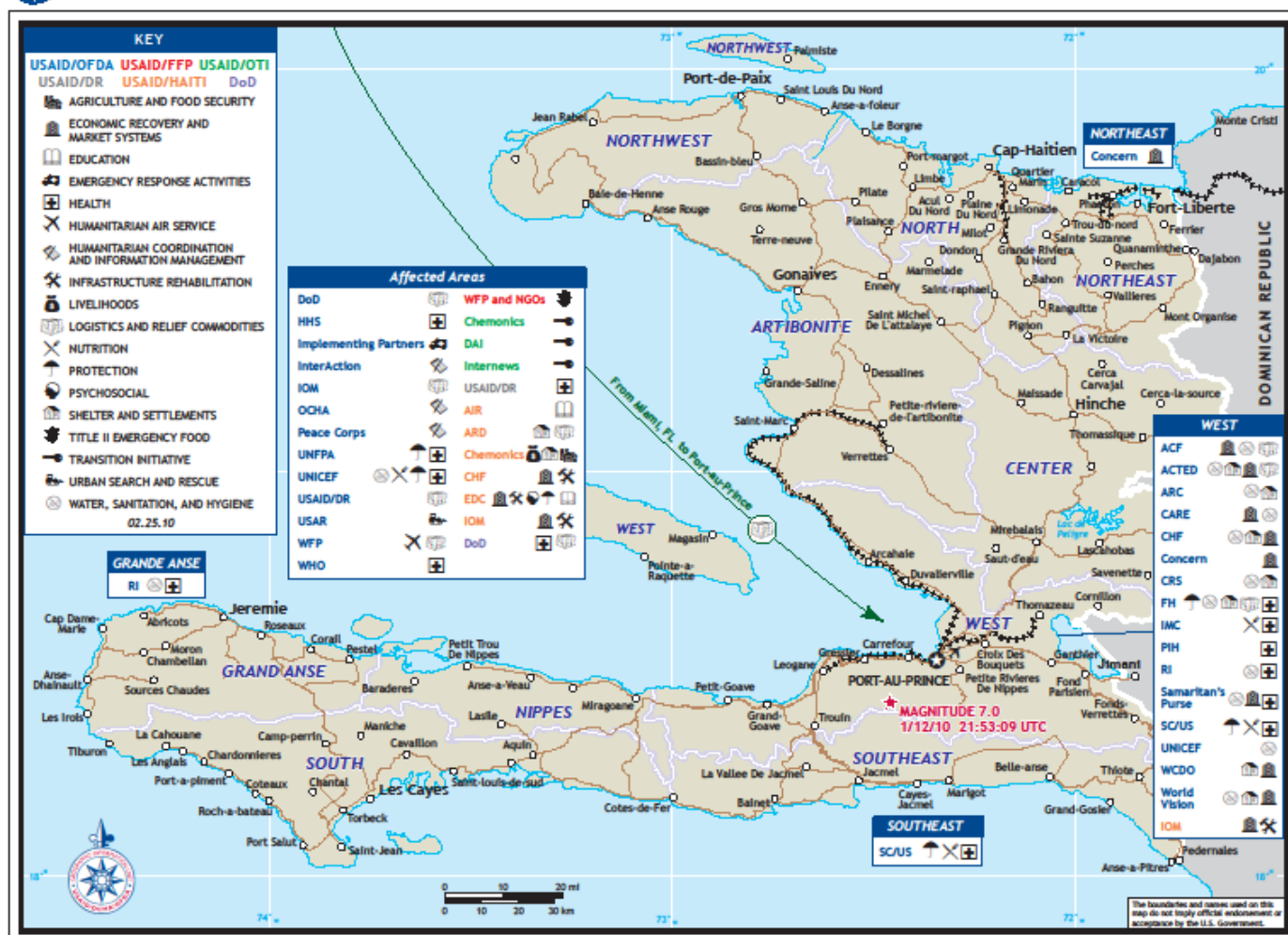
6. Moyens de subsistance et sécurité alimentaire: Les moyens de subsistance et la sécurité alimentaire de centaines de milliers de ménages ont été fortement touchés par la perte des biens de productions, la rupture des réseaux sociaux et les défis pour répondre aux besoins alimentaires. Les survivants de la catastrophe doivent maintenant examiner des moyens de subsistance et des options de sécurité alimentaire qui peuvent avoir un impact négatif sur l'environnement (par exemple, l'augmentation de la production de charbon de bois) et qui peuvent être extrêmement dangereux (par exemple, la récupération des aciers a béton des bâtiments détruits). En même temps, les stratégies de subsistance sont en fluctuation et les marchés alimentaires sont instables, ce qui présente des défis pour l'aide à l'atténuation les impacts négatifs sur l'environnement.

Recommandations

- 6.1. Collecter des informations sur les stratégies de subsistance actuelles et attendues et évaluer des impacts négatifs sur l'environnement.
- 6.2. Identifier et promouvoir des stratégies de subsistance respectueuses envers l'environnement.
- 6.3. Surveiller l'approvisionnement alimentaire et les conditions de nutrition à fin de déterminer si la dégradation des conditions pourrait donner lieu à une augmentation des demandes sur les ressources naturelles.
- 6.4. Augmenter la production alimentaire dans les sites d'abris (par exemple, la culture dans les barils) pour augmenter la consommation.
- 6.5. Analyser les options de cuisson dans les camps à fin de déterminer si l'approvisionnement en combustible doit être augmenté pour améliorer la nutrition, et si ces fournitures ou leur utilisation peut être plus durable.



USG HUMANITARIAN ASSISTANCE TO HAITI FOR THE EARTHQUAKE



NOTE: No responsibility for the accuracy of the USAID USG Humanitarian Assistance to Haiti for the Earthquake map is assumed.

REMARQUE: Aucune responsabilité pour l'exactitude de la carte sismique de l'assistance humanitaire de l'USAID USG à Haïti n'est supposée.

III. Photos taken during REA Data Collection

Photos by Allegra Da Silva, Malory Hendrickson and Diego Vallejo



Rubble management challenges - mixed waste, debris and metal in PAP.



Extractive commerce - charcoal sales on roadside near Grand Goave.



Transport infrastructure damage near Leogane.



Mother/newborn in PAP tent home. @7000 deliveries/ mo projected in affected area.



Lack of sewage and sanitation management in PAP camps.



Cutting of young trees and mangroves for sale/use in shelter and home construction increased dramatically – 100% price increase.



Cash-for-work day laborers separating rubble and debris for removal and storage in PAP.



Affected families squatting and resettling on hillsides and other vulnerable/unsafe sites – land tenure is a critical concern.



Roaming pigs on waste site within PAP camp – hygiene and waste management are major issues.



Squatters construct makeshift houses on roadside medians, in dangerous locations.



Citizens anxious to rebuild, and seeking any available materials - livelihoods are compromised.



Debris and waste filling water canal in downtown PAP – disease vectors increase.



Camp consisting of makeshift homes made from wooden poles and bed sheets.

IV. Key Contacts and REA Distribution

USAID and the REA Team will disseminate this document to all parties below who assisted in the information collection and/or analysis. The REA will also be posted on a series of websites managed by Haiti OneResponse, ALNAP, USAID, the UN, Inter-Action, the PDNA, Haiti Disaster Cluster Groups, Environmental Working Group (EWG), DACHA/FFP (Food for Peace), International Association for Environmental Impact Assessment, IRIN and selected Haitian newspapers. We encourage all readers to share the REA with any other interested individual or institution who could benefit from the assessment.

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V. Introduction

The earthquake which struck Haiti 12 January 2010 resulted in an estimated 230,000 deaths, and the damage or destruction of 285,000 housing units. In addition, up to 598,000 persons left the city of Port au Prince soon after the earthquake due to scarcities of shelter, food and other basic needs.

The earthquake affected both rural and urban areas. While the loss of life and physical destruction were greatest in Port au Prince, losses were also significant in rural areas to the west of Port au Prince extending beyond Jacmel and Petit Goave to the west. Indirect earthquake impacts are also emerging in areas such as Les Cayes and Gonaives, which are hosting disaster survivors displaced from Port au Prince.

A revised United Nations appeal set the immediate relief and recovery assistance needs at no less than \$1.4 billion. The US Government (USG) has provided over \$770 million in disaster-related assistance. As it was clear that an earthquake of the scale which affected Haiti would have significant and numerous impacts on the environment, various elements of the USG response dedicated specific efforts to identify and manage environmental impacts to the greatest degree possible. As part of these efforts, USAID/Haiti commissioned CHF International and Sun Mountain International fielded a team of Haitian and international staff to complete a rapid environmental impact assessment (USAID Haiti REA) of disaster affected areas and response operations. The USAID Haiti REA was intended to

1. Develop an improved understanding of earthquake-related environmental issues as they relate to on-going and planned relief and recovery operations
2. Provide a scoping for an eventual Programmatic Environmental Impact Assessment (PEA) to cover USAID recovery funding
3. Identify key environmental issues which needed to be addressed before a PEA could be completed⁵, and
4. Identify ways in which USAID earthquake-related assistance could contribute to an improvement in environmental conditions in Haiti.⁶

Although Haiti faces a wide range of environmental issues, including residual effects of four tropical storms and flooding in 2008, the USAID Haiti REA was to focus only on earthquake-specific issues.

The USAID Haiti REA work began on 1 February 2010 with a short scoping discussion on post-disaster environmental assessment options at USAID Washington. The REA Team Leader arrived in Port au Prince on 16 February 2010, together with the Regional Environment Officer and USAID/Haiti Mission Environment Officer. Another three international Sun Mountain (SMTN) staff and one USAID team member arrived on February 18 to join four Haitian SMTN REA team members. A preliminary formal assessment report was circulated on 1 March 2010⁷, followed by

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⁵ A PEA could require 60 days to complete, or approximately by 1 June following the Haiti Donors Conference scheduled for 31 March 2010.

⁶ The full ToR for the assessment can be found in Annex A.

⁷ Short reports on salient environmental issues were provided to USAID and other key actors throughout the field work. These reports have been incorporated into this report.

consultations and review in Haiti and in Washington. A final draft of the USAID Haiti REA was circulated on 15 March 2010.⁸

Work on the REA was conducted under the coordination of USAID/Haiti and in cooperation with other entities of the USAID response (e.g., Office of Foreign Disaster Assistance - OFDA), the Haitian Ministry of Environment, USAID implementing partners such as CHF International, CARE, Development Alternatives, Chemonics, US Southern Command (Southcom) staff and advisors from the US Army Corps of Engineers (USACE) and US Environmental Protection Agency (USEPA), the United Nations Environment Program (UNEP) office in Haiti and the International Federation of the Red Cross and Red Crescent.

VI. Methodology, Data Collection and Analysis

A. Methodology

The USAID Haiti REA was based on an assessment methodology specifically designed for use in the disaster context.⁹ The REA methodology focuses separate assessment efforts on the impact of (1) external relief and recovery operations (Organization level assessment - OLA) and (2) disaster survivor perceptions and actions on the environment (Community Level Assessment – CLA). The relief organization and disaster survivor information on disaster-related environmental issues is combined into a single prioritized list of salient disaster-related environmental issues. This list is then reviewed to identify specific actions which could be implemented to (1) avoid (2) reduce, or (3) mitigate the expected negative environmental impacts. The scale of the disaster and scope of issues identified result in general recommended actions which require further development at the programmatic or project level.¹⁰ Details on the REA methodology can be found at http://proactnetwork.org/proactwebsite/media/download/resources/Ressource_Pack/REA_guide_lines.v4.4.pdf.

B. Data Collection

Four data collection methods were utilized in the USAID Haiti REA:

1. Research using secondary sources, including USAID, UNEP and OCHA reports, data collected on food security and media reports.
2. Guided interviews and focus group discussions with key informants, including staff involved in the USG response, Cluster leads for Shelter, Camp Coordination and Camp Management, and WASH Clusters, the Environment Cross Cutting Issue coordinator (UNEP), the Government of Haiti (GOH) and specific NGOs.
3. Interviews with disaster survivors (“Community Level Assessment”) covering urban and rural disaster affected areas, and areas to which people from Port au Prince have moved after the earthquake (e.g., Les Cayes). A total of 66 interviews were conducted across the three areas. (Results of these assessments can be found in Annex 4 and the individual interview forms can be found in Appendix 1.
4. A half-day assessment session was carried out with 12 organizations providing relief and recovery assistance in Haiti to identify salient environmental issues from the external assistance perspective (i.e., “Organization level assessment”). This session included GoH participation.

