United Nations Development Programme

THE HAITIAN EXPERIENCE 2010 - 2012

TECHNICAL GUIDE FOR DEBRIS MANAGEMENT

Empowered lives.
Resilient nations.

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TECHNICAL GUIDE FOR DEBRIS MANAGEMENT

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Fonds de reconstruction d'Haïti
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UNDP

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TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS

CFP	Cash for Production
CFW	Cash for Work
CIAT	Comité Interministériel d'Aménagement du Territoire (Interministerial Committee for Land Planning)
CIRH	Commission Intérimaire pour la Reconstruction d'Haïti (Interministerial Comission for the Reconstruction of Haiti)
CNIGS	Centre National d'Informations Géo-Spatiale (National Centre for Geo-Spatial Information)
DM-WG	Debris Management - Working Group
FAU	Fondation Architectes de l'Urgence (Emergency Architects Foundation)
IHSI	Institut Haïtien de Statistique et d'Informatique (Haitian Institute of Statistics and Information)
ILO	International Labor Organization
LI	Labor-Intensive
LoA	Letter of Agreement
MTPTC	Ministère des Travaux Publics, Transports et Communications (Ministry of Public Works, Transport and Communication)
MoU	Memorandum of Understanding
NGO	Non Governmental Organization
PARDN	Plan d'Action pour le Relèvement et le Développement National d'Haïti (Action Plan for National Recovery and Development of Haiti)
UN	United Nations
UNDP	United Nations Development Programme
UN-Habitat	United Nations Human Settlements Programme
UNOPS	United Nations Office for Projects Service
UNS	United Nations system
WFP	World Food Programme
WG	Working Group

INTRODUCTION

On January 12, 2010, an earthquake measuring 7.0 on the Richter scale struck Haiti and devastated the capital Port-au-Prince, and its peripheral municipalities (Delmas, Cité Soleil, Croix des Bouquets, Pétionville, Tabarre, Carrefour), the Ouest department and the cities of Léogâne, Grand Goâve, Petit Goâve, Ganthier, Gressier, as well as the Sud-Est department and, in particular, the city of Jacmel. The earthquake killed more than 220,000 people and displaced more than 1.5 million people.

The building damage assessment, conducted between March 2010 and February 2011 by the Government of Haiti and the United Nations system, showed that more than 400,000 buildings were damaged or destroyed, of which approximately 218,000 could be occupied without repairs (green category), 105,000 were damaged but could be repaired (yellow category), and 80,000 were severely damaged and remained uninhabitable (red category).

The destruction of buildings and infrastructure generated a huge amount of debris, estimated at 10 million cubic meters, blocking streets and land in affected areas. In the absence of a national debris management strategy, debris could, thus, be cleared and disposed of in an uncontrolled manner, hindering relief, recovery and reconstruction activities.

Following the earthquake, the UN Integrated Strategic Framework (ISF) replaced the United Nations Development Assistance Framework, and defined strategic priorities for intervention in the country. The framework was adopted by all United Nations agencies and the United Nations Mission for Stabilization in Haiti (MINUSTAH), to contribute to the Action Plan for National Recovery and Development of Haiti (PARDN) developed by the Haitian Government, in consultation with all sectors of the country.

The priorities of the Action Plan aimed to address the immediate emergency, resume economic, governmental and social activities, reduce the country's vulnerability to natural disasters and re-launch Haiti on the path of development. Clearing the debris, demolishing potentially hazardous buildings and repairing damaged houses became the main means of encouraging the return and resettlement of displaced people to their areas of origin, the resumption of the productive cycle, the reconstruction of everyday life and the psychosocial recovery of affected populations. As such, debris management was one of the first steps towards rebuilding the country.

With this overarching objective, in February 2010, the United Nations Development Programme (UNDP) launched a joint labor-intensive Cash for Work programme (LI/CFW) in partnership with the World Food Programme (WFP) and the Government of Haiti, to initiate early interventions for debris and waste removal, clearing of roads and public squares, and dredging of drainage channels.

In response to the priorities identified by the Government of Haiti through the Interim Haiti Recovery Commission, UNDP decided to launch the implementation of a sustainable development and recovery-based debris management programme through the implementation of three specific projects, the first project in Léogâne, the epicentre of the earthquake, and two in Port-au-Prince (Debris I and Debris II). These projects were intended to contribute to the rehabilitation of the most affected urban areas through the implementation of a debris management strategy, including planning, demolition, removal, transportation, reuse and recycling and rehabilitation of public spaces through recycled debris.

The earthquake in figures:

- More than 220,000 people died.
- More than 1.5 million displaced.
- 400,000 buildings affected, including 105,000 to be repaired and 80,000 that remained uninhabitable.
- 10 million m3 of debris generated.

The Debris Projects (Debris I and Debris II) in Port-au-Prince benefitted from the strategic integration of the United Nations system, with the involvement of several agencies that played specific roles: the United Nations Human Settlements Programme (UN-Habitat) responsible for social mobilization, community participation and the preparation of neighborhood restructuring plans; the International Labor Organization (ILO) responsible for job creation through the reuse of recyclable debris and the reactivation of the local economy through the creation and support for small and micro-enterprises; and UNDP responsible for demolition, debris removal, neighborhood rehabilitation and the general coordination of the intervention, including a participatory approach and in partnership with UNOPS, central and local governments, local and international NGOs, the private sector, and more importantly, the Haitian population.

Debris management thus become a strategic point of entry into damaged areas through programmes that stimulate the local economy and job creation, becoming the basis for sustainable development.

The chaotic situation from the outset and the limited literature on assistance programmes in urban contexts, such as debris management, made the implementation of this programme a challenging but also exciting experience for UNDP.

This experience has allowed to draw meaningful lessons and propose practical recommendations for the implementation of new debris management programmes, for both UNDP and humanitarian actors at large.

Based on the experience gained by UNDP in Haiti, this guide aims to share the key design, programmatic and operational considerations for the implementation of debris management programmes, from a hands-on learning perspective, based on the successes and challenges of the experience, with a particular focus on the actions under its responsibility.

Sophie de Caen
UNDP Senior Country Director

In terms of recovery and reconstruction, the safe return of people to their neighborhoods of origin, the rehabilitation of damaged buildings, the resumption of daily life and private sector development are at the heart of UNDP's approach. In this context, debris management became a first step towards achieving these goals and laying the foundations for sustainable development.

The design and planning of a debris management programme should consider this approach as well as the needs, interests, resources, mandates and implementation capacities in order to reduce response costs and programme formulation time, promote coordination efforts and clarify the responsibilities, procedures and resources required.

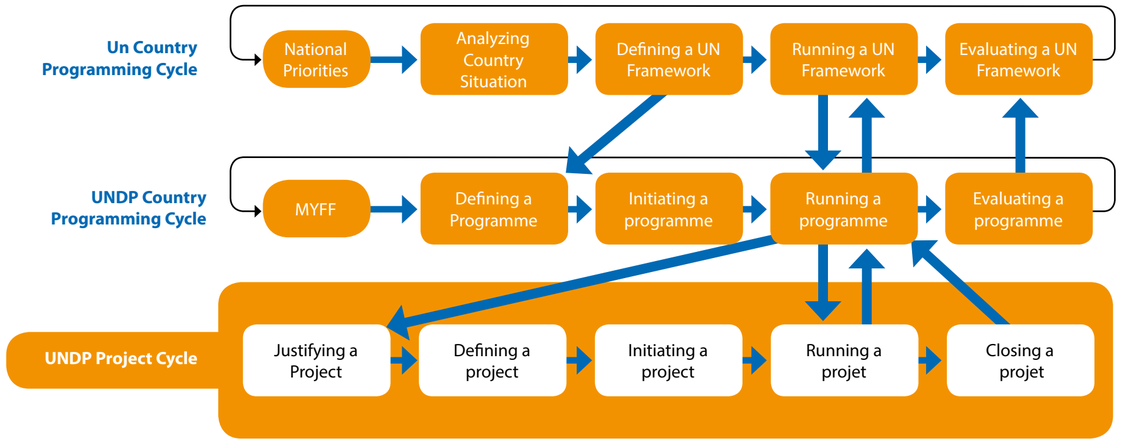
Planning is an ongoing stage of the programme that makes it possible to review and readjust the intervention in function of the rapid changes that characterize a post-crisis context.

CHAPTER I
DESIGN AND PLANNING OF THE INTERVENTION IN HAITI

1.1 THE DEBRIS MANAGEMENT CYCLE

The planning of the intervention was based on the requirements and procedures of UNDP's planning cycle.

Diagram 1. UNDP Planning Cycle



UNDP in Haiti combined a holistic and long-term approach to debris management that goes beyond immediate debris removal and cleaning programmes. For UNDP, debris management became the entry point to begin sustainable neighborhood recovery, encourage early return and resettlement of displaced persons within their area of origin and resume daily life activities.

The UN Integrated Strategic Framework contributed to the definition and implementation of a comprehensive debris management strategy, based on participatory approaches and the engagement of local communities, viewing debris management as a social and economic resource rather than just waste.

UNDP's strategy was therefore focused on maximizing the potential benefits derived from debris reuse and recycling by establishing debris as a raw material for reconstruction, a resource for job creation and an open door for development.

In this context, UNDP addressed debris management in Haiti from a life cycle perspective that includes the following phases:

- Community planning.
- House demolition and debris removal.
- Sorting, treatment and reuse of debris in neighborhoods (reuse and micro recycling) including entrepreneurship and capacity development amongst micro and small entrepreneurs.
- Classification and transportation of debris.
- Recycling of debris at processing sites (macro recycling) and support for reconstruction/redevelopment programmes.
- Disposal of non-recyclable debris at a final disposal site.

Diagram 2. Debris management cycle

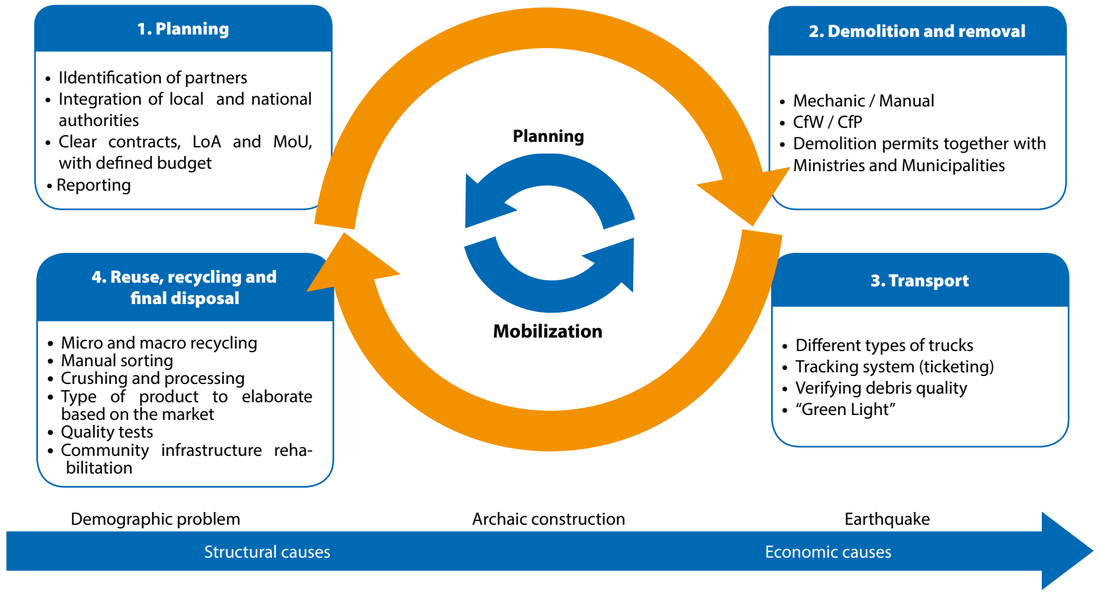


Table 1. Main results and quantitative indicators

Results	Quantitative indicators
House demolition and debris removal	Number of demolition permits signed and approved Volume of debris cleared
Economic revitalization	Number of people hired (temporary jobs) Number of debris processing and recycling micro-enterprises created
Recycling and reuse of debris	Volume of debris transported to recycling facilities Volume of debris recycled or reused
Contribution to the reconstruction	Number of neighborhood redevelopment plans elaborated Amount of materials from recycling used in reconstruction projects
Local capacity development	Number of guides and policies promoted/developed Number of people trained in the techniques of debris recycling, seismic construction Number of people trained in business management

The debris management programme adopted a "results-based management" approach, which primarily sought to define measurable outcomes, as well as methodologies and tools to achieve the desired results. This approach helped improve the performance and accountability of various stakeholders by focusing intervention planning, management and monitoring on the expected results.

