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Rebuilding haiti after the january 2010 earthquake: risk reduction, building cultures and local development

Thierry Joffroy, Philippe Garnier, Alexandre Douline, Olivier Moles

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RE- BUIL- DING HAITI

AFTER THE
JANUARY 2010
EARTHQUAKE

RISK REDUCTION,
BUILDING CULTURES AND
LOCAL DEVELOPMENT



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CRAterre-ENSAG
Translation of the French version of 2014

PREAMBLE

THIERRY JOFFROY
Labex AE&CC Coordinator
CRAterre Laboratory
ENSA Grenoble

This brochure presents a summary of results of a project conducted by a number of Haitian and international organisations that decided to pool their expertise in order to better respond to problems linked to rebuilding, following the earthquake of January 2010 in Haiti.

The proposed approach stems from collective reflections conducted through several international meetings on the subject, and its principles are presented on the manifesto titled «Promoting local building cultures to improve the efficiency of housing programmes»¹ co-signed by Misereor, Caritas France and Caritas Bangladesh, the IFRC, CRAterre and Fondation Abbé Pierre.

In this manifesto, it is recognized that societies all over the world have developed specific local building cultures, resulting in the establishment of identifiable «situated» architectures and building systems respectful of their local environment, which we somehow seek to replicate today through «sustainable development» practices.

In order for such dimensions to be properly taken into account in reconstruction programmes, it was suggested for local populations to be (re)placed at the centre of the process of analysis of local needs and capacities, to prefer participatory approaches, to value the input of holders of local knowledge and local know-how, to strengthen social ties allowing the return to dignity of populations, to identify local capacities and organisational methods that contribute to local protection and resilience strategies for buildings, and to integrate these elements when defining the programmes to be implemented.

Many of our Haitian colleagues, used to a disparaging discourse held by the building community in regards to these building cultures, were therefore surprised by these propositions, and some were even opposed to them. This, however, rapidly changed after the first prototypes were completed and positive feedback was received from their dwellers. Since then, other partners have joined us, conscious of the interest of such solutions. Beyond merely meeting needs, said solutions are adapted to the technical and financial

means and capacities of local populations and artisans, and are therefore replicable by nonbeneficiary communities. Furthermore, through a high return on investment, directly supporting local economies for the most part, these solutions contribute to the fight against poverty.

As we drafted this manifesto, we wished for pilot activities to be implemented and carried out through coordinated efforts, while strengthening monitoring and evaluation mechanisms so that lessons may be drawn. For this last point, I would like to thank, in particular, the French National Agency for Research, which, along with the Labex AE&CC and the ANR Flash Haiti programme, greatly strengthened our capacities. The results obtained clearly demonstrate the value of integrating research into any given development project.

Thanks to all the participants involved in this programme over the last five years, the recommendations herein have been implemented, tested and refined, and have yielded clear and tangible results in the field. Local populations, organisations and institutions involved in the rebuilding process having benefitted from the programme, both specialised and non-specialised, are now better prepared to deal, together, with similar situations in the future.

We also hope that, when necessary, this wide and varied assembly of stakeholders - local and international, dealing with training, research and advocacy activities - will operate even more efficiently, including in the context of disaster preparation operations and risk reduction measures. It is our hope that the wide-ranging and positive experiences described and analysed herein will make a convincing case for the «building cultures» approach to rebuild and prevent, which is also one of the goals of this publication.

¹ This manifesto is available for download: <http://craterre.org/>

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FOREWORD

ANTHONY EYMA

Director of the NGO CONCERT-ACTION
Member of the Haitian Network PADED

The earthquake that struck Haiti in 2010 resulted in a large number of families needing to reconstruct their homes. In urban as well as rural areas, it was necessary to repair and rebuild. There was an imminent need to shelter the affected populations as soon as possible, but at the same time it became apparent there was a need to make a break from an existing paradigm. It thus became vital to do away with certain practices and ways of thinking, which engendered insecurity and vulnerability, and produce a new quality habitat, promoting wellbeing in urban and rural environments. This is the «responsible» building that we hear so much about in the media and in conversation.