⁸ A full schedule of REA activities in Haiti can be found in Annex C.

⁹ Development of the REA methodology was funded in part by USAID.

¹⁰ The REA team has provided specific recommendations to USAID on disaster-related environmental issues where the issues relate to immediate or on-going or near term operations.

Additional data collection and input on the assessment results were collected through electronic, in-person and telephone contacts with USG staff in Haiti and Washington, USAID implementing partners in Haiti and Washington and other collaborating organizations. Briefings were provided to, and feedback sought from, staff working in Haiti for the USAID-funded WINNER and DEED projects, CHF, the International Organization of Migration, World Vision, CRS, ACDI/VOCA, and CARE. Preliminary copies of the REA, with requests for feedback, were sent to USG contacts, the Shelter and CCCM Clusters in Haiti, UNEP and other parties. New information was incorporated into the REA as appropriate.

The USAID Haiti REA collected data on shelter sites visited using the [Checklist-Based Guide to Identifying Critical Environmental Considerations in Emergency Shelter Site Selection, Construction, Management and Decommissioning](#). The results of these site assessments were used in the REA process and shared with the CCCM Cluster. (See Annex 7 for these assessment results.)

The assessment team also collected and tested water samples from a variety of sources as an aid in understanding water and sanitation conditions. This sampling was not statistically representative but the results can be found in Annex 9.

C. Analysis Process

The data collected were analyzed according to the REA methodology. Critical issues were identified from (1) Interviews and secondary sources, (2) the OLA and (3) the CLA results. The resulting list of issues were consolidated and ranked according to potential impacts on life, welfare (livelihoods) and the environment. (The latter class refers to issues which have neither life threatening, or welfare threatening aspects.) The interim and final issue rating tables can be found in Annexes 4 to 6.

The consolidation and ranking process was conducted by the REA team and later shared with other parties for comments through emails and briefings. Subsequent revisions were made as additional information and comments were collected. Note that the REA provides a transitory view of disaster-related environmental issues and, like most post-disaster assessments, is subject to progressive updating.

The CLA results were also subsequently reviewed to identify differences between urban and rural earthquake affected areas and also between predominantly male and female respondents. The results of this analysis are provided in Annex 5.

VII. Critical Issues

Critical earthquake-related environmental issues identified during the assessment are summarized below. Where appropriate, the following discussion include references to linked but lower priority (i.e., not life threatening) issues identified in the assessment.

A. Coordination, Management and Information

A wide range of USG organizations, including the US military, USAID, Department of Health and Human Services and others have responded to the Haiti earthquake. Specific and dedicated environmental management capacity has been incorporated into some elements of this response (e.g., SouthCom) but not others (e.g., USAID). There is, at the time of this report, no cross-organizational coordination on environmental issues or on how to manage potential negative environmental impacts related to USG assistance. Further, there is uneven

dissemination and sharing of information on the USG response, making the monitoring and assessment of environmental issues difficult and the likelihood of negative environmental impacts high.

USAID/Haiti staff, normally responsible for environmental issues, are overworked and unable to dedicate sufficient time to the more than full time requirements of overseeing a multi-million dollar emergency program; a program which can be expected to expand further. This capacity will further degrade with the departure of the Mission Environment Officer and phase-down of the SouthCom capacities focused on environmental issues.

The GoH also does not appear to have had time to establish a coordinating capacity on environmental issues and impact management. The Ministry of Environment (MoE) has limited capacities due to the loss of staff and facilities and increased demands, and does not appear to be part of the GoH recovery planning and implementation structure despite having a legal responsibility in terms of environmental reviews and approving waste management activities. A World Bank planned two-person technical support to the MoE will not fully address the lack of capacity and engagement of the MoE in the relief and recovery efforts.

UNEP is charged to coordinate the environment as a cross-cutting issue through the InterAgency Standing Committee (IASC) Cluster coordination system. However, this effort is reported to be under-funded. No Cluster has yet dedicated internal environmental support. Some Clusters do not recognize the environment as a critical issue in their objective statements. There is no systematic screening of relief assistance for negative environmental impacts, even when such negative impacts are highly likely and have already begun to occur. There is a general lack of accessible information on environmental lessons learned and environmental good practice from previous disaster relief efforts. These issues have only been partially addressed by the creation of an "Environmental Health, Protection and Management" forum under the leadership of IOM and UNEP/Haiti, which is to meet every two weeks.

The on-going Post Disaster Needs Assessment, and subsequent consultations leading to the donor conference scheduled for 31 March 2010, also raises a number of coordination and information issues related to environmental impacts. The most critical of these issues are the overall and immediate resource demands imposed by the recovery effort. Haiti has an already stressed environment. The extraction of additional natural resources such as sand and stone, together with demand for wooden construction for housing, will likely result in further significant environmental damage if not managed in a sustainable manner. The first two steps to minimize these impacts are to:

1. Quantify the total new demand on natural and other resources required to implement recovery plans (including survivor-driven recovery), and,
2. Conduct a strategic environmental impact assessment (SEA) based on these projected demands and official and de facto recovery plans.

Recommendations

- A.1. *Post a Haiti Earthquake Environmental Officer to Haiti with responsibilities for current USAID-funded operations and the transition of emergency programs to USAID/Haiti responsibilities.*
- A.2. *Post a Haiti Earthquake Environmental Officer to the Haiti Task Force in Washington to ensure coordination with policy-level decisions.*
- A.3. *Immediately incorporate a dedicated environmental review and management capacity into the USG command structure for the humanitarian response to the Haiti earthquake.*

- A.4. *Assure the MoE is part of the GoH earthquake relief and recovery management structure and has the necessary resources to conduct appropriate environmental reviews and monitoring as per legal mandates.*
- A.5. *Enable UNEP to accomplish its coordination and support mandate under the Cluster system.*
- A.6. *Disseminate information on disaster-related environmental impacts and lessons learned to field-level personnel and decision-makers.*
- A.7. *Conduct a strategic environmental impact assessment of recovery plans.¹¹*

Key Environmental Guidance to be Made Widely Available to Relief Personnel in Haiti

- [Handbook of Selected Lessons Learned from the Field: Refugee Operations and Environmental Management](#) (UNHCR)
 - [Refugee Operations and Environmental Management - Key Principles for Decision-Makers](#) (UNHCR)
 - [Environmental Guidelines for Small-Scale Activities in Africa: Chapter 10: Humanitarian Response and Natural Disasters. 2nd Edition](#) (USAID)
 - **FRAME Toolkit: Framework for Assessing, Monitoring and Evaluating the environment in refugee-related operations** (UNHCR and CARE International)
 - [FRAME Toolkit: Module I – Introduction](#)
 - [FRAME Toolkit: Module II – Environmental Assessment](#)
 - [FRAME Toolkit: Module III – Rapid Environmental Assessment](#)
 - [FRAME Toolkit: Module IV – Community Environmental Action Planning](#)
 - [FRAME Toolkit: Module V – Environmental Indicator Framework](#)
 - [FRAME Toolkit: Module VII – Evaluation](#)
 - [Environmental Needs Assessment in Post-Disaster Situations. A Practical Guide for Implementation](#) (UNEP)
 - [Transitional Settlement: Displaced Populations. University of Cambridge/ Shelterproject and Oxfam UK](#) (The Max Lock Centre, Corsellis, T. and Vitale, A).
 - [Checklist-Based Guide to Identifying Critical Environmental Considerations in Emergency Shelter Site Selection, Construction, Management and Decommissioning](#) (ProAct/Shelter Cluster)
 - [Ecological Sanitation](#) (Stockholm Environment Institute)
 - [Cooking Options in Refugee Situations. A Handbook of Experiences in Energy Conservation and Alternative Fuels](#) (UNHCR)
 - [Decision Tree Diagrams on Factors Affecting Choice of Fuel Strategy in Humanitarian Settings](#) (IASC Task force SAFE)
 - **Green Recovery and Reconstruction Toolkit** (Worldwide Fund for Nature)
- Source: ProAct Network <http://proactnetwork.org/proactwebsite/index.php/resources/environmental-management-for-humanitarian-and-relief-operations>, except for Green Recovery and Reconstruction document.

B. Geophysical and Hydro-Meteorological Hazards Monitoring¹²

The earthquake-impacted areas of Haiti are subject to a number of geological and hydro-meteorological hazards. The triggering conditions for some geophysical hazards, particularly landslides, can be expected to have increased due to the seismic impacts of the earthquake.

¹¹ It is presumed that USAID will conduct a Programmatic Environmental Impact Assessment, so this action is not included in the recommendations. A USAID PEA can be incorporated into the larger SEA effort.

¹² This section is based on (1) an over flight of the disaster-affected area, (2) **Haiti Flood and Landslide Risk for IDP Camps** report, European Commission, Directorate General, Joint Research Centre, Institute for the Protection and Security of the Citizen, Global Security and Crisis Management Unit, and CriTech, 19 February 2010. <http://www.reliefweb.int/rw/rwb.nsf/db900SID/SKEA-82WDL9?OpenDocument> and **Geotechnical Engineering Reconnaissance of the 2010 Haiti Earthquake, Version 1**: February 22, 2010 Geo-engineering Extreme Events Reconnaissance, (3) and previous work in Haiti on disaster risk management by one of the assessment team members.

Of specific concern are the potential for precipitation-triggered landslides which will increase the amount of sediment and debris (e.g., trees, rocks, boulders) in river flows and consequently the potential for flooding of greater scope and impact than in the recent past. In addition, a number of landslides have blocked rivers, leading to the potential for rapid flooding upon the collapse of these dams. The consequence of such damming and collapse could be high river flows and flooding at unexpected times (i.e., after flooding from localized rains would be expected).¹³

Many disaster-affected populations do not have access to previous flood response strategies, such as local warning systems and evacuation to multi-story schools or other buildings due to earthquake damage. Further, many of the disaster-affected, and particularly those who have moved to rural areas, are likely not aware of historical flood and landslide zones where they are currently located, and may now be residing in historically or newly hazardous areas. Typical areas of concern are Grand Goave, where a shelter site is located adjacent to a river, and Fouché, where it appears a river ends in the location without a clear outlet to the sea. (The degree to which the operation of local disaster management committees, which were well established before the earthquake and had specific local warning and disaster management tasks, has been damaged by the consequences of the earthquake is not clear.)

An initial assessment of flood and landslide risk to shelter sites in Port au Prince can be found in the **Haiti Flood and Landslide Risk for IDP Camps** and an initial assessment of landslide risks was included in **Geotechnical Engineering Reconnaissance of the 2010 Haiti Earthquake**. USAID/OFDA has funded a seismic assessment by the USGS and University of Texas which might include landslide risk and USAID/Haiti is working on flood mapping in the Rivier Greis basin north of Port au Prince¹⁴. However, it is not yet clear whether these efforts are being assembled into a single risk assessment result, and whether the results are being used for local level disaster preparedness.

Recommendations

- B.1. Undertake comprehensive geophysical and hydro-meteorological hazard assessment and mapping for flooding and landslides in the earthquake-affected areas.*
- B.2. Develop site specific warning and evacuation plans in the earthquake-affected areas, covering new and existing settlement sites in rural and urban areas.*

C. Sewage and Solid Waste

Sanitation Access: Crowded conditions, poor sanitation implementation, and flooding are causing environmental damage and increasing infectious disease. Toilets and latrines, when present in shelter sites, are generally extremely unhygienic and do not meet Sphere Standards (20 people per toilet and no more than 50 m from dwellings). Many organizations are coordinating under the WASH Cluster (with leadership from La Direction Nationale de l'Eau Potable et de l'Assainissement - DINEPA) to rapidly increase access and ensure proper management. Sanitation systems in public sector buildings such as schools which have withstood the earthquake may be damaged or over-stressed as larger populations use these facilities.

¹³ Several landslides dams were reported in areas west of Port au Prince. SouthCom was assessing the potential impacts of these sites at the time of the assessment.

¹⁴ Note that flood mapping needs to include historical data from a sufficiently long period to capture extreme events and incorporate the impact of changes in land use (e.g., increased housing, reduction in sugar cane production) in both the source and potential impact areas.