Reference documents:
-Debris Léogâne Project Document
-Debris I Project Document
-Debris II Project Document
-Annual Reports
-Brochures
-Project fact sheets
-Debris Management Guidance Note

1.2 DATA COLLECTION

Planning a debris management programme requires the collection of substantial background information, including:

At the strategic level:

- A working strategic framework: a national debris management policy or strategy and associated legislation to ensure the relevance of the intervention (UNDP, Government).
- A damage assessment, in order to identify and delineate the disaster sites and areas, the number and location of destroyed or severely damaged homes and buildings, this includes facilitating the development of location maps with GPS data and characterization of the level of destruction (Ministry of Public Works or similar, UNDP).
- Defining the official volume of debris to be cleared and its location (Government).
- Recycling and reuse options, establishing the physicochemical characteristics of the debris, its degree of contamination and recycling potential (national and international technical laboratories, Government).

  Estimates indicate that urban debris can be recycled at an average rate of 30-40%, which makes it possible to design preliminary recycling lines and volumes. However, it is important to obtain an official government authorization that validates the use of recycled products prior to the design of recycling actions. Furthermore, if market demands have not been thoroughly analyzed, the quantity and quality of these actions may be overestimated.

Although estimates during the first months of 2010 indicated that the earthquake in Haiti generated a volume of 40 million m3 of debris, the Ministry of Public Works, Transport and Communications concluded in April 2011 that the volume of debris was 10 million m3, after validating the combined results of studies carried out by UNOPS and Miyamoto.

- Establishment and characterization (location, access and capacity) of landfill and treatment sites (Government, private sector).
- Physical accessibility of debris to determine the equipment needs and an adapted workforce (Government, UNDP).
- Reconstruction and development actions planned to provide linkages, continuity and consistency in the programme's actions (Government, UNDP).

At the institutional level:

- The identification of partners, to determine the operational capacities of state agencies, UN agencies, international and national NGOs, the private sector, and establish procedures for coordination and leadership (UNDP).

While many debris management programmes are an excellent opportunity for joint work between UN agencies, government and humanitarian organizations, their active participation must be considered in the various stages of debris management, through a previous analysis of their management capacity, efficiency and expertise.

- Coordination mechanisms to ensure an organizational structure between the Government and all implementing partners (recommended within the Early Recovery Cluster).

  The establishment of a special working group on debris management under the responsibility of the Early Recovery Cluster (Government, UNDP) can be an ideal instrument to manage and share information and facilitate effective coordination for debris management programme design and implementation.

It could take several months for the implementation of a debris management programme to be properly defined. Consequently, the programme must generally be formulated and planned based on assumptions and preliminary values or data to be reviewed and readjusted as the information evolves.

In this context, UNDP began to implement a massive debris removal programme in the immediate aftermath of the earthquake, with the goal of cleaning the streets and arterial roads of the affected areas, while promoting labor-intensive work under Cash for Work modalities to inject rapid economic resources and promote the economic recovery of neighborhoods.

Subsequently, the implementation of pilot projects, made it possible to dynamically address other programme elements (revitalization of the local economy through the creation of labor-intensive jobs under a Cash for Production modality and the promotion of micro and small enterprises, debris reuse and recycling, disaster risk reduction, among others), as the required information was made available and the population and authorities developed the means to cope with the new demands.

The lessons learned through the initial projects contributed significantly to improving the design and implementation of new projects. In this context, fiscal and operational flexibility (review of intervention areas, target population and activities) proved to be a critical element in the evolution of the programme.

Reference documents:

- *Action Plan for National Recovery and Development of Haiti*
- *Location map of severely damaged buildings in Léogâne*
- *Location map of severely damaged buildings in Port-au-Prince*
- *Density map of severely damaged or collapsed buildings per hectare, Léogâne*
- *Map of estimated debris from severely damaged or collapsed buildings by communal section*
- *Technical Reports on the quality of debris: DWR / Grace Construction Products / Ecosur*
- *Analysis of the quality of debris (MTPTC)*
- *Myamoto Structural Debris Assessment*
- *Debris Management Guidance Note*

RECOMMENDATIONS

1. - Seek guidance from people who have participated in this type of phenomenon (Gaza, Lebanon, Algeria, Afghanistan, etc.) within UNDP. Their experience is an invaluable source of learning to draft the first outlines of a debris management programme.

2. - Establish a multidisciplinary and multi-agency team to provide the essential technical skills and necessary background understanding. It should focus primarily on the development of joint and common services, if possible.

3. - Include technical representatives of the State (relevant Ministries, Councils, local authorities), most representative and recognized community structures, local UN agency staff and representatives of the private sector (demolition, recycling, transport) in the early stages of the programme design to draw on their technical skills, their understanding of the local dynamics and specificities, and synergy of action.

4. - Cross-cutting issues such as inclusion, gender equity, environment and disaster risk reduction, should be part of the initial assessment phase, to ensure their integration into the overall debris management programme.

5. - Action planning requires a well-defined neighborhood approach, not based on rigid geographic data but, more importantly, on territorial dynamics and communities. On-going consultation with the local population can help refine the analysis and ensure relevant community-based solutions.

6. – Ensure, from the early planning stages, the sequence and consistency of immediate recovery, rehabilitation/reconstruction and development actions, as well as local ownership, which stands out as a successful exit strategy, involving the private sector from the outset as a valid and experienced alternative.

7. - Perform a deep risk analysis of capacity, security, policy making, finance, environment, gender and disasters.

8. - The initial assessment must rely on computer and data management tools (mapping, GIS) to facilitate decision-making and better planning of the actions to implement.

1.3 FORMS OF INTERVENTION AND IDENTIFICATION OF PARTNERS

The enormous influx of funds and international organizations made this crisis one of the most complex to manage, given the crucial need to ensure humanitarian coordination and management of the operations. In keeping with its mandate, expertise, transparent and results-oriented management and resource optimization, UNDP, a key and strategic partner of the Government of Haiti (GoH) since 1973, proved to be the organization that was not only able to create partnerships with a broad and diverse range of actors, but also plan and implement large-scale debris management operations.

UNDP placed partnership-building at the centre of all aspects of the debris management programme, involving national and local authorities, other UN agencies, international financial institutions, donors, the private sector and civil society, establishing recovery actions and immediate reconstruction as a collective responsibility.

In order to implement the programme, the partners had to provide a set of indispensable capacities to guarantee the smooth operation and management of projects, particularly at the technical and administrative management level:

- Capacity to plan, manage and coordinate activities.
- Capacity to manage the technical aspects of the project.
- Capacity to ensure UNDP procedures to manage human and financial resources, as well as contract management and procurement practices.

UNDP partnered with:

- **State institutions:** Ministry of Public Works, Transport and Communications (MTPTC), as the ministry responsible for debris management, and local authorities to ensure decentralized cooperation (CASEC and ASEC, especially within the municipalities of Port-au-Prince, Pétionville and Léogâne) and follow their guidelines for the implementation of the programme, particularly in the selection criteria and intervention procedures.

- **Civil Society Organizations (CSOs):** Notably NGOs and community-based organizations, for their technical expertise, their understanding of the Haitian context and their presence at the municipal level, enabling joint work on issues such as community planning, demolition, transportation and recycling of debris:

  * NGOs that worked on debris management issues: UJAPH, EPT, GTIH, FFH, FONHEDECO, CEPHAPE (Debris I project); CHF International, J/P Haitien Relief Organization, Viva Rio (Debris II project); CRWRC, IEDA, OJADCO, Anacaona Foundation, Tear Fund (Debris Léogâne).

  * NGOs that worked on community planning: Cordaid, Emergency Architects Foundation, GOAL.

- **UN Agencies:** The complex and multidimensional nature of debris management, as well as its close relationship with longer-term rehabilitation/reconstruction and development strategies required strong coordination within the United Nations system. As such, UNDP worked closely with UN-Habitat and ILO to ensure an integrated and effective response from UN agencies, with the following division of responsibilities:

  UN Habitat: Social mobilization including organization and community planning, as well as land registry issues.

  UNDP: Demolition of hazardous structures, creating short-term jobs under aCash for Production modality, debris management and coordination of the overall programme, with technical support from UNOPS.

  ILO: Market analysis, professional training, support in the creation of micro-enterprises and recycling debris into non-structural products.

  UNDP enlisted the services of UNOPS to support the MTPTC in the technical assessment of houses and the debris management programme with demolition, removal, transportation and recycling activities.

- **Private sector:** The private sector could make an important contribution to the programme by encouraging innovation, and by financing and promoting small and micro entrepreneurship in neighborhoods.

To enable collaboration with its partners, UNDP considered the following contractual arrangements with its operational partners:

- **Letter of Agreement:** UNOPS (Debris I Project), to initiate joint work immediately based on the technical and operational specifications required.
  Advantage: It was not necessary to organize a bidding process, since UNDP may sign letters of agreement with other UN agencies directly.

- **Micro-capital grants:** National and international NGOs (Léogâne Project) and local NGOs (Debris I Project), allowing small local organizations to play a significant role in a large-scale programme, with international partners, and to actively involve them in the process of removing debris from their neighborhoods.

  Advantage: This method did not require a competitive process for the selection of a local NGO (maximum of two USD 150,000 contracts per NGO). However, the amount remained modest compared to national and international NGOs.

- **Long Term Agreement (LTA):**
  a). - For international and national NGOs (Debris II Project), the definition of intervention areas, the maximum amount of debris to be removed by area (MTPTC database) and the unit price per m3 of debris removed were established on the basis of the following four elements: community mobilization, mechanical demolition, manual demolition and transport. Binding contracts for additional professional services were signed with NGOs to identify specific amounts of debris to be removed and to define the work plan and performance indicators.

Advantage: UNDP paid NGOs based on the amount of debris removed, creating a type of "cash for production" modality at a higher management level. UNDP could thus subscribe contracts for professional services until all debris was removed.

b). - With a local construction company (Léogâne Project), selected through a tender process, in order to use their machinery for mechanical demolition of houses deemed too dangerous to be manually demolished and debris removal to a landfill site predefined by the Council.

Advantage: The LTA was signed for a fixed maximum amount to avoid any changes to the cost of the machinery rented for the established period of time.

- **Temporary contract:** A contract was also signed with the same company to define the responsibilities of both parties (UNDP and contracting company) for the work to be executed based on the established time frame.

As for the joint debris management projects (Debris I and Debris II), although the project documents were designed based on combined action by ILO, UN-Habitat and UNDP, there were differences in the intervention modalities, particularly concerning the administration of funds:

Debris I Project: UNDP was designated as the administrator agency of the funds (from the Haiti Reconstruction Fund). UNDP signed letters of agreement with ILO and UN-Habitat, who were expected to submit certified financial reports to UNDP.

Debris II Project: In this project, the funds were transferred directly to each agency, and no letters of agreement were signed between the different agencies.