During the vast reconstruction efforts, often poorly controlled or totally unregulated, the best of circumstances evolved alongside of the worst. It is thus difficult to judge the deeper motivations of all of those who got involved, or what their actual contribution may have been.

Urban areas saw a costly proliferation of temporary shelters and, against all the rules of urban planning, the development of shanty towns. No need to look very far to find evidence of an irresponsible, even criminal persistence in erecting numerous individual constructions, all of which are of doubtful solidity, poorly distributed, and frankly hideous. Our society, it seems, is handicapped by the poor allocation of its meagre resources, by a lack of means, by the dominance of «politics» and by a lack of vision, and it persists in shaping a future that looks like the past and is a vector of the same shortcomings and bound to reproduce the same errors.

However, a few projects exist at least, offering a promising way forward. Such is the case for the State initiative for the development of an administrative district in Port-au-Prince. There are others, smaller in scale, but of high importance because of their obvious potential benefits. Among them is the proposal made by MISEREOR to its partners at PADED, along with the technical support of CRAterre, to promote, valorise and improve traditional construction techniques.

It was not easy for PADED member associations to implement this action, going against the tide of prejudices. Admittedly, our preferences are often strongly conditioned by principles: for beneficiaries, concrete block homes are a symbol of prestige, and for professionals, locally-derived construction materials are perceived as less durable. People may boast of the charms of farmhouses and the urban model derived from it, the so-called «Gingerbread», in choice locations, but likely opt for post-and-beam reinforced concrete structures. It was therefore necessary

to convince ourselves first of the utility of such a programme, which proposed the construction and repair of traditional wood-framed houses using mostly locally-derived materials such as clay, wood and stone.

The experiment soon proved the value of this option as a way to preserve the local architectural heritage and know-how. These techniques are also of a particular interest in remote and isolated areas, where heavy manufactured materials such as cement are very expensive, and where transportation difficulties do not allow for a regular supply.

Other key elements of this programme are organisational and involve the technical training and active participation of beneficiary families. The transmission of knowledge and know-how made them more demanding, better able to follow the evolution of constructions and more capable of expressing themselves or to react to the shortcomings of construction workers. In this country, where the idea of «jan-l pase-l pase» (come what may) taints the attitudes of many, it is not rare to notice the poor quality of «reinforced concrete» structures and the disappearance of bracing systems in traditional houses.

The supply of «professional» services does not guarantee the conscientious observance of principles. Chief masons or «bosses», even aware of the importance of the plumb line, the spirit level and the square, and well trained in their use, will fail to use them systematically on site. And what is worse, the tendency is to never recognise responsibility or negligence. Thanks to the training, the constant and advised pressure exerted by owners is likely to reverse the course of things and, over time, allow hope for useful changes.

Furthermore, the construction and repair of each house was carried out collectively, a dynamic reminiscent of traditional systems of mutual assistance. While many of the post-earthquake emergency actions tended towards charitable donations and excessive handouts, which go against the development and real interests of the country, this programme helped to strengthen local accountability. It cultivated solidarity, mutual aid, and the strengthening of trust between affected families and communities.

The reconstruction undertaken by this programme following the 2010 earthquake is an example of a successful and productive partnership between MISEREOR, PADED, CRAterre and the local communities. It testifies to the effective possibility to rebuild «differently».

FOREWORD

Hans MAIER
Haiti team – Misereor

There are ways of escaping the «destructive assistance» logic orchestrated by the international community in Haiti. This model was documented and criticised by the Haitian filmmaker Raoul Peck in a documentary about the events following the disaster. The filmmaker points to the exclusion of Haitians in the decision making process as being the main cause of the apparent failure of assistance efforts.