Recommendations

- C.1. Coordinate with the WASH cluster to increase the number of latrines or toilets, while ensuring proper design and management. USAID should insist that all WASH activities include installation of hand washing stations at all latrines/toilets. Likewise all USAID-funded parties should be required to arrange latrine usage by households and/or segregated by sex, with special facilities available for small children as well as the handicapped.*
- C.2. The Office of Transition Initiatives should direct some of its cash-for-work programming towards latrine cleaning and monitoring from within the shelter site communities. This work should be in collaboration with other players through the WASH Cluster. These maintenance teams should be equipped with proper clothing (boots, gloves, and masks).*
- C.3. The USAID WASH POC should work with DINEPA and MSB on the ongoing creation of a system for monitoring of waste generation and sanitation conditions as conditions change (rain, debris removal, population movement) and adjust collection schedules accordingly.*

Sewage: The management of new toilets and latrines and sewage disposal are currently inadequate. Many actors are involved in management, creating a need for coordination and clear protocol. Joint actions have been started by UNDP, UNICEF, UNEP, and MSB to support DINEPA in its efforts to develop concrete measures to respond to the emergency and to develop a strategy for sewage and solid waste management in the medium and long term.

Facilities in camps may be filling up more rapidly than the capacity to remove waste, exacerbated by recent rains (e.g., latrines are filling with water). There exists a lack of infrastructure to treat sewage evacuated from toilets and latrines. The immediate plan is to discharge sewage at the Tritiare landfill site in designated pits. Other dumping is at the Route National 9/drainage canal junction north of the dump site and in other informal locations. Pits are likely to fill rapidly and informal dumping is likely to continue.

Longer term plans for sewage disposal may involve settling ponds, which may have a negative impact upon discharge to waterways or the sea. Sizing requirements due to limited land availability may limit effective nutrient removal. By concentrating sewage into these ponds and focusing the discharge point, the environmental impact could be exacerbated (compared to the status quo which may result in greater dilution), possibly creating an anoxic dead zone in the concentrated effluent zone.

Recommendations

- C.4. The USAID WASH POC should work with DINEPA and MSB to support the execution of an environmental assessment of the impact of existing disposal, settling ponds, and other options for sewage treatment/disposal. Additional funding may need to be dedicated to support this effort, if identified as a key priority of USAID programming.*
- C.5. Alternatives for sewage management should be investigated as part of the USAID Programmatic Environmental Assessment (PEA). Bio-digesters (also known as anaerobic sludge digesters) may have a role in sewage treatment and generation of alternative energy for cooking or operating generators. Small bio-digesters could be designed and placed in the transitional shelter sites which are anticipated to operate for up to 3 years. Larger bio-digesters could be placed at a main sewage dump site (landfill site or other designated sites). Bio-digesters are considered low-tech, relatively low-cost, and have a small footprint.*
- C.6. Explore collaboration with DINEPA and MSB to evaluate possible programming for USAID/Haiti/Economic Growth in the area of value added sewage disposal over the longer term (e.g., fertilizer production, bio-gas production).*

Chemical toilets: Chemical disinfecting toilets are being brought into Haiti to meet sanitation needs. The chemicals in these types of toilets vary. Certain types are not considered to have an impact on marine organisms, while others can have acute consequences (killing marine life or changing sex of organisms), which could have severe environmental and food security impacts. OFDA has confirmed that chemical toilets are not to be purchased with USAID funding.

Some in the WASH Cluster (including OFDA contractor Mentor Initiative) are considering usage of addition of deodorizers, pesticides, and larvicides into latrines and toilets for odor and vector control. These additives may have a negative environmental impact upon disposal.

Recommendations

- C.7. If chemicals are to be used in toilets or latrines for any purpose, USAID must collaborate with DINEPA, the Swedish Contingencies Agency (MSB), the WASH Cluster, and other partners on an immediate environmental assessment of the types of chemicals being procured or officially recommended, their potential impact on the environment and proper processing of the chemical-contaminated waste in Haiti.*
- C.8. OFDA should continue to monitor the usage of disinfectants in portable toilets or latrines supported by USAID funding.*
- C.9. The USAID WASH POC should collaborate with the US military to ensure that any toilet-related chemicals used in USG operations, including military operations, are properly treated and disposed.*
- C.10. If chemicals for use in toilets for odor or pest control pose an unacceptable environmental risk, the use of these chemicals should be discontinued immediately and replaced by alternate means of odor and vector control.*

Solid waste: The responsibility for solid waste disposal rests with municipalities, which contract private and public companies for removal, while the Ministry of Environment approves disposal sites and monitors environmental conditions. There is a lack of surveillance of disposal; therefore dumping is widespread and anarchistic. As a result, waste is being disposed in sensitive environmental areas and presents breeding sites for vectors. Additionally, solid waste is being burned in shelter sites both to minimize volume and to control mosquitoes, without proper ventilation. The Ministry of the Environment intends to use the official landfill near Port au Prince for commercial biogas production. Mixing of household and debris waste following the earthquake reduces the value of the site for this purpose.

Recommendations

- C.11. The USAID WASH POC should follow and support DINEPA's evaluation of current capacity, environmental resilience and medium-term sewage and solid waste disposal options. This effort should be linked to the Ministry of Environment's work on solid waste disposal which has received support from the USAID-funded projects in the past.*
- C.12. Explore collaboration with DINEPA and MSB to evaluate possible programming for USAID/Haiti/Economic Growth for longer-term solid waste disposal as an income-generating undertaking.*

D. Hazardous Waste

Biohazards: Emergency response operations are generating significant amounts of biohazard waste throughout affected areas of the country, including amputated limbs, as well as a continuing flow of bandages and other medical waste. According to the UNEP "REA Report" (1 Feb 2010), bio-hazard waste is being picked up by municipal waste trucks, which was verified in the community assessment. DINEPA is working with the technical assistance of UNEP, WHO, and UNDP to carry out an independent system for medical waste treatment and disposal at

Truitier near Port au Prince. Ensuring that all wastes generated (both inside and outside the Port au Prince area) are disposed of properly remains a challenge. Initial observation at Truitier by USEPA indicated that approximately 2 dump loads of biohazard waste were brought to the site, and dumped in and near a pit. This volume does not equal the volumes generated and it is unclear whether designated incinerators are functional.

Recommendation

- D.1. Collect additional information to assess the effectiveness of the current programs for biohazard disposal and control and implement improvements in the program as required to meet minimum environmental and safety standards.*

Chemical: Hazardous materials from households and small commercial and industrial sites will be concentrated as debris is collected and processed. There is also risk of oil and chemical spills throughout the process. While the UNEP “REA Report” (1 Feb 2010) identified damage to transformers, current reports indicate that persistent organic pollutants were not released. A small diesel spill may have an effect on coastal areas but appears to be evaporating rapidly, and was not visible during an aerial inspection in early March. It does not appear that there are hazardous spills due to containers submerged at the port.

At the port, debris is being submerged into the ocean to expand the port area and create a T-jetty. Some of the debris for this purpose was observed to be covered in oil (EPA, USACE, USAID visual observation during a field visit to the port site). Overall the USACE has indicated it does not anticipate a large amount of hazardous waste to be generated or collected.

Recommendation

- D.2. Hazardous waste management must be incorporated into the debris management program, including official identification for a final disposal site for hazardous waste and planning for proper disposal.*

E. Health-Related Issues

Drugs: In some areas medicine is in short supply, and inventory information may not be available to ensure usage and dissemination. Scarcity has affected free sources, while private sources for purchase may still be available to many populations, though family resources preclude access. Drugs have been provided as emergency assistance to Haiti, but it was not clear if all the drugs provided were appropriate or usable.

Recommendation

- E.1. Establish whether unusable or inappropriate drugs were provided to Haiti and verify that these drugs are being disposed of in an environmentally sound manner.*

Illness and injury: Anecdotal reports of infectious disease increase were widely reported by community members (including skin infections, malaria, flu, fever, diarrhea, eye infections, and vaginal infections (noted by a community nurse)). Chronic disease (diabetes and blood pressure) symptoms were also reported as exacerbated. In camps, human health conditions are not adequate due to crowding and access to basic needs (food, free potable water, sanitation). In some shelter sites personal safety was a concern, with flooding cited as dangerous to human life.

Recommendation

- E.2. Continue to follow the Ministry of Health/CDC's disease surveillance effort, as the evolution of health conditions may have an impact on the environment and vice versa (e.g., pathogen transmission and vectors).*

Water Safety: Field assessment respondents indicated their preference to drink commercial purified water (in sachets or bottles) and may be prioritizing family resources for purchased water. It appears that in many cases potable water is being supplied at shelter sites (in bladders), but household storage allows recontamination, creating a problem for those who cannot afford to purchase purified water. Distribution of safe storage containers for drinking water might alleviate the impact of plastic waste on the environment and allow communities to drink supplied bladder water, though the acceptability/priority of this would need to be evaluated.

Recommendation

- E.3. Collaborate with USAID/Global Health to evaluate appropriateness of distribution of safe storage containers for drinking water storage from bladders or household chlorination for point-of-use drinking water treatment, along with community outreach on their use.*

F. Vector control

Vectors (mosquitoes, flies, and rodents) and their breeding sites are currently not controlled in many shelter sites. Communities noted an increase in the presence of these pests. While future control (e.g. for malaria and dengue) may include pesticide spraying, due to the concentration of populations and proximity of food storage, as well as rivers and other water bodies, measures would need to be implemented to minimize environmental and health effects. Some discussion at the WASH Cluster has indicated that camp managers may be putting or will put insecticides or larvicides into toilets and latrines to control vectors. Other control options may be more appropriate.

Recommendations

- F.1. A further scoping of the vector problem is needed. This should be done in collaboration with the CDC and the National Malaria Control Program.*
- F.2. Use an integrated pest management approach for all vector control efforts.*
- F.3. In toilets and latrines, the addition of lime may be sufficient to control vectors (as well as odors). Encouragement of proper maintenance will also reduce vector problems.*
- F.4. The USAID WASH POC should collaborate with MSB to ensure that formal and consistent advice is given to the WASH cluster that is both environmentally and hygienically sound.*
- F.5. If pesticides are used for pest control, best standard practices for application, public information, and safety should be enforced.*

G. Shelter Sites

Disaster survivors are living in a wide variety of shelter sites across Port au Prince and in rural affected areas. Site assessments by the REA team indicated that the conditions in many of these camps did not meet minimum standards, with specific concerns about sanitation, overcrowding and poor shelter noted.

Fire Prevention: Site visits indicated that considerable cooking takes place in or near shelters in crowded shelter sites. In addition, candles are often

On Fuel Efficient Stoves and Alternate Fuels

It has been suggested that the post earthquake period is a good point to introduce fuel efficient stoves and alternate energy sources (e.g., propane). Considerable experience with stove/alternate fuel introduction following disasters and crisis suggest caution in such efforts.

Three issues need to be taken into consideration: (1) Success in introducing stoves/alternate fuels relies as much on education, training and follow-up than the fuel or stove introduced, (2) Fuels/stoves must match local cooking needs and processes, and (3) Efforts need to be planned and funded for long term sustainability, including the need to subsidize fuel use for several years.

It is unclear whether, with the considerable gap in basic humanitarian needs met to date, that such a sustained effort is feasible at this time.

used for lighting. The use of open flame or charcoal together with very flammable shelter materials (e.g., tents, cloth, some plastic sheeting) creates a significant risk of fire.

Recommendations

- G.1. All shelter sites should have a fire management plan.*
- G.2. The use of open flame or cooking near shelter units should be prevented.*
- G.3. Lighting should be provided from solar or crank powered lights or from main electrical supplies. (The use of crank or solar powered lights also allows people to move safely in a site after dark.)*

Flooding and Landslides: There is a concern that many shelter sites are subject to flooding and some subject to landslides. Efforts are being made to clear drains in Port au Prince to reduce the impact of flooding from poor drain operation. However, any flat area (e.g., soccer field) will retain substantial amounts of water during rains unless adequate drainage is provided, leading to degraded sanitation and living conditions.

The **Haiti Flood and Landslide Risk for IDP Camps** report¹⁵ attempts to identify shelter sites affected by these two hazards in Port au Prince. This information is extremely useful, but needs to be backed by site-specific assessments, and expanded to cover the rest of the earthquake-affected zone.

Recommendations

- G.4. A flooding and landslide hazard assessment should be conducted for each shelter site and appropriate risk reduction actions taken.*
- G.5. Drainage within and near shelter sites should be improved to reduce local flooding and post-storm standing water.*
- G.6. Shelter sites in extremely flood prone areas should be relocated, and all shelter sites with flood potential should have warning and evacuation plans.*

New Shelter Sites: New ad hoc shelter sites are being established on the outskirts of Port au Prince. Other new shelter sites are being developed with USG assistance to enable decongesting of crowded shelter sites within Port au Prince. Some of these sites, including those near the junction of Route 1 and Route 9 north of Port au Prince, are in ecologically fragile areas, near wetlands and with limited resources for construction (e.g., locally available trees). Further, some of these locations have been used in the past as industrial or dumping sites.