The administration of funds by UNDP and the signing of letters of agreement with other partner agencies, proved to be a better model to facilitate the effective integration and synergy of actions.

Reference documents:
- Letter of Agreement UNDP-UNOPS
-Contract of micro-capital grant UNDP-NGO
-Long Term Agreement UNDP-NGO
-Contract for professional services UNDP-NGO

RECOMMENDATIONS

1. - It is imperative to analyze the management and implementation capacities of partners, whether UN agencies or government and humanitarian organizations, before considering their active participation in all aspects of debris management. A partner's lack of experience, know-how or capacity can present a major obstacle to efficient joint development of the project. This insufficiency could block the flow of this type of joint programme.

2. - The presence of UN Peacekeeping missions in some countries can foster partnerships for transport, machinery and specialized personnel (technicians and engineers) and can provide security services in areas characterized by precarious security.

3. - The UN system has different contractual and operational procedures. Alternatives should be carefully evaluated based on the partners and approaches considered. UNDP establishes itself, however, as the leader and coordination agency for the overall debris management programme, in keeping with its mandate, experience, strategic relationships with governments and management capacity.

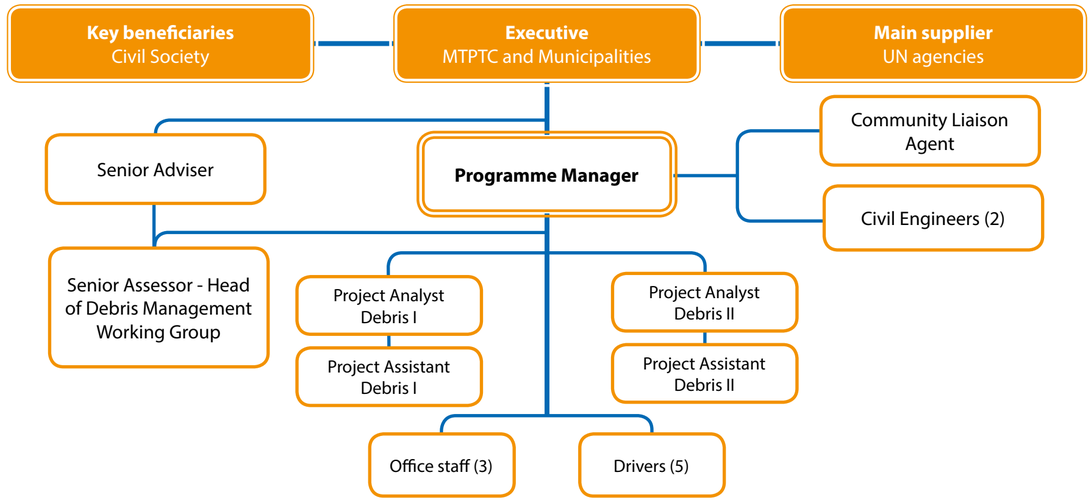
1.4 INTERNAL ORGANIZATIONAL STRUCTURE

Following the initial planning stages of the intervention, the required management structure should be established according to the actions identified and the approved implementation modalities.

Therefore, the identification of human resources within UNDP (numbers, capacities, expertise and complementarity), and the identification of partners are key elements to ensure that programme activities are addressed and managed effectively.

In Haiti, UNDP established a management unit, headed by a Project Coordinator under the direction of a Programme Manager and supported by a technical support staff, to ensure interdisciplinarity and decision-making.

Diagram 3. Organizational Chart of the Debris Management Programme - UNDP Haiti



The presence of senior advisors with, on the one hand, a strong understanding of the cultural, political and institutional characteristics of the country and, on the other hand, experience in debris management programmes proved to be a real asset to ensure coordination actions at all scales and levels of intervention, as well as for the proper design and periodic adjustment of the programme.

Similarly, the integration of facilitators or liaison officers, recognized by the communities and their leaders, proved to be an excellent way of ensuring programme connectivity and synergy, as well as an effective tool for conflict prevention and management at the neighborhood level. The liaison officer, who is integrated in the communities and provides an almost permanent presence, is also a necessary investment in terms of contributing to better local management and continuity of experience beyond the duration of the project.

RECOMMENDATIONS

1. - Adequate programme management requires a multidisciplinary, multi-agency and enduring working team.

2. - UNDP, as lead agency in early recovery, must assign a leader of the Debris Management Working Group within the Early Recovery Cluster to ensure proper coordination of the programme with other stakeholders and consistency with the government strategy.

3. - Team engagement, commitment and flexibility to work outside of working hours can help to achieve results in a very demanding context.

4. - The administration and finance unit must have a logistician to facilitate the administrative and financial work which can become difficult especially during periods of payment to labor-intensive working groups.

5. - The management team must have a person in charge of communications for the debris management team in order to simplify the flow of communication, making it faster and more direct, and to provide a unique communication strategy by the UN system. Similarly, the presence of a GIS expert will facilitate the elaboration of products essential for proper planning, such as maps and databases.

1.5 COORDINATION MECHANISMS

The earthquake generated an unprecedented influx of international aid to Haiti. Governments, private entities, non-governmental organizations, donors and multilateral agencies mobilized significant amounts of resources to support relief and recovery efforts, including debris management.

As a result, internal and external coordination for programme design, planning and implementation became a crucial element of the UN system and, therefore, of the UNDP debris management intervention.

At the external level:

At the national level, the implementation of UN-supported programmes was managed in close partnership with the GoH institutions, through a series of consultation mechanisms

involving government officials, members of civil society and UN agencies such as UNDP.

In order to improve the governance of the different sectors, consultation frameworks were implemented, through sectorial working groups for better coordination between stakeholders and institutions.

In response to the March 2010 request of the Government of Haiti, the International Development Association (IDA), the United Nations Development Group (UNDG) and the Inter-American Development Bank (IDB) - as partner agencies - and donors created a multi-donor trust fund called the **Haiti Reconstruction Fund** (HRF), whose primary role was to support the post-earthquake action plan of the GoH, known as the Action Plan for National Recovery and Development of Haiti (PARDH, 2010).

Following the 2010 earthquake, the GoH established the **Interim Haiti Reconstruction Commission** (IHRC), a strategic body that brought together the GoH and international partners to coordinate and monitor rehabilitation and reconstruction efforts. Key features of the IHRC included information sharing, planning and coordination of reconstruction efforts, prioritizing rehabilitation efforts, development and approval of programmes and projects, support for their implementation, assessment of their impact and communication of results to stakeholders. The IHRC was also responsible for the validation of all post-earthquake reconstruction projects or programmes, including those funded by the HRF, in close collaboration with the Ministry of Planning and External Cooperation (MPCE) and relevant sectorial ministries.

In order to support national reconstruction efforts, the Early Recovery Cluster served as a platform for the strategic coordination of all recovery efforts. UNDP facilitated the work of the cluster, which brought together more than 120 organizations, including national institutions, UN agencies, national and international NGOs, and private sector representatives.

Given the importance and specificity of the various components of the Early Recovery Cluster, different Working Groups (WG) were established, such as livelihoods, host communities and district-housing.

To facilitate dialogue, coordination and interaction among stakeholder organizations in debris management, UNDP, in partnership with the Ministry of Public Works, Transport and Communications (MTPTC), activated the Debris Management Working Group (DM-GW) within the Early Recovery Cluster, with more than 50 national and international organizations, having the following main objectives:

- Identify key stakeholders involved in debris management and contribute to the effective coordination of efforts.
- Ensure the exchange and updating of multiple information.
- Share strategic and technical developments in the fields of debris, recycling and reuse.
- Maintain geographic and tabular databases of partners.
- Support national authorities and strengthen their capacity to structure and improve the debris management chain.
- Support advocacy for improved policy and strategic planning in the area of debris management.
- Disseminate lessons learned and best practices in the field of debris management.

Partnership with authorities at the decentralized level (department, commune and communal section) proved to be crucial to programme planning and implementation, promoting ownership by communes/municipalities and populations, and proving to be a sound exit strategy.

To ensure work at the neighborhood level, UNDP relied on grassroots organizations and NGOs with established experience and presence in the priority areas identified, which proved to be a real asset, especially in insecure neighborhoods such as Bel Air and Fort National.

At the internal level:

The UN country team in Haiti adopted the principles of joint programming. To ensure a consistent approach to resource mobilization, the country team approved a coordination mechanism for the submission of projects to the IHRC. In particular, the Inter-Agency Group, chaired by UNDP and including various UN agency programme coordinators, was appointed by the country team as the main structure responsible for the identification and thorough review of priority projects to be submitted to the IHRC by the DSRSG/RC/HC.

The UN Resident Coordinator led the exchanges and facilitated synergies within the country team. This was achieved by monitoring the implementation of the UN Integrated Strategic Framework activities, replacing individual projects with programmes, and promoting joint programmes between UN agencies and key partners. Similarly, the Resident Coordinator's Support Office established reporting and information sharing procedures with the office of the Multi-Partnership Trust Funds (MPTF), ensuring coordination and greater efficiency of UN action. The planning process of the debris management programme focused on the requirement to have significant impact through a coordinated, focused and coherent stakeholder response, establishing coordination structures, mechanisms and tools to promote teamwork and build cohesion and complementarity of action.

UNDP, UN-Habitat and ILO worked together to support the GoH, including the Ministry of Public Works, Transport and Communications and municipalities, in their efforts to plan and implement demolition, clearing, safe return, economic revitalization of neighborhoods and urban rehabilitation actions in Port-au-Prince and Léogâne. The collaborative, coordinated and complementary approach at the UN agency level accounted for the specific mandates, experience and comparative advantages of each agency to provide a full and effective response.

The joint debris management programme in Port-au-Prince also contributed to the GoH's overall debris management strategy, with the support of the Debris Management Working Group (DM-WG) and the Early Recovery Cluster.

Reference documents:
- *Structure of the Early Recovery Cluster*
- *Factsheets of the Debris Management Working Group*

RECOMMENDATIONS

At the external level:

1.- The coordination of humanitarian actors after a disaster must be primarily implemented as prescribed by the United Nations humanitarian reform, i.e., clusters or sectoral working groups led by the government.

2.- The establishment of a special working group on debris management within the Early Recovery Cluster (UNDP - Government) proves to be a suitable tool for effective information sharing and coordination, as well as design and implementation of debris management programmes.

At the internal level:

1.- The Resident Coordinator should ensure the articulation and coordination of the joint programme among UN agencies, which can be delicate and difficult, since each agency responds to a particular vision of the actions for joint programme implementation.

2.- Programme coordination must be ensured through the establishment of a steering committee comprised of the different implementing agencies, donors, operational partners, national and local authorities, including community leaders and municipal authorities.

1.6 BUDGETARY CONSIDERATIONS

In a context of uncertainty, budget planning for the programme required that a basic programme design outline be established from the outset to define the technical content and action mechanisms planned in the different projects and provide an initial estimate of the resources required.

In Haiti, the critical budget elements - requiring the largest percentage of financial resources - were the removal and transport of debris (based on machinery and labor-intensive programmes) and the creation or management of debris processing sites. Special considerations should be given to these aspects when elaborating the budget.

To reduce the enormous costs associated with these activities, UNDP Haiti identified and implemented strategies for a better cost-effectiveness:

- For labor-intensive schemes, UNDP decided to replace the traditional Cash for Work system, established in the immediate response to the earthquake and allowing for rapid injection funds into the Haitian economy, with the Cash for Production modality. According to this innovative approach, the community members were paid based on the amount of debris cleared and not the day worked, thus promoting a results-oriented workforce and multiplying productive efficiency (up to 5 times higher).

- This same approach was implemented with the partner organizations involved, which were paid per cubic metre of debris removed and not on the basis of a fixed amount for their services.

- The transportation costs were amongst the highest of the debris management programme. The reduction of these costs was also promoted based on market research on alternative transportation and through alliances and partnerships with truck rental companies and organizations.