This publication, derived from the Re-build Haiti exhibition, and which is also a follow-up, presents the different aspects and stakeholders in the post-earthquake reconstruction and rehabilitation programme, mainly in rural areas. This programme was initiated and supported by several European NGOs, and adopted and implemented by several Haitian NGOs. Since then, the 1,000 odd houses that have been constructed and adopted by beneficiaries became an eloquent testimony to the efficiency of the programme.

The success of this programme can be attributed to several fundamental factors that were important for the execution of the programme supported by Misereor. It provided without a doubt a wealth of information and lessons for other Haitian and International NGOs involved in the reconstruction process. The technical and methodological results that were obtained have since been adopted and replicated, even by local populations, with their own means, however limited they may be. This is a great satisfaction.

The prerequisites for the implementation of this programme, supported by four NGOs located in the region affected by the earthquake, were their ability to develop their own agro-ecological programme at a local community level, their belonging to the national PADED (Agro-Ecological and Sustainable Development Platform) network and their cooperation with Misereor built over many years - a solid foundation. With a perfect knowledge of local partner organisations and the capacity to reinforce the community organisation of rural families, the programme met the indispensable requirements for success.

As for the Haitian NGOs concerned, the joint decision-making between the officials of the organisations and the community representatives was essential for the planning and implementation of the programmes and their improvement, and to reach the set objectives. The coordination and cooperation between the 4 PADED NGOs, the steering committee, in participation with Misereor and the consultants from the CRAterre laboratory of ENSA Grenoble were equally important factors in the success of the programme.

As for the European NGOs, the close partnership between Misereor and CRAterre, which was established immediately after the initial field assessment and maintained throughout the implementation of the programme, is a good example of cooperation and joint participation. It allowed for sustainable solutions to be found quickly in a post-catastrophe emergency situation. The project's success is strongly attributable to the mutually complimentary aptitudes of these two organisations.

Together, European and Haitian NGOs have developed a joint programme of reconstruction and rehabilitation of rural dwellings. The guidelines, criteria, terms and dimensions of the programme, formulated and discussed immediately after the earthquake, are remarkably well presented in this publication.

Cooperation, partnership, group development and implementation of programmes, transmission and sharing of new knowledge and know-how, have enabled a multitude experiences which form a solid foundation for the sustainable promotion of rural habitat. Homeowners are proud to have built their own houses, all the while reinforcing community spirit. This publication is testimony to that, and further galvanises the hope for a better future in Haiti.

FOREWORD

CHRISTINE KING

Head of ANR Flash Haiti programme

YVES LE BARS

Chairman of the Monitoring Committee ANR
Flash Haiti

Since the 1970's, the international community has made major efforts to come to the aid of victims of natural and human disasters. Progress has been made in terms of mobilisation and reconstruction, but some recurring questions have been raised regarding the coordination, pertinence and effectiveness of this aid, and regarding the actual direct or indirect benefits for those affected. The debate over the compatibility of emergency interventions and development actions is constantly reopened. Are specific local dynamics and the risk to overshadow them taken into consideration? How to combine them in order to bring about sustainable actions founded upon the endogenous capacities of local societies and stakeholders?

Following the earthquake in Port-au-Prince in January 2010, the French National Research Agency (ANR) quickly organised the «Flash Haiti» call for projects to support research related to this unforeseen and exceptional event. One objective was to be able to collaborate with Haitian authorities and the institutions that support them, and provide information liable to optimise the use of resources available for the lasting recovery of day-to-day life: physical infrastructures, economic and social systems and social solidarity. All matters relating to the disaster were open to discussion, from the analysis of the event, the acquisition of data related to its exceptionality, the setting up of analytical approaches to social, physical and economic repair and reconstruction procedures, the analysis of resilience systems...

It was in this context that the RepairH project was developed. As with the other seven ANR programme projects, the expectation was to learn from this post-disaster situation via scientific analysis and quality data. The ambition was to produce knowledge by focusing research efforts on crisis management, but also and especially on the ways in which a society can recover following a major catastrophe.