Information on the USG-supported development of possibly five new shelter sites outside central Port au Prince was not readily available at the time of the assessment. From what information, which was made available, it appears that environmental considerations are not being systematically assessed or addressed. In addition, several of the sites are located in possible flood (flash and river) areas, putting potential residents at significant risk.

It appears that the process of developing the official new shelter sites is being done with intentional secrecy. This approach both goes against best practice and common sense. The success of transitional shelter sites comes in large measure from ownership of the site by those who move to the site. If these persons are not involved in the selection, development and management of a site, it is likely there will be both environmental and social problems.

¹⁵ European Commission, Directorate General JRC, Joint Research Centre, Institute for the Protection and Security of the Citizen, Global Security and Crisis Management Unit, CriTech, 19 February 2010.
<http://www.reliefweb.int/rw/rwb.nsf/db900SID/SKEA-82WDL9?OpenDocument>

Recommendations

- G.7. *All new shelter sites should be subject to an environmental impact review (e.g., based on the UNHCR FRAME procedures¹⁶) and impact mitigation and local environmental management systems established.*
- G.8. ***No USG assistance should be provided for site construction until a site environmental review is completed, a site environmental impact management plan is implemented and the prospective residents consulted about the site.***
- G.9. *The GoH should immediately develop a land classification for greater Port au Prince area which designates areas which can, and cannot, be used for housing, and take action to enforce this classification. (Note that the USAID WINNER project could likely assist in this process.)*

H. Emergency and Transitional Shelter

Many disaster survivors do not have access to shelter meeting minimum humanitarian standards. There is also a pressing need to provide transitional shelter (i.e., shelter which meets minimum standards for the next 2-3 years) before the on-set of seasonal rains in 45 days.

Extreme Weather: Haiti is entering a period of increased rains and possibly strong storms. Even at less than hurricane intensity, seasonal storms can result in significant damage to shelter due to flooding and high winds.

Recommendations

- H.1. *Transitional shelters should be designed to resist winds generated by typical seasonal tropical storms.*
- H.2. ***Transitional shelters should not be used for shelter during hurricanes or severe weather storms and occupants should be evacuated to proper storm shelters due to the risk of flooding and damage to the transitional shelters.***

Plastic Sheeting and Forest Resources: Current emergency shelter assistance focuses on providing plastic sheeting. Emergency shelter efforts have resulted in an increased exploitation of small trees to provide framing for plastic or other short term shelter materials such as bed sheets and blankets when disaster debris cannot be used for this purpose. Interviews indicated that it takes up to 12 poles (trees of approximately 15 cm circumference and 400 cm long) to make a basic plastic or cloth-covered shelter.

Market research indicated that while the demand for poles has increased (and is being supplied from locations such as Jeremie, Baradere, Grand Goave, Leogane, Pestel, and Hinche) many users are cutting poles on their own because of a lack of means to purchase. At present, the price for poles is approximately twice the level as before the earthquake. (See Annex 9 for a summary of data collected).

Recommendation

- H.3. *Measures to mitigate the impact of the excessive cutting of poles for emergency shelter should be incorporated into recovery programs.*

Wood for Transitional Shelter: The urgent provision of transitional shelters poses a greater danger to Haitian forest and environment. Preliminary estimates are that between 20,000 and 30,000 tons of wood are needed for the up to 100,000 transitional shelters which are required in the next 45 to 60 days. To limit significant negative impacts on the Haitian environment, the wood for transitional shelters should:

¹⁶ http://www.proactnetwork.org/proactwebsite/media/download/resources/Ressource_Pack/UNHCR_CARE_FRAME_Toolkit.pdf

- Come from sustainable sources, and
- Be provided at the same time as other transitional shelter inputs such as plastics sheeting, zinc roofing and cement.

If the needed wood is not provided at the same time as other transitional shelter resources (already a significant logistical challenge due to the need for a larger volume of wood) or disaster survivors are not provided adequate transitional shelter, a significant increase in deforestation can be expected in the disaster-affected areas of Haiti.

There is no need to treat wood used for transitional shelter for protection against rot, fungus or insects due to the limited duration the wood will be used, the costs involved with treatments, and extra health and environmental hazards that such treatment could lead to. All wood imported should have a phytosanitary certificate and be free from insects and disease.

Recommendations

- H.4. The wood needed for transitional shelters should be acquired from sustainable forests and provided at the same time as other shelter materials. **This latter point requires a strong collaboration between shelter and logistics operations.***
- H.5. There is no need for chemical treatment of wood provided for transitional shelters to limit rot or insect damage.*

I. Debris Management

The Haiti earthquake generated an estimated 20 to 25 (USACE) up to 75 (UNDP) million cubic yards of debris, much of this in Port au Prince. At present, the debris clearance is not well coordinated and results in ad hoc disposal in ways, which will result in considerable environmental damage. A GoH-Donor-UN task force has developed a management plan, which should be progressively used to improve the debris removal and management process. This plan needs to consider the maximization of recycling, reuse of debris for the reconstruction process or other environmentally positive uses. USAID has already developed debris clearance impact mitigation guidance¹⁷ and an environmental review of the initial Debris Task Force plan is underway.

Recommendations

- I.1. The Debris Task Force plans and operations need to ensure that earthquake debris is managed (e.g., collected, processed and disposed) in ways which avoid or minimize negative impacts on the environment and specifically human health during clearance and processing operations.*
- I.2. An initial environmental examination is needed for the debris management plan (as US Government funding is being used to develop and implement the plan), and follow-up impact mitigation plans implemented and monitored. The Ministry of Environment needs to approve the debris management plan, and specifically disposal sites and operations.*
- I.3. Given the core role played by the USG in the development of the debris management plans, other parties involved should be encouraged to meet or exceed the operational and environmental standards set out in the plan.*

¹⁷ Environmental Mitigation Plan and Report (EMPR) on debris clearance operations developed for CHF by Sun Mountain International. This work took place concurrent with the REA, but was not directly part of the REA.

J. Livelihood Security

The earthquake has severely affected livelihoods. Overall hundreds of thousands of households have lost significant productive assets and experienced considerable damage to the economic and social networks required for secure livelihoods and family sustenance. The loss of infrastructure and materials and relocation of the affected to camps or friends/relatives' homes has led workers to seek alternative but less effective forms of income generation. Field assessment data indicates that many rural and non-Port au Prince disaster-affected struggle to be self-sufficient with their limited livelihood base, due to a lack of resources.

The principal response to disaster-related livelihoods issues to date has been the delivery of free food rations and the establishment of food and cash for work mechanisms. Urban residents have been hired to assist with rubble removal, debris management, clearing of drainage canals, demolition of unsafe structures and road rehabilitation among other activities. In some cases seeds and tools, as well as fishing equipment and boats, have been purchased and delivered to assist victims regain agricultural productive capacity.

The options for the large number of disaster survivors to insure their livelihoods have changed dramatically since the disaster. Among the options which most directly affect the environment are:

- 1) Internal migration from Port au Prince to rural and peripheral urban areas, to escape the insecurity, hardships and shortages in Port au Prince and seek alternative extractive strategies to earn income.
- 2) External migration, particularly to the Dominican Republic, for short term employment.
- 3) Increased cutting of forest and mangrove building materials for shelter and housing reconstruction – particularly young trees for shelter poles, but also including wood planks.
- 4) Increased collection of cooking firewood in areas as near as possible to resettled and urban populations.
- 5) Increased production of charcoal, which requires the cutting, burning, and transport of wood, a significant percentage of which is being imported illegally from the Dominican Republic, according to several informants.
- 6) Mining and harvesting of marketable resources from damaged buildings and dump sites, often at significant personal risk (e.g., working around heavy equipment or with no protective clothing).
- 7) Increased artisanal mining of rock and gravel for reconstruction efforts.
- 8) Increased private and public sector work (often on a short term and insecure basis) in debris removal and reconstruction.

Overall, it can be expected that livelihood strategies of many of the disaster-affected are flexible and will remain fluid vis-à-vis pre-disaster patterns. The new livelihood, and changes in these

The Question of Charcoal

The production of charcoal, principally for the Port au Prince market, has been the subject of environmental concern for decades. Charcoal demand is seen as a leading cause of deforestation, and subsequent soil and land degradation in Haiti, and increasingly in border areas of the Dominican Republic.

The impact of the earthquake on charcoal production and demand is as yet unclear. Port au Prince demand has probably decreased due to outmigration and decreased purchasing power. Rural production may increase due to the need for displaced to secure income to meet needs. In the short term, the combination of decreased demand and increased production may lower prices and lead to a further increases in production to match income needs.

Charcoal production and consumption themselves are not directly linked to immediately life-threatening outcomes (the criteria for prioritizing REA recommendations). However, the historical links between charcoal, livelihoods and environmental degradation indicate that the question of charcoal needs specific attention in the recovery effort.

strategies over-time, need to be tracked and moderated where necessary, to limit avoidable negative impacts on the environment.

Recommendations

- J.1. Collect and assess additional information on current and expected livelihood strategies for negative impacts on the environment. This assessment should cover disaster-survivor actions as well as external assistance programs (e.g., provision of fishing equipment, cash for work, etc).*
- J.2. Identify and promote environmentally-positive livelihood strategies, including training unskilled or semi-skilled workers to increase employment opportunities and reduce the direct pressure on natural resources for daily survival.*

K. Food Security¹⁸

It appears that a significant part of the household and commercial urban city food stock was lost due to building collapse and other damage (e.g., lack of electricity for cold storage). Direct and indirect damage was also done to food production systems (e.g., irrigation systems damaged or lacking electrical power to run pumps needed for crops) and stocks in rural areas. Market disruption (e.g., reduced imports, limited movement within the country) after the earthquake significantly impacted urban and rural food security.

Currently, food supplies are unevenly concentrated while prices are in flux and extremely unstable (e.g., some food supply costs have more than doubled in price). Recent market assessments for rice and beans indicate that the supply of these basic commodities will likely remain disrupted for the coming months due to food aid operations and population displacement. (See **Emergency Market Mapping & Analysis (EMMA) Assessment**, February 2010).

It appears that minimum food needs are not being met for all disaster survivors, and nutritional intake is not adequate for many of the disaster affected populations. (The reported loss of income by many disaster survivors will likely worsen pre-earthquake nutritional problems.) Field assessments indicated that some urban residents were reducing food consumption as the cost of charcoal was limiting their ability to cook as often as before the earthquake.

There are numerous links between food security and the environment. The most immediately important are

1. How the disaster-affected, in urban and rural areas, will secure food, and
2. Whether the displacements to rural areas will result in changes in the food production structures, and specifically whether
 - a. Land area under cultivation will increase and
 - b. The nature of productive systems will change in ways which will result in increased damage to the environment.

At the same time, a lack of capacity to assure food security in rural areas over the near term may simply result in the disaster-affected returning to Port au Prince, as has happened after past crises.

¹⁸ This section only summarizes expected food security-environment linkages as they relate to earthquake impacts. More extensive assessments of food security are available from the World Food Program and other related sources, and additional assessments are expected in the coming months.

Recommendations

- K.1. *Food security (and livelihood) assessments and assistance need to be reviewed to identify new or expanded mechanisms to secure food which may have negative impacts on the environment (e.g., increases in cropping areas, intensity or irrigation, etc.).*
- K.2. *Food supply and nutrition conditions should be monitoring to identify whether worsening conditions could lead to increased demands on natural resources, e.g., as a response to increases in the prices or scarcities of basic commodities.*
- K.3. *Shelter site level food production should be expanded (e.g., through the use of barrel gardens) to increase micro-nutrient intake. (Such interventions would also improve shelter site environmental conditions by providing shade and waste water processing.)*
- K.4. *Cooking options in shelter sites should be reviewed to identify whether fuel supplies should be increased to improve food intake, and whether these supplies or the way they are used can be adapted to be more sustainable.*

VIII. Medium to Long Term Issues

The following section summarizes a number of non-immediately life threatening issues identified in the assessment. These issues should be considered as part of programmatic or strategic environmental impact assessments, as well as through the post disaster needs assessment (PDNA)¹⁹ process being coordinated by the Government of Haiti, UNDP and World Bank.