- Similarly, actions aimed at in situ debris reuse and recycling reduced the volume of debris transported and disposed in landfill sites and enabled debris to be used as a raw material in rehabilitation and reconstruction projects.

Reference documents:
- Léogâne Project Budget
-Debris I Project Budget
-Debris II Project Budget

RECOMMENDATIONS

1.- Given the lack of references for the specific costs of certain activities, a budget planning exercise between the various stakeholders (UN system, central and decentralized governments, NGOs, private sector) is recommended in order to reduce the likelihood of budgetary deficit or surplus.

2.- A post-crisis programme budget must be flexible enough to allow for the necessary adjustments as the information becomes available, the action context changes, and/or other disasters occur, causing a delay in the implementation.

3.- The budget must consider allocating resources for the implementation of a communication strategy and to ensure monitoring, evaluation and knowledge management activities.

1.7 VISIBILITY AND COMMUNICATIONS STRATEGY

The Haiti Debris Management Programme considered a communications strategy to facilitate the dissemination, understanding and awareness of differentiated messages aimed at:

- Beneficiaries (how, where and when community planning, house demolition and debris removal would be implemented).
- Government and local authorities (progress, challenges, status updates).
- Partners (progress achieved, challenges).
- Media and donors (aid deployment, newly identified needs, field visits).
- General public (unfolding situation).

Special attention was given to provide visibility to the programme, through billboards and banners, while vehicles, equipment and facilities for workers were all marked with the programme's logo.

The development of a communications strategy and the use of local capacity for advertising and dissemination are effective ways to reach the public.

RECOMMENDATIONS

At the external level:

1.- Focus information on simple, easy to understand messages and on the concept of "Debris: a door for development"

2.- Pay special attention to the relationship with the media and donors, based on their progressive need for specific information (demolition, removal, rehabilitation), and encourage them to visit the work sites to facilitate a better understanding of the reality.

3.- Ensure smooth communication at the community level, a sine qua non condition for the success of projects and activities in neighborhoods.

4. - Promote the use of social networks like Twitter or Facebook.

At the internal level:

1.- Despite efforts, agencies tend to communicate in a singular or partial way instead of sharing the vision of joint work and partnership. At the programme level, there must be a communications expert from the very outset of the planning phase to develop a long-term joint communication strategy with agencies and partners of the debris management programme.

2.- The communication strategy of the debris management programme must be implemented from the beginning of the operation and a graphic identity must be established (logo, slogan).

3.- Ensure a budget to cover the creation of communications materials such as videos, radio spots, flyers, websites, among others.

4.- Ensure the presence of a cartographer and GIS specialist for data tabulation and map preparation, which essential for ongoing planning and decision making.

1.8 MONITORING, EVALUATION AND FEEDBACK

In the Haitian experience, planning for the monitoring of implementation and evaluation began during the programme's design phase and was revised as information and the programme itself materialized, thereby identifying what and when programme elements needed to be monitored.

Results-based monitoring helped to identify weaknesses of the intervention, make recommendations to improve the situation and to follow up with appropriate decisions and actions.

Monitoring and evaluation improve the effectiveness of UNDP programmes by establishing clear linkages between interventions and outcomes, and by measuring and assessing progress towards achieving the expected results. The information that emerges from monitoring and evaluation improves the strategies, programmes and planned activities, thus promoting a culture of knowledge management and learning.

M&E mechanisms established by the Haiti Debris Management Programme included:

Rapports et analyses

- Annual Project Report
- Quarterly reports to donors (HRF)
- Monthly reports from partners
- Work plans (weekly from partners, for each particular contract, UNDP Annual Work Plan)
- Reports on the project/programme implementation and combined reports from partner organizations
- Monthly technical monitoring (trackers): houses demolished, people involved, debris removed

Validation mechanisms

- Ongoing site visits
- Internal audits
- External evaluations and monitoring
- Population surveys in collaboration with community leaders
- Technical evaluations
- Verification of intervention areas on Google Earth

Participation mechanisms

- Newsgroups
- Steering committees
- Periodic briefings (donors)
- Planning meetings with communities and local NGOs (micro-rehabilitation projects)

The program established participatory monitoring mechanisms to ensure commitment, ownership, feedback and dissemination of information, helping to improve the effectiveness of the intervention and contribute decision-making as well as promote learning within the organization. This guide is an integral part of this process.

The provision of feedback is an operation established within the M&E framework by which information and knowledge are disseminated and used to assess progress towards the achievement of results or to confirm the achievement of results. Feedback can take the form of findings, conclusions, recommendations and lessons learned.

I - DESIGN AND PLANNING OF THE INTERVENTION IN HAITI

RECOMMENDATIONS

1.- Prepare the terms, purpose and timing of M&E at the outset.

2.- Establish clear indicators and appropriate benchmarks.

3.- Analyze the situation, observe changes and monitor their impact.

4.- Engage external partners in the process.

5.- Propose and discuss measures to minimize errors and improve response in the reports and meetings.

6.- Ensure periodic monitoring so as to observe changes.

7.- Systematically draw lessons learned and promote knowledge management.

8. - Use M&E data to communicate project results.

Tons of debris cluttering streets and neighborhoods dramatically hinders aid and relief programmes and the return of populations to their area of origin. In this context, the first debris management actions should focus on the implementation of massive cleaning and clearing operations to open access roads, facilitate travel and develop relief actions; subsequent demolition of high-risk houses and buildings and debris removal will help to encourage the return and resettlement of displaced persons and the gradual resumption of their daily lives.

CHAPTER II
DEMOLITION AND DEBRIS REMOVAL

2.1 BACKGROUND

The demolition of houses and buildings, both private and public, and subsequent removal actions must accompany the major road clearing operations, in the following order of priority:

1. Demolition and removal of debris to facilitate relief operations - Search and Rescue.
2. Demolition of buildings at high risk of collapse - Public Protection.
3. Removal of debris that can cause health problems - Public Health.
4. Demolition and removal of debris to facilitate rehabilitation/ reconstruction stages.

The demolition of houses and buildings must be planned and executed according to technical diagnostics and assessments, and guided by national and local authorities to ensure compliance with the relevant legal and operational framework.

In Haiti, the extensive damage to buildings in all areas affected by the earthquake quickly evidenced the clear need for a diagnosis from a reconstruction perspective. The Ministry of Public Works, Transport and Communications (MTPTC) immediately created a structure called the Technical Evaluation of Buildings Office (BTEB), under the Directorate of Public Works, whose mission was to assess buildings and create the conditions and preparations for repair and reconstruction.

The assessment of structural damage to buildings, both public and private, was the starting point for the implementation of demolition and debris removal programmes. To this end, local engineers toured the affected areas, street by street, to determine the level of security of the various structures on the basis of rapid assessment techniques. They were preceded by social workers whose function was to explain the purpose of the assessment and ensure the support of the population.

In Haiti, the UN system provided technical support to the Ministry of Public Works, Transport and Communications to assess the structural damage of more than 400,000 buildings.

The evaluation carried out between March 2010 and February 2011 found that 403,176 buildings were damaged or destroyed, including 104,572 that were damaged but could be repaired (yellow category), 80,609 had suffered significant damage and should probably be demolished (red category) and the remaining buildings showed no structural damage and could be occupied without repairs (green).

The international and national actors also relied on the Government's guidelines regarding the legal process for obtaining the demolition permit for private homes, for buildings registered at ISPAN (Institute for the Protection of National Heritage) and about the alternatives for debris reuse and recycling.

Once assessed, the buildings were marked with different colors depending on the level of structural damage and the classification established by the MTPTC, thus facilitating the visual identification of houses and buildings in good condition (green), to be rehabilitated (yellow) and to be demolished (red).

All information collected by engineers in the assessments, including GPS data of buildings, was recorded in a database, which proved to be an essential source of information for the development of maps and statistical reviews and therefore a key planning tool in the recovery, rehabilitation and reconstruction process.

In keeping with its mandate in Haiti, UNDP prioritized the demolition of private homes that are severely damaged and belong to populations with the lowest socioeconomic profile. UNDP thus ensured its intervention would target the poorest populations and the most difficult areas, due to issues of accessibility, technical difficulties and safety factors, which significantly restricted the presence of other actors.

The intervention areas of the Haiti Debris Management Programme were identified in discussions with the competent Ministry (MTPTC), Municipalities, partner agencies (UN-Habitat, ILO), other organizations engaged in debris removal activities through the Debris Management Working Group, and the general population.

The selection of **intervention areas**, however, considered the following criteria:

- Areas with high levels of devastation, with a high number of structurally-damaged houses (red houses).
- Poor neighborhoods.
- Areas that has not benefited from debris removal operations and the presence of other actors.
- Difficult to reach areas, in order to facilitate manual demolition and the injection of money directly into communities.
- Areas with dynamics of community participation.
- Areas of synergy with rehabilitation and reconstruction programmes to motivate owners of severely damaged homes to agree to the demolition permit.

Reference documents:

- *Location map of severely damaged buildings in Léogâne*
- *Location map of severely damaged buildings in Port-au-Prince*
- *Density map of severely damaged or collapsed buildings per hectare, Léogâne*
- *Map of estimated debris from severely damaged or collapsed buildings by communal section*
- *MTPTC Structural Debris Assessment - Miyamoto*
- *Tips Google Earth - IASC Shelter Cluster Haiti*

RECOMMENDATIONS

1.- During the structural assessment, houses should not only be marked with a colour to differentiate and classify them according to their state of damage, but also to codify them for easy location and identification.

2.- Demolition and debris removal needs are very dynamic and can change throughout the programme implementation (presence of other actors, self-demolition initiatives, among others). Therefore, interventions must be highly flexible and adapt to the unfolding situation.

3.- The delimitation of intervention areas should be based on social and neighborhood dynamics, and not on rigid geographical criteria (polygons), which can lead to social upheaval in the communities.

4. - The Google Earth software is a suitable and extremely useful tool for the exploration and identification of affected geographic areas, as it allows for the launch of investigations, to facilitate decision-making and the planning of demolition and removal actions by means of satellite photos, relief and 3D building mapping, and enables the sharing of common information online.

2.2 KEY STAKEHOLDERS

The 2010 earthquake in Haiti was an unprecedented tragedy in the country. The government lost nearly 33 percent of its employees, and 60 percent of government and administrative buildings were destroyed, including the Presidential Palace, the Parliament, the Palace of Justice and the majority of the ministries and public administration buildings, resulting in the loss of countless files and records.

The level of loss suffered by officials and damage to buildings and utilities significantly reduced the capacity of national authorities to lead and coordinate the response, especially given the sudden arrival of hundreds of cooperation agencies, with varying degrees of expertise, abilities and interests, making this crisis one of the most complicated responses to manage.

A Cluster system was activated to provide an emergency response to support the national coordination system. Through this mechanism, UN agencies - also affected by the loss of 102 employees - worked arduously to help the various ministries and offices face the humanitarian and reconstruction challenges.

UNDP played a dual role in the international community by leading the coordination of the UN system and the international community, and by strengthening its operational role in

the thematic programmes developed in Haiti. More than 50 organizations participated in the Debris Management Working Group (DM-WG), coordinated by UNDP in partnership with the MTPTC.

The establishment of the DM-WG made it possible to update databases related to debris activities including:

- Organizations involved
- The geographical location of activities
- Tabular information on the quantities of debris managed by all partners
- Mechanisms and implementation technologies

This information was used to refine the debris management operations by sharing maps and statistical data, avoiding duplication of interventions, and reducing the costs associated with the demolition and debris removal through the sharing of experience and information.