Issue	Background
Asset distribution	Social solidarity is generally high in shelter sites, with survivors going to great lengths to share resources with others. However, many survivors noted an uneven distribution of aid, which may lead to tensions between populations with and without access to basic needs.
Land tenure	Shelter sites are on private land and displaced need land to live on and use now (particularly for urban displaced). Urban residents need clear titles to land before rebuilding. People moving to new shelter sites outside Port au Prince need clear land titles before making any substantial investments in shelter or land improvements.
High expectations	Field assessments indicate a high level of expectation from post-disaster relief and recovery efforts. At the same time, there were indications of a lack of trust in governance systems, suggesting that regulatory controls on resource use may not be following the recovery efforts, particularly those driven by the disaster survivors themselves.
Governance of relief effort	Field assessment discussions indicated discontent with the level of direct government involvement in relief operations and needed improvements in coordination, oversight and management of the relief efforts.

¹⁹ See

<https://www.cimicweb.org/cmo/haiti/Crisis%20Documents/Early%20Recovery%20Cluster/Haiti%20PDNA%20FAQs.pdf> for more information on the PDNA.

Environmental Resilience	Many parts of the earthquake impacted area of Haiti have degraded environments with little existing resilience from short and long term negative impacts. Improving resilience should be an element of the comprehensive recovery programming.
Deforestation	Recovery efforts risk considerable additional deforestation in Haiti. While the use of forest resources (e.g., charcoal, sale of poles or palm mats) is key to rural livelihoods, imported timber should be used when possible, and sustainable use of local forest resources encouraged.
Drought	Drought is a recurrent hazard in Haiti and may be exacerbated by the increasing pressures on rural resources (e.g., forests) at the same time as demands for recovery have increased. Further, seasonal or multi-season drought can lead to worsening local food security in destination areas for displaced populations.
Air pollution	The earthquake may have mobilized dangerous pollutants and particulate matter (particular in dust from cleanup operations) and this risk needs to be addressed. An increase in waste disposal through burning, in shelter sites and ad hoc disposal sites, is likely increasing air pollution, as is the density of charcoal cooking in shelter sites. Recovery will likely increase hydrocarbon consumption. Specific and overall impacts of past and evolving air pollution need to be assessed.
Security	Field reports indicate security concerns but the scale of the reported problems (e.g., rapes, stabbings) is not clear. The link between shelter sites, environmental conditions and security need to be further assessed, as input into further development of shelter sites and the use of natural resources.
Transport	Transport is essential for moving disaster victims to work opportunities as well as moving food and other essential supplies between source areas and consumers. Seasonal rains, together with seismic impacts will likely cause road blockages and capacities for clearing roads will need to be increased to reduce barrier-induced shortages and price increases. Transit vouchers may be considered to facilitate shelter-site to work travel and reduce the direct cost of travel for workers, thus increasing the level of assets available for survivor-driven reconstruction.
Fuel	Although the demand for fuel wood and charcoal may have dropped after the earthquake due to population displacement and increases in costs, the production of charcoal and fuel wood may increase as an income source for displaced populations. Shelter sites may provide opportunities for the introduction of more environmentally friendly fuel sources, although lessons from similar efforts need to be considered in such efforts.

IX. Annexes

Annex 1 - Terms of Reference

USAID
TERMS OF REFERENCE
Rapid Environmental Assessment of Earthquake Recovery Efforts in Haiti
February 13, 2010

BACKGROUND

The 7.0 January-12-2010 earthquake in Haiti was disastrous for Port-au-Prince and surrounding areas. The earthquake has had a massive impact, unprecedented in modern times. Reconstruction of this urban area, neighboring rural areas and secondary cities, will be a significant challenge due to a variety of physical, environmental and social issues, including weak governance, poverty, an overexploited natural environment and a contorted physical geography. In addition, donor coordination during reconstruction is likely to be a significant challenge. Following the disaster, enormous quantities of solid waste can result in threats to public health, seriously hindering reconstruction efforts and causing adverse environmental impacts. USAID and numerous other donors are working with GOH on relief and recovery efforts, and are already putting plans into place for reconstruction. Environmental impacts of relief and recovery efforts will be significant, and can seriously impede later reconstruction efforts, threaten public health, and make the recovery period unnecessarily long.

A Rapid Environmental Impact Assessment (REA) is a tool to identify, define, and prioritize potential environmental impacts in disaster situations. The proposed REA methodology was developed by Charles Kelly of Benfield Hazard Research Centre, University College London and CARE International with funds from USAID/OFDA and others (see <http://www.qdrc.org/uem/disasters/disenvi/kelly.doc>). A simple, consensus-based qualitative assessment process, involving narratives and rating tables, is used to identify and rank environmental issues and follow-up actions during a disaster. The REA is built around conducting simple analysis of information in the following areas:

- The general context of the disaster.
- Disaster related factors which may have an immediate impact on the environment.
- Possible immediate environmental impacts of disaster agents.
- Unmet basic needs of disaster survivors that could lead to adverse impact on the environment.
- Potential negative environmental consequences of relief operations.

The REA is designed for natural, technological or political disasters, and as a best practice tool for effective disaster assessment and management. The REA does not replace an EIA, but fills a gap until an

EIA is appropriate. A REA can be used from shortly before a disaster up to 120 days after a disaster begins, or for any major stage-change in an extended crisis. The REA here will provide initial guidance to USAID and its partners in addressing extant environmental impact issues during the relief and recovery period. It will also set the stage for a Programmatic Environmental Assessment of USAID's reconstruction program by identifying the likely significant environmental issues and proposing a detailed outline of the PEA.

OBJECTIVES

1. Conduct a rapid environmental impact assessment using standard disaster-focused assessment procedures adapted for operational conditions in Haiti. Note that separate rural and urban areas assessments and that sector (Cluster) specific assessments may be needed to complete the overall assessment process. This assessment will provide a list of key impacts to each sector that would then be addressed in the PEA below (Specifics of assessment needs will be established before the assessment process starts based on Task Force 4 on Reconstruction input.)
2. Make contact with other parties (e.g., GoH, environmental and relief PVOs, UNEP, UNDP, Cluster Leads, World Bank, IADB, European Community and other major stakeholders in the relief, recovery and reconstruction efforts); including any key contacts at USAID/Washington to ascertain whether other environmental impact assessments have been done following the earthquake. Where appropriate, collect and synthesize this information and provide a report to USAID on "who is doing what" on earthquake-related environmental issues. The World Bank Rapid Assessment should be included as one of the relevant documents to review.
3. Based on assessments (already available or specifically conducted) provide USAID with a concise list of critical issues which need to be addressed in (A) immediately, (B) medium term (one month) and (C) Long term (one to three months). Note that "immediate" environmental issues relates to issues which have an impact on

- the current lives and livelihoods of disaster survivors.
4. Provide recommendations to USAID on steps to be considered to address immediate environmental issues. This would include reviewing existing and potential debris sites and recommendations for the use of these sites.
 5. Provide an outline for a programmatic environmental impact assessment (PEA) of USAID recovery plans and identify existing information and new information which is needed for this assessment.
 6. In contacts with other assistance providers, ascertain the level of environmental reviews planned and, where possible, incorporate these efforts into the PEA plan.
 7. Provide recommendations for a structure to monitor post-earthquake relief and recovery environmental issues. (This structure may be multi-lateral.)
 8. Evaluate the use and effectiveness of the EMPR (Environmental Mitigation Plan and Report) system in use by USAID/Haiti partners for small-scale infrastructure and agriculture activities, including "umbrella" EMPRs for key activities; and make recommendations for any changes needed for the earthquake recovery/reconstruction and may not have been included in the original umbrella EMPR.
 9. Provide specific recommendations on earthquake-related environmental issues as requested. Priority issues should include site selection for hazardous waste disposal (eg. medical waste and pesticides) and body burial sites, as well as debris disposal and storage/recycling sites.

DELIVERABLES:

- 1) Comprehensive Logistical Plan and Work Plan developed and cleared with Mission and LAC & DCHA BEOs—remaining deliverables contingent upon this step.
- 2) Assessment report, outline to be agreed.
- 3) Specific critical issues identified and solutions proposed.
- 4) Outline for PEA proposed and preliminary identification of significant environmental issues (As part of the PEA outline, prepare draft "Existing Condition" and "Desired Condition" sections for the PEA that is based upon information gathered in the REA. As well, prepare a draft of key issues to address in the PEA, and any recommended alternatives)
- 5) Scoping of relief, development and government/non-government actors involved in post-earthquake environmental issues.
- 6) Recommendations on environmental monitoring structure.

- 7) Recommendations on environmental guidelines for relief and recovery activities.
- 8) Debriefing for mission staff, key partners and stakeholders
- 9) Specific inputs as requested.

PROPOSED TEAM COMPOSITION

- Lead (Charles Kelly) Environment and disaster management specialist
 - Min 10 years experience
 - French speaking
 - Haiti experience preferred
- Rural Development and Disaster Risk Management Specialist
 - Disaster Risk Reduction and Humanitarian Asst experience
 - Environmental and or Rural Development Specialist
 - Haiti, French/Creole speaking
 - Min 5 years experience
- Generalist, sustainable development, environmental and or wat/san specialist
 - Risk management and or development experience
 - Haiti, French/Creole speaking
 - Min 5 years experience
- Several additional supporting team members will be needed to help with local logistics and transport, carrying out field interviews in Creole, setting up meetings, collecting secondary information, possible GPS mapping, assistance with gender analysis, possible water testing, various aspects of translation and purchase of supplies.

LEVEL of EFFORT: Three weeks or less

MATERIALS / SUPPLIES REQUIRED

- The REA team is expected to purchase and bring all supplies needed to conduct this REA during a three week period. This includes the purchase of tents, sleeping bags, mosquito netting, food stuffs, GPS, and any other supplies needed. The cost of these items will be reflected in the budget, and will be reimbursed to the REA team.

RESOURCES

- *Rapid Environmental Impact Assessment in Disasters*, April 2005.
<http://www.gdrc.org/uem/disasters/disenvi/kelly.doc>
- *After the Tsunami: Rapid Environmental Assessment, a new report by the UNEP*
http://www.idrc.ca/en/ev-71434-201-1-DO_TOPIC.html
- *Hurricane Mitch Lessons Learned*, June 2000
- *An Evaluation of A Programmatic Environmental Assessment Approach for U.S. Funded Large Scale Programs, with application to Earthquake Reconstruction in El Salvador, Central America*, Mike Donald, June 2008.

- *Programmatic Environmental Assessment for Earthquake Reconstruction Activities, ARD, August 2001*

- *Pakistan Workshop for USAID Earthquake Reconstruction Projects*

Annex 2 - Assessment Team Members

Name	Position	Dates in Country
Charles Kelly (CK)	Team Leader/Risk Management Specialist	February 16-March 5, 2010
Joe Torres (JT)	USAID Regional Advisor of the Caribbean	February 16-February 24, 2010
Scott Solberg (SS)	Environmental Management, Competitiveness and Disaster Risk Reduction Specialist	February 18-March 5, 2010
Allegra Da Silva (AS)	Environmental Engineer/Water and Sanitation Specialist	February 18-March 5, 2010
Kessa Ruthnande (KR)	Water Resources Management/Field Interviewer	Resident
Jimmy Alcindor (JA)	Communications & Monitoring/Field Interviewer	Resident
Malory Hendrickson (MH)	Environmental Training/Gender and Environmental Ethics	February 18-March 5, 2010
Diego Vallejo (DV)	Risk Management and NRM Specialist	February 18-March 5, 2010
Vasthie Cayo (VC)	Management Specialist/Field Interviewer	Resident
Shilove Pierre (SP)	Agronomist/Field Interviewer	Resident

Annex 3 - Locations Visited & Meetings Held

Date	Key Meetings and Activities
Sunday, Feb 14	- CK Travel: Atlanta-Santo Domingo
Monday, Feb 15	- CK meeting w/ JT & USDA Rep
Tuesday, Feb 16	- CK road travel: Santo Domingo-PAP - CK briefing on response and assessment at USAID (C. Abrams, A. Dupre) - CK meeting w/UNEP (A. Morton)
Wednesday, Feb 17	- SS, DV, AS, MH travel to Santo Domingo - CK visit to UN LogBase - CK discussions w/Shelter Cluster Leader and Tech. Coordinator on environment issues - CK attend presentation on post-disaster markets ("EMMA") - CK meeting with US EPA, Corps of Engineers at USAID - CK meeting w/C. Abrams, JT and M. Chrystosome at USAID
Thursday, Feb 18	- SS, DV, AS, MH land travel: Santo Domingo-PAP - CK at PDNA opening, contact with PDNA staff and A. Perera, UNEP/Haiti (two visits during day) - CK contact meetings w/Shelter, CCCM Clusters at UN Log Base - Complete REA team meeting - CK meeting with IFRC Disaster Needs Assessment Team (M. Zekele)
Friday, Feb 19	- CK, SS, AS at US Embassy: CK REA briefing for USG response at USAID - DV & MH begin research, logistics and REA outline - CK contact meetings at LogBase (CCCM, Shelter) - CK briefing for REA team on REA process and plans
Saturday, Feb 20	- Security briefing - REA Team field assessment in PAP Cark de la Paix/Salvation Army Camp - CK meeting with Phil Gelman (OFDA) @ US Embassy - Team meeting, reporting, documenting and prep time

Sunday, Feb 21	<ul style="list-style-type: none"> - REA Team travel to and field assessments: 1) Cabaret and 2) Bon Repos - CK meeting with Red Cross - CK meeting with env. focal point at IFRC assessment (Palo Thomas) - Team meeting, reporting, documenting and prep time
Monday, Feb 22	<ul style="list-style-type: none"> - REA Team travel to and field assessments in Urban PAP; 1) Centre Sportif, 2) Terrain Accra, 3) Canape Vert, 4) Champs Mars, 5) Premature, 6) Delmas Golf, and 7) Martissant - CK meeting at PDNA - CK meeting with USAID LogBase (CCCM, Shelter, WASH, WFP) - CK meeting with CARE on wood supply for transitional housing (L. Torelli, P. Bikram) - Field visit to CHF waste dumping sites - Team meeting, reporting, documenting and prep time
Tuesday, Feb 23	<ul style="list-style-type: none"> - REA Team travel to and field assessments in 1)Mirebalais and 2)Leogane - CK visit to Tityure mass grave site w/ USEPA - CK meeting w/ JT, US Army Corps of Engineers and USAID staff - Reporting and documenting
Wednesday, Feb 24	<ul style="list-style-type: none"> - REA team travel to and field assessments in Petit Goave - Field assessments on wooden pole market - CK meet with USAID (Abrams, JT), US Army Corps of Engineers, USEPA, USAID staff, - CK travel to Petit Goave - REA Team meeting, reporting and documenting
Thursday, Feb 25	<ul style="list-style-type: none"> - SS travel to PAP - DV & VC travel to and field assessments in Les Cayes - JA, AS and CK travel to and field assessment in Pinchinat in Jacmel - AS & CK return to PAP - CP, KR & MH field assessment in Petit Goave and travel to Jacmel - CP, KR, JA & MH travel to and field assessments in Marigol & Peredo - CK, AS & SS meeting - Reporting and documenting
Friday, Feb 26	<ul style="list-style-type: none"> - CK, SS & AS REA Organization Level Assessment at @ Chemonics/Winner Project office: gathering and recording perceptions of relief organizations - CK & AS meeting w/ Swedish Disaster Management Agency (MSB) - CK & AS meetings w/USAID, USEPA, Global Health, Southcom - KR, CP, VA, MH field assessments in Kawolf1 and Wolf3 in Jacmel and travel to PAP - REA Team travel to Côtes Des Arcadins
Saturday, Feb 27	<ul style="list-style-type: none"> - REA drafting - Team documenting
Sunday, Feb 28	<ul style="list-style-type: none"> - REA drafting - REA Team travel to PAP - Team documenting
Monday, Mar 1	<ul style="list-style-type: none"> - Team meeting - Drafting report - CK, SS, AS, MH USAID REA briefing - USAID discussions
Tuesday, Mar 2	<ul style="list-style-type: none"> - Report review - Team discussions on WASH/Sanitation issues - Teleconference with USAID WASH - JA field assessment on pole market price and demand - CK, SS, AS REA briefing, presentation and discussions with PDPA - CK, SS, AS REA briefing with Health Cluster - Field visits to LogBase and LZ4 Military Camp - Team documenting

Wednesday, Mar 3	<ul style="list-style-type: none"> - AS REA briefing at; 1) WASH Sanitation cluster meeting, 2) Wash Water cluster meeting, and 3) USAID Global Health meeting - CK, DV, MH Airplane survey for damage overview & assessment - PDNA related meetings - Team documenting
Thursday, Mar 4	<ul style="list-style-type: none"> - Team meeting - CK, SS, KR briefing at USAID WINNER project and discussions on new camp - AS departure - CHF briefing - CK meetings with Shelter, CCCM clusters and USAID
Friday, Mar 5	<ul style="list-style-type: none"> - REA Team departure
Monday, Mar 8	<ul style="list-style-type: none"> - Briefing for USAID, USG and UNEP - Briefing for NGOs/IOs - Technical discussions on REA outputs and next steps.
Tuesday, Mar 9	<ul style="list-style-type: none"> - Briefing of USAID Haiti Task Team on REA outputs - Technical discussion on REA outputs and follow-up
Wednesday, Mar10	<ul style="list-style-type: none"> - Debriefing with Alexandria Panehal, Acting Deputy Assistant Administrator, EGAT
Thursday-Sunday, Mar 11-14	<ul style="list-style-type: none"> - Team discussions and review of assessment; redrafting of assessment based on inputs
Monday, Mar 15	<ul style="list-style-type: none"> - Delivery of draft Haiti USAID REA to CHF Intl for review.

Annex 4 - Organization Level Assessment Results

See the REA methodology (module one & annex B) for a full explanation of the development and use of the following output from the assessment process.

Factors Affecting the Environment
Number of persons affected (relative to total population in disaster area).
Concentration of the affected population.
Self-Sufficiency: After the start of the disaster, the ability of survivors to meet needs without recourse to additional direct extraction from the environment or external assistance.
Asset distribution: The distribution of economic and other assets within disaster affected population after the start of the disaster.
Livelihood options: The number of options that disaster survivors have to assure their livelihoods after the start of the disaster.
Expectations: The level of assistance (local/external) which the disaster survivors expect to need to survive.
Availability of natural resources, or whether the available natural resources meet the needs of the disaster survivors in a way which can continue without degradation to the environment or future availability of the resources.
Capacity to absorb waste: The environmental, social and physical structures available to handle waste produced by the survivors.
Environmental Resilience: Ability of eco-system to rebound from the disaster itself and from relief and recovery activities which cause environmental damage.

Unmet Needs - Issues identified as “not being met” or “not being met in a sustainable manner”
Land mass movement
Earthquake impact
Contamination (from flooding)
Flooding
Disease (human)
Drought – Management of impacts

Air pollution
Food supplies
Shelter
Safety (human)
Health care
Environmental conditions
Lighting
Transport
Waste management
Fuel
Lighting (safety)
Domestic Resources (cooking utensils, bedding)
Clothing

Possible negative impacts of relief/recovery assistance

Activity	Questions on whether potential negative environmental consequences of activity have been addressed.	Yes/No
Agro-chemicals	Is the danger to applicators and humans from exposure in the application, handling or storage of agro-chemicals addressed?	?
	Are negative impacts on non-target organisms in soil, water and air avoided or minimized?	?
Seeds, tools and fertilizer	Is the loss of agro-bio-diversity prevented?	?
	Is the introduction of species and varieties which are invasive or cannot be used without locally unavailable inputs avoided?	?
	Is damage to traditional seed management systems avoided?	?
	Is the potential for increased resource extraction due to availability of more effective means of farming addressed?	?
	Is the potential for damage to soil and water from overuse of fertilizers addressed?	?
Expansion of Area or Type of Cultivation.	Is the potential for the loss of habitats and reduced bio-diversity addressed?	?/y
	Is the possibility of deforestation addressed?	?/y
	Is the potential for soil erosion addressed?	?/y
Expansion of Livestock Use	Is the potential for the loss of habitats and reduced bio-diversity addressed?	?/y
	Is the potential for the introduction of new animal diseases or expansion of existing diseases addressed?	?/y
New farming or livestock raising activities.	Is the potential for loss of habitats and reduced bio-diversity addressed?	?
	Is the potential for the introduction of new animal diseases or expansion of existing diseases addressed?	?
	Is the potential for land degradation and erosion from land clearing or grazing addressed?	?
Irrigation (expanded)	Is the risk of increased disease transmission addressed?	?/no
	Is potential for soil degradation and water logging addressed?	?/?
	Is the potential for aquifer depletion addressed?	?/no
	Is the potential for weed dispersal through irrigation water addressed?	?/no
Fishing	Is harvesting which exceeds production capacity or reduces future production capacity prevented?	?
	Is the potential for damage or destruction of habitats from fishing methods addressed?	?
	Is the introduction of exotic species of fish, parasites and diseases prevented?	No

Construction, including shelter, public buildings and infrastructure excluding roads.	Are plans and procedures established to prevent scarce natural resources from being over exploited for construction activities?	Y
	Are plans and procedures established to ensue that the construction site is not in an area of increased hazard compared to location or conditions before disaster?	Y
	Are plans and procedures in place to avoid increases risk of flooding, erosion or other hazards due to the construction?	Y
	Do construction methods and procedures take into account the risk of disaster?	Y
Roads, paved or other, new and existing.	Are there plans and procedures designed to avoid the exploitation of new lands or increased exploitation of existing lands due to the road?	?
	Are procedures and plans developed to prevent flooding and drainage problems due to the road work?	?
	Are there plans and procedures to avoid landslides and soil erosion due to the road work?	?
Water Supply	Are increased opportunities for disease transmission avoided?	?
	Are there plans and procedures to avoid an increase in population density having a negative environmental impact?	?
	Is the overuse of ground or surface water supplies avoided?	?
	Are chemicals used to clean or purify water managed in such a way to avoid human health dangers or contamination of the environment?	?
Sanitation, including latrines, waste treatment and transport infrastructure, and solid waste management.	Is the creation of hazardous waste sites avoided?	No
	Is additional pollution of land, water and air avoided?	N
	Is an increase in disease transmission and presence of disease vectors avoided?	N
Health Care	Is pollution from disposal of medical and other waste avoided?	?
	Is an increased demand for traditional medical herbs and plants which exceeds sustainable yield avoided?	?
Industry (new or re-starting)	Are plans and procedures in place to avoid and increase in air, soil and water pollution?	Yes
	Is the unplanned and unmitigated disposal of solid and liquid waste avoided?	?
	Is an increase in road and other traffic avoided or mitigated?	?
	Are there plans and procedures in place to address the environmental impact of increased population and demand for services?	Yes
	Is an increased and unsustainable resource extraction avoided?	Yes
Change in cooking or food processing procedures.	Is increased fuel harvesting avoided or mitigated?	Yes
	Is increased air pollution avoided?	Yes
	Is an increase resource harvesting to cover food preparation costs avoided?	?
Creation of Small or Medium Enterprises (SME)	Is unsustainable resource extraction avoided?	Yes
	Is the waste produced disposed of properly?	?
	Are steps taken to avoid siting enterprises in hazardous locations?	?
Relief Supplies	Are steps taken to ensure that relief packaging does not create a solid waste disposal problem?	No
	Are steps taken to ensure that personal hygiene materials are disposed of properly and pose no health and sanitation problem?	No
	Are steps taken to ensure relief assistance is appropriate or acceptable to survivors and not discarded?	Yes
	Are there procedures to ensure that relief does not create new and unsustainable consumption habits on part of survivors?	Yes

Rubble removal	Is the handling and disposal of rubble done in a way to avoid the creation of disease vector breeding sites, leading to increased disease levels?	Yes
	Are rubble removal efforts also clearing obstructions to existing drainage/water flow systems so that flooding and sanitation problems can be avoided?	Yes
	Is rubble being recycled to that greater natural resource extraction is not necessary?	Yes
	Are individuals working in rubble removal provided with appropriate and adequate safety protection and training as needed to safely handle potentially dangerous materials?	Yes
(Re)Settlement	Do resettlement plans address possible negative environmental impacts due to changes in land use and bio-diversity?	?
	Are assessments and mitigation procedures been used to ensure that new settlements are not subject to new or greater hazards than before disaster?	Yes
Training	Are steps taken to ensure that new skills do not lead to greater extraction of resources or production of waste?	?

Annex 5 - Disaggregated Analysis of Community Level Assessment Responses

See the REA methodology (module two & annex D&E) for a full explanation of the development and use of the following output from the assessment process.