Table 2. Main actors of the JOINT DEBRIS MANAGEMENT PROGRAMME IN HAITI

ACTOR	FUNCTION
Ministry of Public Works, Transport and Communications (MTPTC)	- Governmental counterpart. - Support for project planning and formulation. - Member of the Steering Committee of the programme and monitoring structures. - Establishment of operational and legal guidelines for the implementation of demolition and debris removal operations (demolition permit).
National Laboratory of Building and Public Works of Haiti	- Debris testing and inspection, applied research on the use of materials from debris, promoting standards of construction and geotechnical maps.
Municipalities **Léogâne, Port-au-Prince, Pétionville, Delmas, Carrefour**	- Counterparts at the local level. - Support for project planning and formulation - identification of intervention areas, community planning. - Members of the Steering Committee of the programme and monitoring structures. - Establishment of operational and legal guidelines for the implementation of demolition and debris removal operations (demolition permit)

ACTOR	FUNCTION
UN agencies	- UN-HABITAT: Community planning and mobilization. - ILO: Market analysis, professional training, promotion of micro-enterprises. - UNDP: demolition and debris removal, creating short-term jobs under Cash for Work and Cash for Production modalities and coordination of the overall programme. Support the MTPTC in developing a National Debris Management Strategy. - UNOPS: Technical support to the MTPTC for the structural assessment of houses. UNDP partner in demolition, removal, transport and recycling of debris.
Debris Management Working Group (DM-WG)	- Technical support to national authorities and capacity building for debris management. - Contribute to effective coordination of debris management initiatives. - Contribute to the mapping of all debris-related activities in the affected areas. - Support the development of policies and strategic planning tools in the debris management and recycling sector.
Partner international NGO UNDP: CHF International, J/P HRO, Viva Rio, EDM, CRWRC, IEDA, Tear Fund UN-Habitat: Cordaid, GOAL, FAU ILO: EDM	- Members of monitoring structures. - Mobilization and community planning, demolition and debris removal. - Professional empowerment, creation of micro-enterprises. -Construction of houses using recycled debris.
Partner local NGO UNDP: UJAPH, FONHEDECO, EPT, FFH, CEPHAPE, CRAD, PEJEFE, OJADCO, Anacaona Foundation ILO: OPB, OPADEC, OJEIB, Awoyo pou Christ, OJAH, MOLEGHAF	- Support for project planning and formulation. - Members of monitoring structures. - Professional empowerment, creation of micro-enterprises. - Neighborhood rehabilitation.
Neighborhood associations	- Support for project planning and formulation. - Selection of beneficiaries, intervention planning.
Donors	- Support for project planning and formulation. - Member of monitoring structures.
Private Sector	- Debris transportation and demolition. - Promotion of small and medium entrepreneurs and capacity development.

RECOMMENDATIONS

1.- For the implementation of its activities, UNDP should work with officially registered NGOs, whether local or international, with expertise in the intervention area, and established and recognized at the neighborhood level.

This approach is particularly important in the case of neighborhoods with issues of violence and insecurity, with gang presence, where it is essential to ensure the implementation of the project. In this context, communication activities at the leadership and community level are crucial for reducing the risk of conflict.

2.- It is recommended for demolition and clearing activities to be distributed among several implementing partners, instead of just relying on one partner. This makes it possible to distribute the intervention areas and assign the most technically competent partner to each area.

2.3 DEMOLITION PERMITS

Legal conditions must be ensured before beginning any demolition and clearing action, as debris is part of the private property of individuals.

In Haiti, the proliferation of uncontrolled construction, lack of zoning, loss of property titles and land registry records, and the death or absence of thousands of formal and informal homeowners, problematized and constrained the work of humanitarian organizations and authorities with regards to the demolition of private homes and debris removal.

In this context, UNDP supported local and national authorities in the implementation of administrative and legal procedures to ensure the validity of the property titles or the legitimacy of the occupation of land, and ratify administrative processes - however heterogeneous - to obtain the demolition and/or debris removal permit.

In the case of houses declared "abandoned" and presenting a public hazard, the Municipal Mayor of Port-au-Prince issued an order granting the Mayor the legal authority to authorize the demolition on behalf of owners. To this end, lists of houses designated as abandoned were published for two weeks in major newspapers across the country in a final attempt to identify the owner, and to ensure, on behalf of the City Council, a legal non-objection to the demolition.

Community Participation

Regarding community participation, it should be noted that all relevant community organizations were convened, ensuring their voluntary participation. In this phase, the programme did not specifically emphasize the participation of women, which naturally led to a greater influx of men.

Based on methodologies such as the problem tree, the visualization of results and prioritization of action, the project staff identified a feasible results framework, avoiding the creation of unrealistic expectations. Similarly, the active participation of the community was ensured in the different phases of the project: community mobilization, mapping, presentation of results and meetings with government officials and potential donors. Fourteen workshops were conducted by UN-Habitat and the Urban Planning Department, in order to strengthen community capacity in terms of mapping, community platforms, field surveys, data collection, focus groups, debris management, natural hazards, urban surveys and assessments, planning and reconstruction, social inclusion (persons with disabilities, women, etc.), land tenure and life cycle of community plans.

However, working with the community during the project presented its own challenges. Major legal and administrative barriers (signature of owner, CASEC certificate, judge approval, payment to the municipality, etc.) to carrying out demolition significantly delayed the process and also led to a decrease in community interest and trust, which questioned why it was necessary to demolish when they had never had to apply for a planning or building permit for their homes.

Therefore, it is necessary to carefully analyze all relevant legal and administrative provisions and ensure a proper communication strategy to avoid the above-mentioned issues.

Similarly, if there is no solution provided for relocation, at least temporarily, people will not likely leave their homes and allow demolition. The lesson learned reveals that demolition programmes should be planned alongside relocation programmes to improve community support and preserve their effectiveness.

Reference documents:

- *Stages for the demolition of red buildings (UNDP Debris I-II Projects)*
- *UNOPS process for obtaining the demolition permit in different scenarios*
- *Systemic representation of demolition and debris removal, UNOPS*
- *Demolition permit from the City Council of Port-au-Prince*
- *Demolition and clearing permission - UNOPS*
- *Demolition evaluation form - UNOPS*
- *Demolition monitoring form - CHF*
- *Demolition report for ISPAN (Institute for the Protection of National Heritage) buildings*
- *Justice of the Peace Form / Order from the municipal mayor of Port-au-Prince*

Procedures for Demolition of Private Houses - Haiti Joint Debris Management Programme

1. Project officers contact the owners of the houses to be demolished, and verify legal status of the building.

2.- In case of loss of documentation, several types of evidence was used to determine owners: electricity bills (Electricité d'Haiti), receipts from the General Directorate of Taxes (DGI) or any other document proving any connection between the alleged owner and the property to be demolished, and the recognition of the owner by witnesses (usually neighbors) without family ties.

The demolition permit is ratified by the Mayor's Office and by a justice of the peace, who notarizes the property title (Léogâne and Debris I Projects), or the Ministry of Public Works, Transport and Communications (Debris II Project) acting as the relevant Ministry.

3.- The demolition permit is accompanied by a technical analysis performed by engineers, in order to define the most appropriate demolition method (manual, mechanical, mixed) and the geographical data (GPS) in order to avoid confusion and to clearly delineate the properties to be demolished – tools which are used to update the cadastre.

4. - The owner obtains a document ratifying that his/her house was demolished, identifying the address and GPS coordinates.

RECOMMENDATIONS

1.- The demolition of private homes is very sensitive for homeowners, especially those with fewer economic resources, who see this as an insurmountable challenge in terms of loss of heritage and as a psychological barrier to their recovery.

A strong communication strategy and community outreach effort must precede demolition and debris removal in order to explain the actions planned and to seek the committed and responsible participation of communities.

Liaison officers, recognized by either the leaders or the local authorities, have proven to be essential in reconciling and building trust within communities, coordinating and defining the demolition stages, facilitating access to private property, and ensuring conflict prevention and management.

Similarly, it is essential to combine demolition actions with reconstruction programmes or actions to guarantee financial and technical assistance for the reconstruction of houses.

2.4 FORMS OF INTERVENTION AND TYPES OF DEMOLITION

Prioritizing the massive participation of individuals through labor-intensive programmes, with a focus on hiring women, who represented 40% of the labor force, was a key component of UNDP's approach to demolition and debris removal.

After an initial preparatory period focused on securing equipment and establishing recruitment and payment systems, UNDP began its demolition and debris clearance activities with the cleaning of main streets and arterial roads based on a **Cash for Work** modality to promote the massive hiring of the population, rapidly inject vital economic resources to restore the livelihoods of beneficiaries and promote psychosocial recovery by converting the population into active participants rather than passive recipients.

Beneficiaries, grouped into teams, worked for two to four weeks, six days a week, at the minimum wage rate so as not to alter the supply and demand cycle of the local labor market and to discourage hiring in the private sector.

UNDP implemented these programs in collaboration with neighborhood committees, the National Directorate of Water Supply and Sanitation (DINEPA), the Directorate of Civil Protection and municipalities to promote ownership by national institutions and guarantee their response to the needs and priorities of Haitians. To ensure more effective coordination, it was agreed that the management of disaster areas would be distributed between the government (DINEPA, municipalities), NGOs and UNDP.

In 2011, a new **Cash for Production** formula was established under the Debris Management Programme. While the old formula provided for the payment of wages based on the number of hours worked per day, the new modality tied payment to the amount (m3) of debris removed, allowing workers to increase their income, sometimes significantly, and increase programme productivity.

For its implementation, mixed local teams with an average of 10-15 members (although several organizations preferred to work with teams of 20-25 people in difficult access areas), including a team leader, were hired to demolish and manually clear houses. These teams received training on specialized demolition techniques, safety measures and health at work, and had access to the necessary work equipment and continuous technical monitoring by professional engineers.

Local associations and authorities were also mobilized to identify and implement other priority projects such as the construction of retaining walls and dams, cleaning of canals, improvement of roads and earthworks, among others, allowing Haitians to lead the reconstruction efforts in their communities.

The Debris Management Programme facilitated the rotation of teams to provide job opportunities to a greater number of people, while workers who distinguished themselves through their work were appointed to supervise and lead less-experienced teams. The salary was established on a production basis (m3 of debris) and was agreed upon by the government and implementing organizations, based on the minimum wage.

As for UNOPS (Debris I Project), the amount to be paid per m3 was stipulated in the contract, and depended on the degree of difficulty of the work to be performed (easy, medium and hard), which was determined by the engineers in the presence of the team leader during the last site visit and prior to the demolition or clearing work. This was based on the following criteria:

- Accessibility of the site
- Distance from demolition site to disposal site
- Difficulty of the demolition

Simplified measures were implemented for the payment of workers, using coupons and money transfer services (UNI transfer), which enabled the safe and rapid transfer of wages to workers, without requiring them to open a bank account or withdraw money during working hours. For partners, this method simplified the internal payment procedures and avoided having to keep large sums of money in the office, which proved to be a considerable risk factor.

The calculation of the total volume of debris removed per team was based on different approaches:

- For UNOPS: On the capacity of the truck, where the airspace was defined in advance by engineers in the presence of the team leader.
- For CHF: Based on the amount of wheelbarrows filled.
- For Viva Rio: On the basis of filled containers (14 m3/container).

Gender Approach

The Joint Debris Management Programme was able to reach the target number of women, who contributed to 40% of the demolition and removal activities in Port-au-Prince, considered unachievable at the outset.

Because of strong local stereotypes about women's abilities to perform this type of work, their participation in the early stages of the UN programme was considerably reduced. However, thanks to a strong investment in community outreach through their leaders, the programme was able to gradually increase the number of women participating in labor-intensive programmes, reaching or exceeding the expected 40% in several areas of intervention.

The programme therefore succeeded in reversing the social clichés while proving the added value of women's participation in Cash for Production programmes, through increased team productivity by implementing improved work dynamics and the high productivity rates of women, sometimes higher than men's.