	TOTAL	Port-Au-Prince	Non Port-Au-Prince
1	4. Are a large number of persons affected by the disaster?	1. Did the community report environmental concerns?	8. Is level of self-sufficiency low?
2	5. Has the disaster been going on for a long time?	2. Did the community report environmental problems?	4. Are a large number of persons affected by the disaster?
3	1. Did the community report environmental concerns?	4. Are a large number of persons affected by the disaster?	5. Has the disaster been going on for a long time?
4	2. Did the community report environmental problems?	5. Has the disaster been going on for a long time?	12. Is livelihood base limited (not diversified)?
5	28. Are household resources adequate?	27. Is fuel adequate?	13. Are expectations high?
6	13. Are expectations high?	6. Are the disaster survivors concentrated?	28. Are household resources adequate?
7	12. Is livelihood base limited (not diversified)?	28. Are household resources adequate?	1. Did the community report environmental concerns?
8	26. Is food adequate?	13. Are expectations high?	2. Did the community report environmental problems?
9	27. Is fuel adequate?	26. Is food adequate?	14. Will current resource use reduce adequate availability in the future?
10	8. Is level of self-sufficiency low?	21. Is human disease a reported problem?	15. Is capacity to absorb waste limited?
11	6. Are the disaster survivors concentrated?	25. Is shelter adequate for local expectations?	26. Is food adequate?
12	25. Is shelter adequate for local expectations?	12. Is livelihood base limited (not diversified)?	30. Are human health conditions adequate?
13	30. Are human health conditions adequate?	22. Are other hazards reported problems? (flood, strong wind, hurricane, landslides/erosion, deforestation, tsunami)	31. Is waste management appropriate?
14	15. Is capacity to absorb waste limited?	29. Is personal safety adequate?	25. Is shelter adequate for local expectations?
15	21. Is human disease a reported problem?	30. Are human health conditions adequate?	21. Is human disease a reported problem?
16	31. Is waste management appropriate?	32. Is the control of insects and breeding sites adequate?	27. Is fuel adequate?
17	22. Are other hazards reported problems? (flood, strong wind, hurricane, landslides/erosion, deforestation, tsunami)	31. Is waste management appropriate?	6. Are the disaster survivors concentrated?
18	32. Is the control of insects and breeding sites adequate?	15. Is capacity to absorb waste limited?	16. Does the environment have limited resilience?
19	16. Does the environment have limited resilience?	8. Is level of self-sufficiency low?	32. Is the control of insects and breeding sites adequate?
20	14. Will current resource use reduce adequate availability in the future?	11. Are most assets concentrated with a few individuals?	22. Are other hazards reported problems? (flood, strong wind, hurricane, landslides/erosion, deforestation, tsunami)
21	29. Is personal safety adequate?	16. Does the environment have limited resilience?	17. Is drought a reported problem?

Comments: Environmental concerns and environmental problems (1&2) are lower priorities and limited livelihood base (12) a higher priority for non PAP. Adequate fuel (27) is a higher priority for PAP. Low level of self-sufficiency (8) is the top priority for non PAP and much lower on the PAP list. Capacity to absorb waste (15) is higher priority outside of PAP. Future availability of resources (14) did not appear in top issues for PAP. Personal safety (29) did not appear in priority concerns for non PAP. PAP recognized imbalanced concentrated assets (11) and non PAP reported drought a problem (17) while neither of these issues were represented as high concerns in neither the total nor the opposite population.

	TOTAL	Male	Female
1	4. Are a large number of persons affected by the disaster?	1. Did the community report environmental concerns?	1. Did the community report environmental concerns?
2	5. Has the disaster been going on for a long time?	4. Are a large number of persons affected by the disaster?	5. Has the disaster been going on for a long time?
3	1. Did the community report environmental concerns?	5. Has the disaster been going on for a long time?	13. Are expectations high?
4	2. Did the community report environmental problems?	13. Are expectations high?	28. Are household resources adequate?
5	28. Are household resources adequate?	2. Did the community report environmental problems?	2. Did the community report environmental problems?
6	13. Are expectations high?	12. Is livelihood base limited (not diversified)?	4. Are a large number of persons affected by the disaster?
7	12. Is livelihood base limited (not diversified)?	22. Are other hazards reported problems? (flood, strong wind, hurricane, landslides/erosion, deforestation, tsunami)	12. Is livelihood base limited (not diversified)?
8	26. Is food adequate?	26. Is food adequate?	26. Is food adequate?
9	27. Is fuel adequate?	28. Are household resources adequate?	30. Are human health conditions adequate?
10	8. Is level of self-sufficiency low?	30. Are human health conditions adequate?	15. Is capacity to absorb waste limited?
11	6. Are the disaster survivors concentrated?	6. Are the disaster survivors concentrated?	21. Is human disease a reported problem?
12	25. Is shelter adequate for local expectations?	25. Is shelter adequate for local expectations?	27. Is fuel adequate?
13	30. Are human health conditions adequate?	27. Is fuel adequate?	6. Are the disaster survivors concentrated?
14	15. Is capacity to absorb waste limited?	8. Is level of self-sufficiency low?	16. Does the environment have limited resilience?
15	21. Is human disease a reported problem?	21. Is human disease a reported problem?	25. Is shelter adequate for local expectations?
16	31. Is waste management appropriate?	32. Is the control of insects and breeding sites adequate?	32. Is the control of insects and breeding sites adequate?
17	22. Are other hazards reported problems? (flood, strong wind, hurricane, landslides/erosion, deforestation, tsunami)	15. Is capacity to absorb waste limited?	8. Is level of self-sufficiency low?
18	32. Is the control of insects and breeding sites adequate?	31. Is waste management appropriate?	22. Are other hazards reported problems? (flood, strong wind, hurricane, landslides/erosion, deforestation, tsunami)
19	16. Does the environment have limited resilience?	16. Does the environment have limited resilience?	31. Is waste management appropriate?
20	14. Will current resource use reduce adequate availability in the future?	7. Have the survivors moved a great distance?	14. Will current resource use reduce adequate availability in the future?
21	29. Is personal safety adequate?	23. Are adequate supplies of potable water available for humans?	17. Is drought a reported problem?

Comments: Males reported that natural weather hazards are a problem (22) more than females. The results show very few differences between males and females. This could be due to the broad nature of the questions (questions were not directed toward unique gender issues for Haiti's culture) and the extent of devastation causing limited livelihood and increased concerns for the entire population.

	TOTAL	Urban	Rural
1	4. Are a large number of persons affected by the disaster?	1. Did the community report environmental concerns?	2. Did the community report environmental problems?
2	5. Has the disaster been going on for a long time?	4. Are a large number of persons affected by the disaster?	8. Is level of self-sufficiency low?
3	1. Did the community report environmental concerns?	5. Has the disaster been going on for a long time?	14. Will current resource use reduce adequate availability in the future?
4	2. Did the community report environmental problems?	2. Did the community report environmental problems?	28. Are household resources adequate?
5	28. Are household resources adequate?	13. Are expectations high?	4. Are a large number of persons affected by the disaster?
6	13. Are expectations high?	28. Are household resources adequate?	5. Has the disaster been going on for a long time?
7	12. Is livelihood base limited (not diversified)?	6. Are the disaster survivors concentrated?	12. Is livelihood base limited (not diversified)?
8	26. Is food adequate?	27. Is fuel adequate?	13. Are expectations high?
9	27. Is fuel adequate?	12. Is livelihood base limited (not diversified)?	15. Is capacity to absorb waste limited?
10	8. Is level of self-sufficiency low?	26. Is food adequate?	1. Did the community report environmental concerns?
11	6. Are the disaster survivors concentrated?	22. Are other hazards reported problems? (flood, strong wind, hurricane, landslides/erosion, deforestation, tsunami)	25. Is shelter adequate for local expectations?
12	25. Is shelter adequate for local expectations?	21. Is human disease a reported problem?	26. Is food adequate?
13	30. Are human health conditions adequate?	30. Are human health conditions adequate?	31. Is waste management appropriate?
14	15. Is capacity to absorb waste limited?	25. Is shelter adequate for local expectations?	30. Are human health conditions adequate?
15	21. Is human disease a reported problem?	8. Is level of self-sufficiency low?	21. Is human disease a reported problem?
16	31. Is waste management appropriate?	15. Is capacity to absorb waste limited?	27. Is fuel adequate?
17	22. Are other hazards reported problems? (flood, strong wind, hurricane, landslides/erosion, deforestation, tsunami)	31. Is waste management appropriate?	32. Is the control of insects and breeding sites adequate?
18	32. Is the control of insects and breeding sites adequate?	32. Is the control of insects and breeding sites adequate?	7. Have the survivors moved a great distance?
19	16. Does the environment have limited resilience?	16. Does the environment have limited resilience?	17. Is drought a reported problem?
20	14. Will current resource use reduce adequate availability in the future?	29. Is personal safety adequate?	6. Are the disaster survivors concentrated?
21	29. Is personal safety adequate?	11. Are most assets concentrated with a few individuals?	16. Does the environment have limited resilience?

Comments: The urban population is more concerned about fuel adequacy (27). Level of self sufficiency (8) is lower in rural areas. Disaster survivors are more concentrated (6) and there are more reported natural hazards (22) in urban areas. Current resource use (14) is a higher concern for the rural population and adequacy of personal safety (29) for the urban population. Urban areas recognized that assets are concentrated with a few individuals (11), and rural areas identified that survivors moved a great distance (7) and that drought is a problem (17) while none of these issues were represented as high concerns in neither the total nor the opposite area.

Annex 6 - Issues Consolidation Sheet – Haiti REA

Note that the information below is a combination of the results presented in Annexes 4 and 5. See the REA methodology for a full explanation of the development and use of the following output from the assessment process.

OLA/CLA Issues	
Life Threatening	
Large number of persons affected (relative to total population in disaster area).	
Geophysical events: Changes and increased rain-related erosion or landslides and flooding Earthquake risk for future leading to further material loss damages and potential tsunami	
Shelter sites: May be located in fragile areas and prone to flooding (high water and contamination) Officially designated (existing and growing) shelter sites – poorly located in high risk geographic locations and not well developed	
Shelter: Distribution and adequacy Concentration of the affected population. Limited space; chance of fire and infectious disease Lighting Weather conditions affecting shelters (high winds, floods and temperature)	
Food supplies	
Livelihood options: The number of options that disaster survivors have to assure their livelihoods after the start of the disaster. Low self-sufficiency: After the start of the disaster, the ability of survivors to meet needs without recourse to additional direct extraction from the environment or external assistance. Domestic Resources (clothing, bedding, cooking utensils) Spatial limitation High vulnerability	
Sewage and solid waste: Sewage and solid waste management and disposal are inadequate Capacity to absorb waste: The environmental, social and physical structures available to handle waste produced by the survivors. Proper ventilation when burning waste Biohazard waste management Sanitation facilities in public sector over-stressed (ie: social service facilities)	
Health-related issues: Health care Human health conditions are not adequate; Safety, disease and injury are ongoing Sanitary delivery center	
Vectors and breeding sites not controlled. Future control (e.g. for malaria and dengue) may include pesticides.	
Welfare Threatening	
Long-term disaster.	
Asset distribution: The distribution of economic and other assets within disaster affected population after the start of the disaster.	
Land tenure: Squatters on private and public lands Land use	
High expectations: The level of assistance (local/external) which the disaster survivors expect to need to survive. Lack of support and trust in governance	
Governance of relief effort: coordination, oversight and management of relief efforts (effect on environment)	
Environmental Resilience: Ability of eco-system to rebound from the disaster itself and from relief and recovery activities which cause environmental damage.	

Deforestation Availability of natural resources, or whether the available natural resources meet the needs of the disaster survivors in a way which can continue without degradation to the environment or future availability of the resources.
Drought – Management of impacts
Air pollution (particulate matter and chemical contamination of dust) Proper shelter ventilation
Security (human)
Transport Personal and public
Fuel
Debris management – no plan, not minimizing negative env. impacts
Environmental Threatening
Mass burial sites (Titritu) (impact of human remains on the environment)
Use of natural resources for emergency and transitional shelter (wood)

Annex 7 – Shelter Site Level Environmental Checklist Results

The following camp-level assessment results are based on the [Checklist-Based Guide to Identifying Critical Environmental Considerations in Emergency Shelter Site Selection, Construction, Management and Decommissioning](#). These results were shared with the CCCM Cluster in Port au Prince as well as with specific camp managers where they could be identified.

	PAP: La Paix	PAP: Martissant	PAP: Terrain Accra	PAP: Centre Sportif	PAP: Canape Vert	PAP: Champs Mars	PAP: Premature	PAP: Delmas Golf	PAP: Bon Repos	Grand Goave: Bas Tapion	Petit Goave: Tiginin	Petit Goave: Belle Avenue	Leogane: Dirinel
1. Is there a site management plan?	Y	N	Y	Y	Y	N	N	Y	N	Y	N	Y	N
2. Are residents represented on the site management committee?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
3. Are community residents members of a gender-balanced site water and sanitation committee?	Y	N	N	N	N	-	Y	Y	-	N	N	N	N
4. Is there potable water available on a sustainable basis for the site?	Y	N	N	N	N	Y	N	Y	Y	N	N	N	N
5. Is there a regular collection and sustainable disposal of solid waste?	N	N	N	Y	N	N	N	Y	N	N	N	N	N
6. Is there a regular collection and sustainable disposal of sewage?	N	N	N	Y	Y	Y	N	Y	N	N	N	N	N
7. Are drainage systems well maintained?	N	N	N	N	N	Y	N	N	N	N	N	N	N
8. Are fuel efficient stoves available, and are users familiar with the proper operation of these stoves?	N	N	N	N	Y	N	N	N	N	N	N	N	N
9. Are the cooking fuels used by the shelter inhabitants available at the site without requiring unsustainable harvesting of local natural resources?	N	N	N	N	Y	N	N	N	N	N	N	N	N
10. If pesticides being used, are they being used safely and are residents aware of necessary precautions related to the use of pesticides?	-	N	N	-	N	Y	N	Y	Y	-	N	N	-
11. Is adequate space available for household livelihoods activities, include gardens and raising livestock?	N	N	N	N	N	N	N	N	N	Y	N	N	N
12. Is there adequate lighting of public areas and household level?	N	N	N	Y	N	N	N	N	N	N	N	N	N
13. Are public facilities (e.g., latrines) considered safe day and night?	N	N	N	Y	Y	Y	N	Y	Y	N	N	N	Y
14. Are efforts being made to upgrade living and environmental conditions at the site?	Y	N	N	Y	N	N	Y	Y	N	Y	N	N	N
15. Are upgrades to shelter units and infrastructure planned?	Y	N	N	Y	N	N	N	N	N	Y	N	N	N
16. Is there a system in place to repair damaged or degraded structures?	N	N	N	Y	N	N	N	N	N	N	N	N	N
17. Is there a system in place to monitor environmental conditions at the emergency shelter site?	N	N	N	N	N	N	N	N	N	N	N	N	N

	Leogane: Park Christophe	Leogane: Bel Val Plaza	Leogane: Adapcil/Chatulet	Leogane: Santo	Leogane: Moulin Durandisse	Leogane: Lomprey Kaymak	Comye Diclo: (Rural Jacmel)	Jacmel: Camaya/Parc Pechinal	Jacmel: Wolf 3	Jacmel: Kawof 1	Les Cayes: Terrain	Les Cayes: TivernisTorbeck	PAP: US Embassy	PAP: Logistics Base	US Military Camp LZ4
1. Is there a site management plan?	N	N	Y	Y	N	N	N	N	Y	Y	Y	Y	Y	Y	Y
2. Are residents represented on the site management committee?	N	Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	-	Y
3. Are community residents members of a gender-balanced site water and sanitation committee?	N	N	Y	N	N	N	N	Y	Y	N	N	-	N	Y	N
4. Is there potable water available on a sustainable basis for the site?	Y	N	N	N	Y	N	N	Y	N	N	Y	Y	Y	Y	Y
5. Is there a regular collection and sustainable disposal of solid waste?	Y	N	N	N	N	N	N	Y	N	Y	Y	Y	Y	Y	Y
6. Is there a regular collection and sustainable disposal of sewage?	-	N	N	N	N	N	N	Y	N	N	Y	Y	Y	Y	Y
7. Are drainage systems well maintained?	N	N	N	Y	N	N	N	N	N	N	Y	Y	Y	Y	Y
8. Are fuel efficient stoves available, and are users familiar with the proper operation of these stoves?	N	N	N	N	N	N	N	N	N	N	Y	N	NA	NA	N
9. Are the cooking fuels used by the shelter inhabitants available at the site without requiring unsustainable harvesting of local natural resources?	N	N	N	N	N	N	N	N	N	N	N	Y	N	Y	Y
10. If pesticides being used, are they being used safely and are residents aware of necessary precautions related to the use of pesticides?	N	N	-	-	-	-	-	Y	-	-	N	Y	Y	-	-
11. Is adequate space available for household livelihoods activities, include gardens and raising livestock?	N	Y	N	Y	N	N	N	N	N	N	Y	Y	Y	NA	Y
12. Is there adequate lighting of public areas and household level?	N	N	N	N	N	N	N	N	N	N	Y	N	Y	Y	Y
13. Are public facilities (e.g., latrines) considered safe day and night?	-	N	-	Y	-	-	-	Y	Y	N	Y	Y	Y	Y	Y
14. Are efforts being made to upgrade living and environmental conditions at the site?	Y	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y
15. Are upgrades to shelter units and infrastructure planned?	N	N	N	N	N	N	N	N	Y	N	Y	Y	Y	Y	Y
16. Is there a system in place to repair damaged or degraded structures?	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y
17. Is there a system in place to monitor environmental conditions at the emergency shelter site?	N	N	N	N	Y	Y	N	Y	N	N	Y	N	Y	-	Y

Annex 8 - Water Testing Results

Sampling

Twelve grab samples were taken in sterile vials: 6 household (HH) samples, 2 commercial samples, and 4 source samples (bladders or taps). Samples were taken from Port-au-Prince, Mortissant, Les Cayes, Mirebalais, Petit Goave, Leogane, and a rural source between Leogane and Jacmel. Samples were taken opportunistically and do not represent statistical sampling of sites visited as part of the REA CLA.

Methodology

One milliliter of water was plated, resulting in a detection limit of 1 colony forming unit (cfu) per milliliter. Both 3M Petrifilm and Micrology Labs Easygel plates were used for each sample. A single replicate was included for each due to supply limitations. Both plates test for the presence of *Escherichia coli* and general coliforms, summed to give the number of total coliforms (TC). Plates were incubated for two days at environmental temperature of Haiti (around 25-33 C).

Drinking water standards generally require no detectable *E. coli* per 100 milliliters of water (WHO Guidelines for drinking-water quality, third edition, 2006). This detection limit requires membrane filtration, which was attempted but impractical in field conditions. Due to methodological restrictions, the drinking water standard detection limit ($< 1 E. coli$ cfu/100 mL) was not achievable, implying that these results only detect bacterial presence 100 times higher than the drinking water standard. Lower (but still significant) levels of contamination were not detected. Due to field incubation identification of air bubbles next to colonies (standard practice for reading plates) was difficult - results should be taken only as indication of general contamination and not considered quantitative.

The presence of coliforms indicates the probable presence of fecal contamination (but does not indicate actual pathogen contamination). *E. coli* is the more precise indicator of fecal pollution, though the presence of TC indicates that the water allows the presence of bacteria, meaning that chlorination (when present) is inadequate to allow protection from recontamination.

Results

The water quality tests resulted in the following:

- Households
4/6 household samples had detectable coliforms (rural and urban). Two of the samples were contaminated with *E. coli*. The two that were negative for coliforms included one from Canape Vert (PAP) and one from Les Cayes (which had been chlorinated prior to sampling).
- Source samples
2/2 bladders (Delmas 44 Terrain Golf and Parc Gerard Christophe) and 1/1 hose source (Les Cayes) were negative for coliforms. 1/1 rural source sample (Mirebalais) was contaminated with *E. coli*.
- Commercial samples
2/2 commercial (purchased) samples were negative for coliforms.

Table 1 summarizes the results. TNTC indicates colonies were too numerous to count. Blank cells indicate the absence of colonies to the detection limit (100 cfu/100 mL).

Sample information				3M Petrifilm		Easygel	
Date taken	Site	Rural/Urban	Type	<i>E. coli</i> (cfu/100 mL)	Total coliforms (cfu/100 mL)	<i>E. coli</i> (cfu/100 mL)	Total coliforms (cfu/100 mL)
22-Feb	Martissant	Urban	Household 1	--	2,300	100	2,900
22-Feb	Martissant	Urban	Household 2	4,600	18,000	5,500	TNTC
22-Feb	PaP	Urban	Household	--	--	--	--

	Canape Vert		(bucket)				
22-Feb	PaP Champs de Mars	Urban	Household (bucket)	--	13,000	--	5,800
25-Feb	Petit Goave to Jacmel Comye Diclo	Rural	Household (rural spring water – bucket)	--	10,000	--	9,200
25-Feb	Les Cayes Beach camp site	Urban	Household (from well then chlorinated – kitchen bucket)	--	--	--	--
22-Feb	PaP Delmas 44 Terrain Golf	Urban	Source (Bladder)	--	--	--	--
23-Feb	Mirebalais	Rural	Source (Faucet)	900	28,000	1,400	39,000
23-Feb	Leogane Parc Gerard Christophe	Urban	Source (Bladder)	--	--	--	--
25-Feb	Les Cayes Soccer field camp site	Urban	Source (Hose - direct from treatment)	--	--	--	--
22-Feb	Martissant Frchlne Lokal ARC	Urban	Commercial (Purchased)	--	--	--	--
24-Feb	Petit Goave Petit Ginen AGUA eau purifie	Urban	Commercial (Purchased)	--	--	--	--

Conclusion

Bladders and commercially purchased water samples had no detectable coliforms, to the detection limit (100 cfu/100 mL). The one rural source water tested (Mirebalais) was contaminated with *E. coli* and total coliforms. Household samples were often positive for coliforms, indicating that it is likely that household storage allows recontamination of drinking water, as expected. (An important caveat is that we did not test paired source and household water samples at the same site, so it is not possible to pinpoint contamination as from the household or source, though the former is more likely as all urban source samples were not contaminated.) The two methods (3M and Easygel) gave similar results.

Annex 9 – Pole Market Research

Investigation of Wood for the Construction of Tents and Transitional Housing

Throughout the two weeks of field assessments, the Team was able to carry out 9 separate interviews with wood vendors to investigate the cost and demand of wooden poles. Displaced people are harvesting and selling wooden poles (or rods) to provide structural support for their transitional houses and makeshift tents. The assessments were executed in various areas of Port-Au-Prince (Carrefour, Martissant, Frères, etc) and in various locations outside of PAP (Leogane, Les Cayes, Jacmel, etc).

A higher demand for these rods has reportedly arisen since the earthquake, when many humanitarian aid entities distributed tarps or other forms of plastic sheeting. These support items did not include the structural support needed that these wooden poles provide. Due to this distribution of tarps and plastic, the displaced turn to the limited natural resources in areas near and far.

Interviews with key camp informants found that an average shelter requires at least 12 poles. In all assessed markets, the price of the wooden rods has approximately doubled since the earthquake. The named types of wood being harvested include: Mang, Kanpech, Frenn, Lilac, and Len and are from: Jeremie, Baradere, Grand Goave, Leogane, Pestel, Hinche coming in from various ports and bus stations. Buyers and vendors carry out commerce on roadsides and streetside markets.

Since watersheds near PAP are already greatly deforested, harvesting of young trees for shelter poles could cause a significant reduction in future wood availability, forest cover and moisture absorption capacity. Institutions responding to the disaster should take this information into account when planning and designing responses.

Below are the data from five representative interviews about the type, availability, origin, and price increase of wooden poles since the earthquake:

Carrefour

Origin: Jeremie, Baradere, Grand Goave
Type of wood: Mang, Kanpech, Frenn,
Price increase (y/n): yes
Rods per tent: At least 12
Port or bus station: Cite Soleil, Jeremie, Larochelle, Bon Repos, Mariani
Management: Buyers and vendors
Cost: 60 to 100\$ht (1dz)

Martissant

Origin: Leogane, Pestel, Baradere
Type of wood: Lilac, Len
Price increase (y/n): yes
Rods per tent: At least 12
Port or bus station: Cite Soleil, Jeremie, Larochelle, Bon Repos, Mariani
Management: Buyers and vendors
Cost: 50 to 100\$ht (1dz)

Frères

Origin: Hinche
Type of wood: -
Price increase (y/n): yes
Rods per tent: At least 12
Port or bus station: Cite Soleil, Mariani
Management: Buyers and vendors
Cost: 50 to 100 \$ht (1dz)

Mariani 1

Origin: Jeremie, Pestel
Type of wood: Bayaronne
Price increase (y/n): yes
Rods per tent: At least 12
Port or bus station: Cite Soleil, Mariani
Management: Buyers and vendors
Cost: 60 to 120 \$ht (1dz)

Mariani 2

Origin: Jeremie, Pestel
Type of wood: Bayaronne
Price increase (y/n): yes
Rods per tent: At least one dozen
Port or bus station: Cite Soleil, Mariani
Management: Buyers and vendors
Cost: 100 to 120 \$ht (1dz)

Data collected and analyzed by Scott Solberg, Jimmy Alcindor, and Malory Hendrickson.