The transition from Cash for Work to Cash for Production ensured fair distribution of income and production bonuses within work teams, especially for the elder, disabled or physically weaker.

Experience showed that women in Cash for Work teams were the members of the community most capable not only of saving money but of investing that money in the creation of micro enterprises, in the education of their children or in the general welfare of the family unit, thus allowing the programme to have a greater impact on community at large and a greater number of indirect beneficiaries.

- For J/P HRO: Based on an approximate calculation of m3 contained in each house, where teams had a set time to complete the demolition. If the task was completed on time or in less time, the team received a bonus, which proved to be an important motivator for team members. In the case of delay, they were paid on a Cash for Work basis, reducing their revenues considerably.

In Haiti, an analysis by engineers was required prior to any demolition and debris removal action related to the programme in order to define:

- The type of demolition (manual, mechanical, mixed).
- The necessary labor.
- The work schedule and the time required for the demolition (days).
- Specific safety considerations (the interruption of traffic, reinforcement of adjacent houses, establishment of a security perimeter).

This information was included in the file annexed to the demolition permit and was sent to the owner, neighbors and the local authorities. Thus, programme engineers produced demolition plans on a weekly basis.

Health and safety measures established in the Debris Management Programme

1.Establish, disseminate and implement the health and safety regulations among all workers.

2. Provide the required safety tools and equipment (terminal strings, gloves, helmets, masks, boots – closed-toe shoes were accepted as an alternative to boots - and safety jackets).

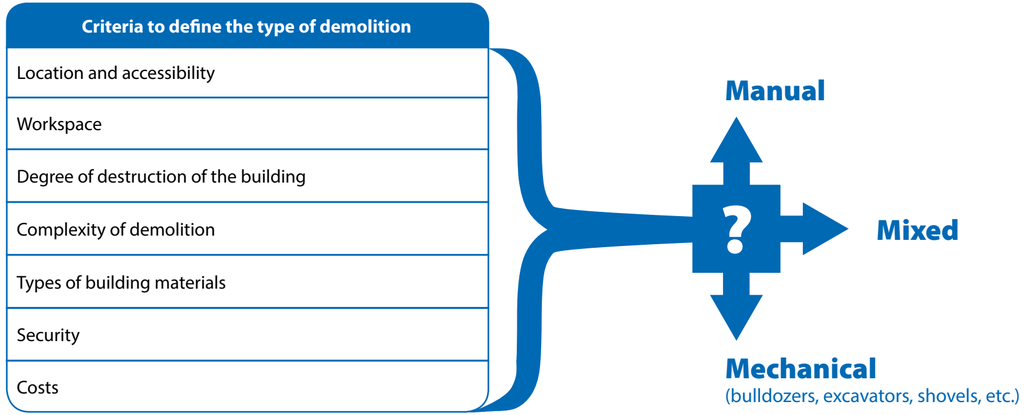
3. Define differentiated circulation systems for heavy machinery and worker vehicles (one way).

4. Seal off the work site and prohibit the presence of any person external to the team (exceptions were made for the owners to facilitate the recovery of their property).

5. Provide first aid kits on site.

6. Acquire health insurance for all workers. Insurance became an extremely important device in facilitating not only curative but also preventive care for workers and their families, ensuring immunization coverage and screenings for the entire family.

Diagram 4. Criteria to define the type of demolition



UNDP in Haiti favored manual demolition to the extent possible, primarily because it stimulated the local economy by creating new individual and family income and promotes financial flows at the neighborhood level, as opposed to the technological approach, which is often more efficient in terms of time and resources. As such, the human dimension remained at the centre of its intervention.

This technique proved to be a suitable approach because of the uneven Port-au-Prince terrain and narrow access roads in slums, which rendered access of heavy machinery almost impossible, and because of the abundance of a local underemployed workforce in need of income to survive.

Reference documents:
- UNOPS Demolition contract

RECOMMENDATIONS

1. - Actively approach community leaders, local authorities and the community to identify the people in the neighborhood to engage in priority programmes.

2. - The inclusion of women on work teams is a valuable asset, as they demonstrated that they were not only able to assume different roles within demolition teams, even those considered the most physically challenging, but were also more disciplined, responsible and committed to work. Their presence however, is not always immediately recognized, and requires a process of individual and social acceptance, particularly by men.

3.-When using heavy equipment, the demolition of houses can eliminate many physical signs that enable the differentiation of existing private property limits due to the absence of a register and an official list. Special attention must therefore be paid to maintain these references.

4.- The implementation of safety measures in the workplace must be accompanied by a sound communication strategy and strict monitoring measures to ensure that workers use personal safety equipment and tools and limit the risk of accident.

5.- After the crisis, the transition from a Cash for Work approach, which served to quickly inject money into communities, to approaches like Cash for Production - more suitable for medium-term programme implementation - is not easily understood and is often challenged by workers who are accustomed to receiving daily rather than production-based wages. Therefore, it is essential to explain and establish the different steps and working mechanisms in participation with local authorities, community leaders and communities early in the intervention. This exercise of community outreach should be a continuous process.

6.- Ensure adequate information and neighborhood participation in the demolition and removal plans; establish a communications programme through radio spots or broadcasts and the placement of signs with contact telephone numbers for information requests about the work.

7.- Ensure adequate visibility of the programme among workers (stickers on helmets and work materials and logos on clothing) and work sites (signposts).

2.5 MONITORING AND FOLLOW-UP MECHANISMS (TRACKING SYSTEM)

A tracking system was implemented to ensure regular tracking of the activities, particularly the number of houses demolished, the volume of debris cleared and people hired.

Data was recorded in an Excel spread sheet to provide daily updates, which helped ensure programme transparency, not only as an institutionalized UNDP process but also as a governance mechanism and a tool to manage stakeholders relationships by:

- Ensuring data entry during project implementation phases.
- Verifying the performance of the different partners.
- Analyzing the data captured during the monitoring process.
- Providing a useful base of information for reports and evaluations.

Reference documents:
- CHF debris workman days tracker
- CHF debris houses demolished tracker
- CHF debris removal tracker
- UNOPS debris removal tracker

The transportation of debris is an essential component of a debris management programme, proving to be a major budgetary and operational challenge.

CHAPTER III
DEBRIS TRANSPORTATION

3.1 BACKGROUND

Following an earthquake, the first operations should focus on massive clearing of the main streets and arterial roads of the affected city or areas, followed by the demolition of homes and buildings and the clearing of land and streets, which requires heavy and specialized equipment (bulldozers, loaders, trucks, cranes, etc.) for debris removal and transport to landfill or recycling sites.

In large clearing and cleaning operations, the expertise and technical capacity of large national and multinational transport and public works companies proved indispensable. Agencies specialized in the implementation of public works, such as UNOPS within the UN system, UN Peacekeeping missions and local carriers, combined their trucks and heavy equipment with those of the Ministry of Public Works or the relevant ministry, to support rapid and efficient road cleaning.

The topography and uncontrolled construction may limit the access of heavy equipment in many affected areas, in which case manual removal and transport must be implemented on a Cash for Production basis. Carts or buckets will be used to transport debris to collective disposal sites where it will be collected and transported by small or medium-sized transport companies to the official landfill or recycling site, thereby stimulating the local economy and supporting local entrepreneurs.

3.2 SUPPLIERS

The selection of transportation providers is diverse, and several criteria must be considered to facilitate decision-making in meeting the required transportation needs and characteristics.

Diagram 5. Elements of analysis for selecting suppliers

Suppliers
State/Municipality Trucks (Public Works)
Acquisition of own trucks
Hiring of private local transport companies (large, medium, small-sized)
Hiring of large private international transport companies
Involvement of NGOs that will subcontract
Association of local transport and logistics companies

Elements of analysis
Volume of debris to transport (m3)
Availability, condition and characteristics of trucks (capacity in m3, maximum weight of the vehicle, roll-on/roll-off container)
Access to the collection point
Access to landfill point
Roads
Transport distance
Availability of GPS in trucks
Price

In Haiti, UNDP hired private companies (Léogâne Project), UNOPS and local NGOs (Debris I Project) and international NGOs (Debris II Project) to perform demolition and transport tasks. The latter subcontracted carriers and were paid strictly on the basis of m3 of debris effectively removed and transported to landfills or recycling sites. The NGOs are then responsible for monitoring loading and unloading tickets and carrier invoices, thus establishing a type of Cash for Production modality that maximizes performance and ensures the safe and responsible transportation of debris.

To support the local economy and local entrepreneurs, UNDP promoted the participation of small and medium-sized local transport companies, which also helped to gradually reduce transport costs as it generated increased competition for major transport companies.

Reference documents:
UNOPS invitation to bid - transport

RECOMMENDATIONS

1.- The Ministry of Public Works or its equivalent, the Municipalities and the Association of Local and National Transport and Logistics Companies should be consulted prior to the hiring of any transportation services, given that local capacities are generally underestimated or ignored in the plans of action of non-governmental actors.

3.3 COST ESTIMATION

The cost of transporting debris is usually a critical factor in budgeting removal operations, given the different alternatives and strong price fluctuations. Reduced transport costs are therefore an important factor to the success of debris management programmes.

In Haiti, UNDP broke down the unit cost of removal of debris per m3 into four main components: community mobilization, manual demolition, mechanical demolition and transport. Therefore, the cost of transportation proved to be the decisive factor, accounting for nearly 50% of the unit cost.

In the face of this constraining reality, the programme prioritized alternatives to reduce the transport-related costs, including the promotion of reuse and recycling of debris in situ and the selection of more efficient transport means (small and medium enterprises, tracking).

Table 3. Analysis of transport costs

Factors related to transport costs	Factors reducing transport costs
Fuel prices	gas, biodiesel, and / or methanol-fueled trucks
Amount of debris to transport	Reuse and /or recycling of debris in situ
Distance	Secondary roads or traffic flow / Site diversification
Capacity of the truck	Heavy trucks (high tonnage)
Market	Small and medium enterprises (Promotion of competition)

In Haiti, UNDP sought to reduce the costs associated with transport through a collaboration with the United Nations Mission for the Stabilization of Haiti (MINUSTAH), by establishing a UN trusted crushing site at Harry Truman Avenue. In partnership with UNOPS, in this site 20-25% of the debris would be recycled. A storage site (Bizoton) in Carrefour was also approved by the Mayor of Carrefour and the MTPTC.

The use of small and medium local carriers also significantly reduced transport costs, encouraging competitiveness and reducing prices in the sector.

Other aspects to consider:

- Costs of renting/buying trucks.
- Accessibility to the work area.
- Payment mechanisms (by cargo, discharge, ticketing).
- Visibility and safety measures: appropriate vehicles in good condition, cargo protection to reduce the risk of accidents.

RECOMMENDATIONS

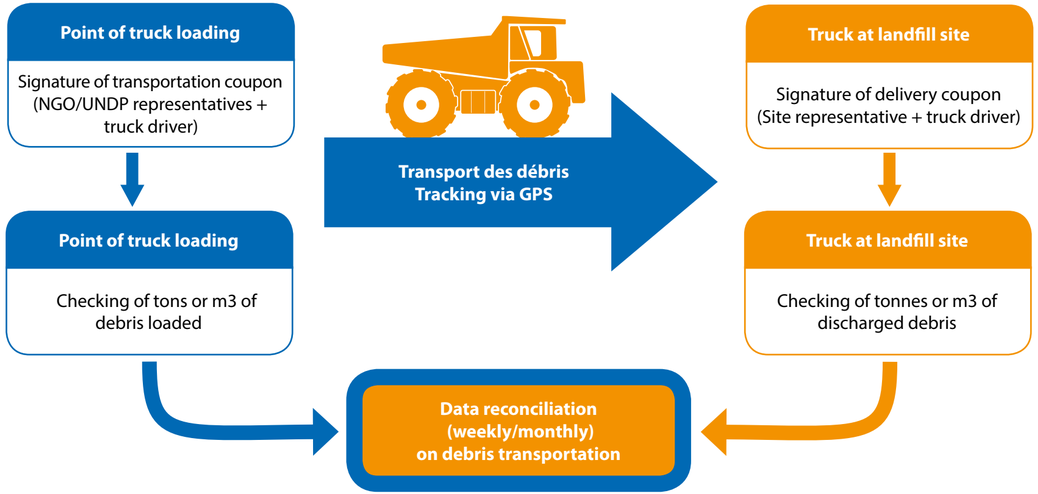
1.- Transport costs are among the highest of a debris management programme. The reduction of these costs must be promoted by researching transport alternatives in the market and through alliances and partnerships with truck rental companies or organizations, and reuse and recycling actions.

2. The debris management operations require heavy machinery such as bulldozers and heavy trucks, which often negatively impact road surfaces. It is therefore advisable to consider the maintenance and road repair components in debris management programmes to minimize these adverse effects.

3.4 MONITORING

The use of a "ticketing" system to monitor the transport of debris proved to be essential for ensuring effective transportation of the expected total cargo to the final disposal or recycling site. In the last stage, a landfill representative emits a control ticket with the number of cubic meters discharged. In Haiti, this third actor replaced the need for a specific UNDP controller on site.

Diagram 6. Tracking system



RECOMMENDATIONS

1. - The tracking system, GPS monitoring and the photographing of truckloads help ensure that debris transport is properly monitored, regulating uncontrolled discharges into unauthorized areas or removal for reuse or sale, which occurred in Haiti, particularly after the earthquake. This also helps to promote transparency between the contractor and the carrier.

3.5 TRANSPORTATION ROUTES AND PERIODS

The enormous amount of debris generated by earthquakes in urban areas, as was the case in Haiti, requires a constant flow of heavy machinery and high-capacity trucks to clear roads and terrain, as well as the final disposal of debris in Government-established landfills.

In Haiti, the government established the primary solid waste landfill in the city of Truitier, located in the Cité Soleil commune, as the official site for debris storage. The site, however, was only possible to access by one main road.

The distance between Truitier and primary debris collection points, in addition to the traffic conditions on Route 9, proved a great challenge for ensuring the rapid and sustained flow of trucks (14TM capacity on average), as the number of trips could exceed 900/day. To this end, the authorities severely restricted private traffic on this road during peak hours of truck traffic. Unsafe conditions in Cité Soleil prevented night operations.

For this purpose, the route or routes used for the transportation of debris must comply with government provisions to be established according to a series of criteria including:

Table 4. Criteria for the selection of transportation routes

Selection of transportation routes
Distance
Accessibility
Security
Maintenance status
Traffic

RECOMMENDATIONS

1. - The debris transport operations must consider the constraints imposed by traffic, travel time, the distance to the landfill site, accessibility, and the security situation of the roads. The use of alternative routes, restrictions on non-essential traffic, and night operations can be considered to reduce the travel time (and therefore costs) and minimize inconvenience to the public.

2.- Particular attention should be paid to truck traffic in areas of high insecurity; night operations are not recommended, but, if implemented, additional security measures should be provided.

Debris has an economic value and reuse potential in various economic sectors. An effective and long-term debris management strategy should ensure minimal environmental impact and maximum recycling of materials, completing their life cycle.

Thus, debris becomes a resource for the physical, economic and social reconstruction of disaster areas, and an open door for sustainable development.

CHAPTER IV
DISPOSAL, REUSE AND RECYCLING OF DEBRIS

4.1 BACKGROUND

In Haiti, there was no facility capable of receiving and processing the massive amounts of debris, estimated at more than 10 million cubic meters for the entire country. In the absence of a national debris management strategy, debris could, thus, be cleared and disposed in an uncontrolled manner. In this context, the Government designated the site of Truitier, the regular site for solid waste disposal in Port-au-Prince, as the official site for massive discharge of debris to facilitate the rapid clearing of the city and avoid or mitigate environmental and public health impacts caused by its uncontrolled disposal.

Housing and edification debris, however, included a variety of building materials that could be recovered and reused in situ by the owners, tenants or neighborhood residents. Likewise, they could be transformed and recycled into new materials with a market value or used in the reconstruction programmes.

In Haiti, the strategy of the UN debris management programme focused on maximizing the benefits derived from debris. Consequently, UNDP launched a controlled debris management programme, focusing first on the options for reuse and recycling "in situ", in order to reduce the final disposal volumes, promote economic activity within neighborhoods, and encourage the reuse of materials in local redevelopment programmes. Simultaneously, a large-scale recycling component was implemented to use debris as raw material for reconstruction programmes.

4.2 DEBRIS DISPOSAL SITES

National and/or municipal authorities are generally responsible for identifying landfill sites for debris, supported by the private sector and specialized agencies and based on different selection criteria.

Local authorities also established supplementary small and medium sites to accelerate the clearance of roads and terrain, reduce costs associated with transporting debris to Truitier and to promote the recovery of materials at the neighborhood level. In Léogâne, municipal authorities also established a large landfill site for debris. Finally, UNDP used a storage site (Bizoton) in the commune of Carrefour, approved by the City Council and MTPTC, to store 30,000 m3 of debris that the City plans to use in future neighborhood development projects.

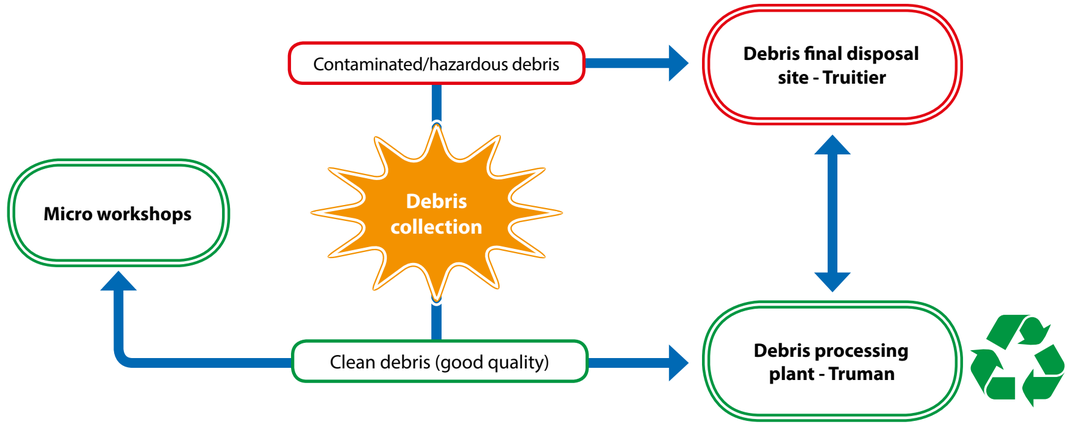
In large landfill sites, such as Truitier and Léogâne, management established technical and administrative measures, and carefully recorded technical information about the material disposed (type, source, volume, etc.) to facilitate proper monitoring and data logging.

Meanwhile, the UN programme acted as a catalyst and facilitator in establishing processing sites, particularly in debris recycling and production, as well as technical tests of the various products developed.

Table 5. Site selection criteria

Main criteria for site selection include
- Type of debris (non-hazardous, hazardous, recyclable, non-recyclable). - Volume of debris. - Type of treatment desired (final disposal, reuse, recycling, mixed). - Type of site (temporary or final). - Previous existence of sites (is it possible to redesign them? do they have the necessary capacity?). - Distance to primary collection points. - Accessibility (number and conditions of roads, traffic). - Extension of the area and capacity / development opportunities. - Site lifetime. - Safety. - Distance to human settlements and public health measures (noise, vibration, traffic, pollution, visual impact, odors). - Protection of the environment (soil, water, air). - Ownership (public or private). - Costs of development and management.

Diagram 7. Landfill sites - Joint Management Debris Programme



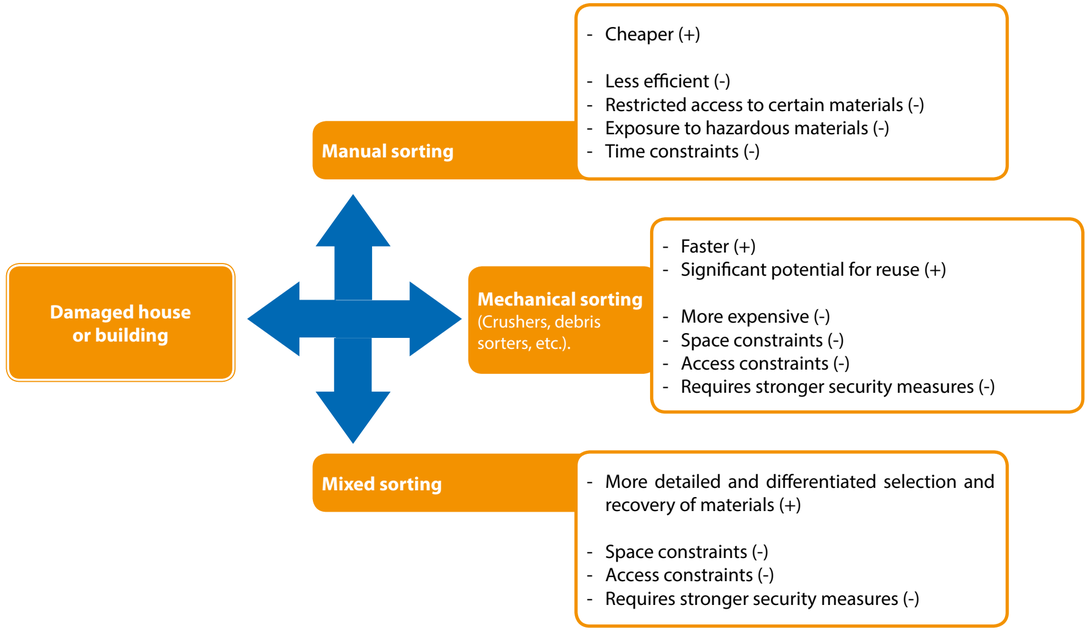
4.3 REUSE OF DEBRIS

In the process of reuse or preparation for reuse, the unaltered materials are extracted from the debris for their potential reuse.

In Haiti, the owners, tenants and neighborhood residents were the first to retrieve their personal belongings from the rubble, and to recover reusable building materials such as wood and iron, facilitating the rapid recovery of a portion of the debris for its direct use or for sale to local entrepreneurs.

Measures were taken to avoid security problems and vandalism. In the case of recovery of materials, the engineers in charge of the demolition of houses and private buildings, made it easier for owners to retrieve their belongings, while providing the necessary security measures.

Diagram 7. Alternatives for sorting and recovering materials "in situ"



The UN Programme has also promoted the in situ use of recovered material such as sand and gravel for the implementation of neighborhood redevelopment programmes. Crushers and sorters were thus installed in small workshops to facilitate the recovery of materials.

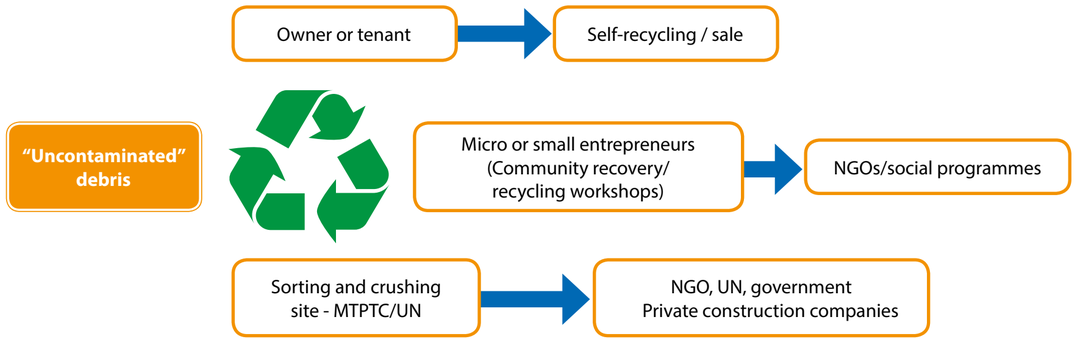
4.4. DEBRIS RECYCLING

Recycling is a processing action that seeks to produce secondary raw materials from waste. Urban disasters, which produce millions of tons of debris, provide an opportunity for the implementation of recycling programmes.

The Government must specify debris recycling alternatives based on composition studies and specific quality standards from accredited laboratories. In Haiti, the Government approved the use of recycled products solely for the implementation of non-structural work after consulting technical studies by national and international laboratories (Ecosur, Grace and DWR).

In this context, the UN Debris Management Programme multiplied its efforts to promote use of recycled products in redevelopment and reconstruction programmes, based on two complementary approaches: a) "in situ" recycling by small to medium-sized local businesses (micro recycling) to revitalize neighborhood economies and promote long-term work, and b) massive recycling to promote the recovery of large volumes of construction materials (macro recycling) to support reconstruction programmes.

Diagram 9. Key actors of debris recycling - Joint Debris Management Programme



4.4.1 Debris micro recycling: the experience of small workshops in neighborhoods

Given the extent of the damage to urban areas, the labor market of the construction and recycling sector has become an important source of long-term employment in Haiti.

In order to clear neighborhoods, create jobs and promote long-term economic growth, the UNDP approach in Haiti sought to use debris management as an entry point in the neighborhoods, in order to encourage people to return to their homes and to try to resume a normal life. The aim therefore was not only short-term job creation but the development of new skills within communities.

Understanding the need for integrated debris management, UNDP, in close collaboration with ILO and the Entrepreneurs du Monde NGO, promoted a major programme for debris micro recycling in neighborhoods most affected by the earthquake in Port-au-Prince, with the goal of clearing debris while strengthening the economic livelihood of the area through business development and job creation. The programme fostered the creation of micro-enterprises (small workshops) to facilitate the recovery and reuse of materials from the rubble in the implementation of reconstruction work on a small scale, thus contributing significantly to the reduction of the volume of debris to be removed, and accelerating urban, economic and social recovery.

As a result, three types of procedures were encouraged to promote stable employment in the field of debris recycling:

1. Micro and small entrepreneurs in the construction sector of each neighborhood, once briefed, were invited to participate as producers of recycled materials. In order to participate, the contractor made their workshop and workers available. The project itself provided technical and management training, as well as production equipment, in addition to assistance in product marketing and business plan development. Possible financial contribution by the contractor is considered.

2. Small and medium enterprises, operating building materials sector outside of the neighborhoods, intervene and invest in the production of recycled material. Spaces were provided for the installation of workshops where entrepreneurs could organize the production of recycled products with their equipment and receive technical assistance for the project. Entrepreneurs used the raw material from previously treated demolitions, and workers are trained by the project.

3. Groups of young people were trained in business management and the technical aspects of recycling, and organization of recycled material production units. After the development of the training programme, some young people acquired technical and management skills that enabled them to participate as recycling entrepreneurs. The project supported a certain number of these young people in organizing working groups as production units to develop micro-enterprises. Technical assistance, equipment and financial guidance were provided during the development and consolidation of these groups, which gave them the opportunity to become autonomous.

Four complementary components were considered for this purpose:

1. Study component: Identification of economic sectors to develop in relation to debris recycling:
   - Construction
   - Urban development
   - Highways
   - Home equipment and decoration items

2. Technical component: Technical training and organization of production within workshops.

3. Training component: Economics and management training.

4. Mobilization and logistics component: Dissemination of programme in communities and logistics supply (freight, transport, travel, deliveries).

Different types of products were then selected, such as pavers, curbs, latrines, nozzles, tiles, tables, benches, among others, and technical tests conducted to convert them into recycled debris, verify feasibility and reliability while adhering to the government regulations and safety standards, and to ensure competitive pricing in the market.

The programme encouraged the production of innovative products with a good market demand, and a catalogue of different products manufactured in the workshops was developed to facilitate marketing efforts.

Artisans began to produce and market their products during the programme's training phase, which made it possible for them to develop and adapt their expertise, their customers and their management capacities. In addition, those who do not have their own equipment benefitted from workshop equipment rentals to launch their own production and respond to the orders received.

Trainers provided continuous support to ensure the successful launch of operations.

Table 6. Considerations for the implementation of micro recycling workshops

Key considerations for the implementation of micro recycling workshops
- Feasibility studies (characteristics of materials, recycling options, volume/quantity, technical viability of manufacturing, potential market, production capacity, quality standards, price). - Community work (outreach and planning). - Selection of beneficiaries (local micro entrepreneurs, collectors, sorters, etc.). - Identification of transformation and training sites. - Implementation and management of workshops. - Workshop equipment. - Training of trainers. - Technical and business management training. - Market strategy (product marketing). - Monitoring and follow-up.

As part of a pilot initiative by the Entrepreneurs du Monde NGO, construction models incorporating recycled debris products were built, inspired by local architectural typology resulting in a contemporary, earthquake- and hurricane-resistant, inexpensive and modular model house.

In May 2012, the Government, through the Ministry of Public Works, Transport and Communications (MTPTC), validated the construction method developed by Entrepreneurs du Monde, highlighting its earthquake- and hurricane-resistant qualities, and the respect for Haitian traditional architecture, in providing residents of Port-au-Prince with sustainable, modular and affordable housing.

This validation provided UNDP, as the partner agency in charge of the UN programme, with confidence for this type of construction and made it easier for artisans already trained in these new and innovative construction techniques to disseminate this construction alternative to their clients.

With this model, Entrepreneurs du Monde also wanted to promote access to renewable or less polluting energy, health and safety, by suggesting the use of solar panels, gas heaters, latrines, rain water recovery and cement tiles.

Contruction model incorporating recycled products
Entrepreneurs du Monde

4.4.2 Debris macro recycling: Truman transformation site

To promote and facilitate massive, safe, effective, tested and quality-certified debris recycling, UNDP, in partnership with the Ministry of Public Works, Transport and Communications and UNOPS, installed a macro site for debris crushing and processing in downtown Port-au-Prince, called the Truman site or the Bicentennial Crushing Centre.

To this end, non-contaminated debris from, among other sources, the demolition of private homes and buildings by the UN programme were classified and converted into raw materials suitable for reconstruction.

The UN processing site targeted the recovery of large volumes

of construction materials such as sand, aggregates and blocks, and the transformation of debris into various products, such as cobblestones, producing over 20,000 per week while encouraging the reuse of materials by national and international cooperation organizations, construction companies and communities, by making them available at no cost for redevelopment and reconstruction activities.

This site facilitated a significant reduction in the volume of debris for final disposal, estimated at approximately 20-25%. The debris that did not meet quality standards for recycling was delivered directly to the Truitier landfill site.

The United Nations multiplied its efforts to promote the reuse of recycled products in risk mitigation projects (embankments, retaining walls, etc.) and neighborhood rehabilitation (including the paving of small corridors) based on the urban plans developed by communities, and in close collaboration with the small community workshops. In this way, the debris management cycle was completed.

Reuse alternatives were established in based on official technical regulations and direct consultation with local authorities and neighborhood residents, promoting a participatory planning approach.

Table 7. Cost estimation criteria for macro recycling sites

Cost estimation criteria Macro recycling sites
- Purchase or lease of land. - Landscaping. - Construction of recycling workshops. - Machinery and equipment. - Security perimeter. - External road improvements (if necessary). - Administrative costs (licenses, permits, taxes, etc.). - Personnel (salaries, equipment, benefits). - Operation/Maintenance (machinery, driveways, etc.). - Visibility (external and internal signs). - Marketing.

Documents de Référence :
- *Debris offer form DM-WG - UNOPS*
- *Debris request form DM-WG - UNOPS*
- *Letter of Agreement for the transfer of recycled materials- UNOPS*
- *Catalogue of Recycled Products - Entrepreneurs du Monde*

RECOMMENDATIONS

1.- If economic returns are calculated normally in the programme costs, a debris management programme should primarily focus on its social and environmental impacts, prioritizing other collateral benefits such as the reduction of the volume of debris, the volumes of recycled material, economic revitalization of neighborhoods and strengthening the social fabric.

2.- The technical house demolition study should be an important source of information in terms of the construction materials of the building to be demolished, providing a preliminary inventory of the products that may be reused or recycled. Engineers in charge of the demolition must play a leading role in classifying the debris by their degree of contamination and their potential for reuse and recycling.

3.- The quality of debris for reuse and recycling must be guaranteed at demolition sites.

4.- The production or manufacture of recycled material from debris must establish a fluid marketing process for the products. In this context, any product to be integrated in the commercial chain - usually in the construction sector - should provide added value to facilitate its introduction, both as an innovative approach and for its competitive pricing and quality as compared to available products on the market.

5.- The systematic integration of debris management initiatives with other recovery and development efforts is not only an essential approach to ensure the holistic management of debris, but also an effective strategy for the marketing of recycled products.

6.- The establishment of a debris exchange mechanism ("Debris Stock Exchange") proves an effective mechanism for meetings between key producers and users of recycled materials, and therefore an effective marketing strategy.

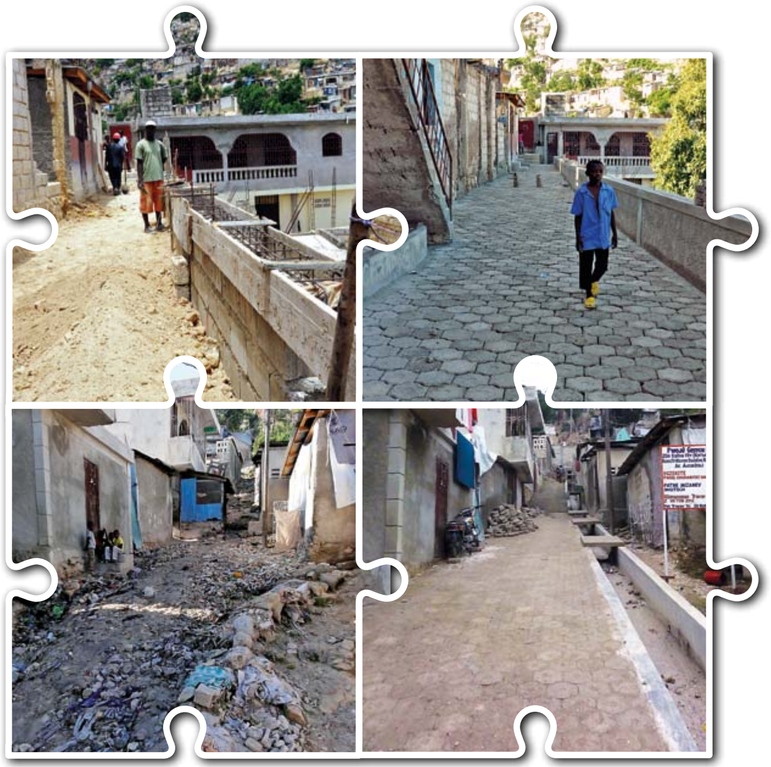
7.- The inclusion of recyclers and small and medium-sized entrepreneurs from the solid waste management and construction sectors in reuse and recycling programmes are great assets, even if it is necessary to strengthen their capacity and train them in specific technical alternatives.

8.- Hazardous waste must be delivered to approved disposal companies (if they exist) or deposited in regulated areas.

The Debris Management Programme in figures:

Amount of debris removed: 1,163, 931 m3
Number of workers (men): 22,003
Number of workers (women): 14,498
Total workers: 36,501
Percentage of women: 39.7 %

RESULTS



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