In this context, the RepairH project achieved its goals, which were set by the ANR programme, and helped to meet the needs expressed locally in Haiti. This seemed to be largely due to the original partnership upon which the project was based, and to its innovative scientific approach.

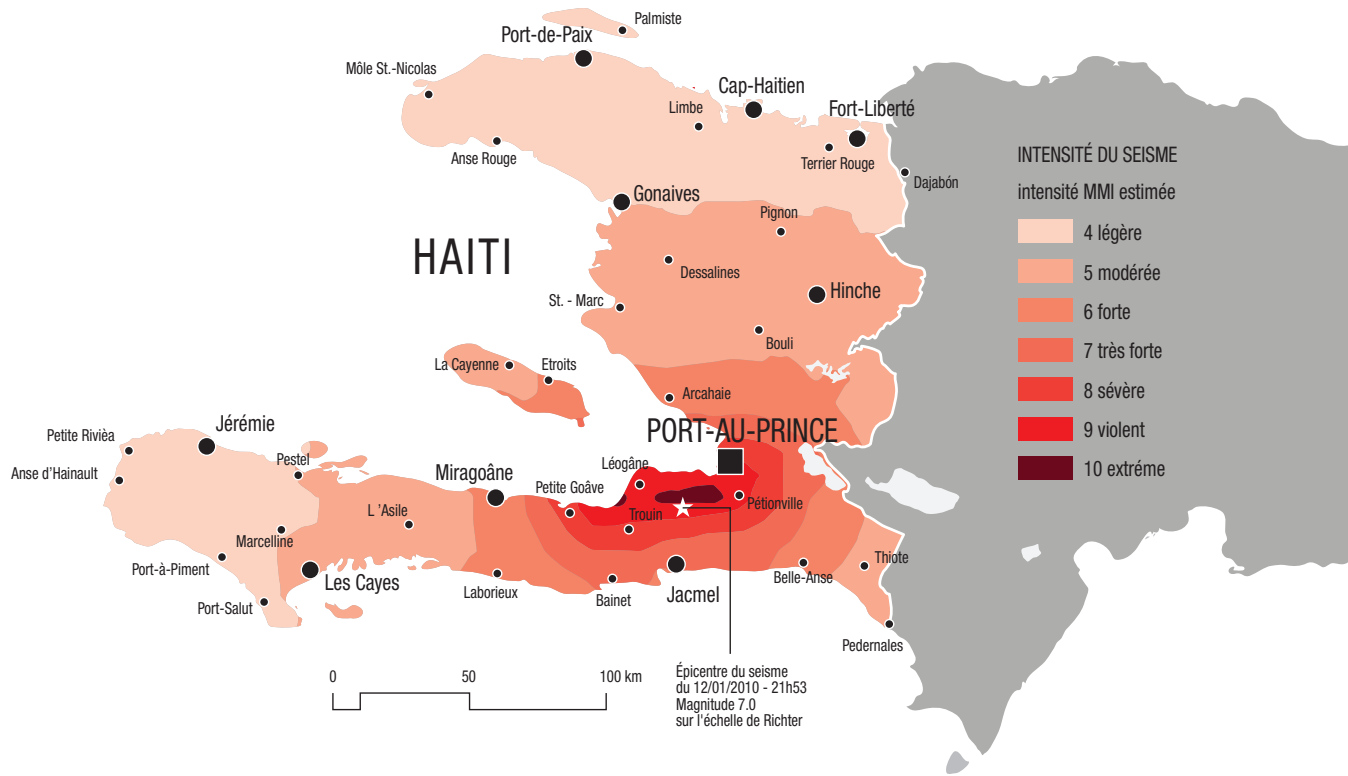
The association of two research laboratories (ENSAG's AE&CC and UJF's 3SR) with the project coordinating NGO (CRAterre), along with the help of local partner NGOs (members of the PADED and PAPDA platforms, EdM, etc.) involved in the reconstruction, with international support (Misereor, CARITAS, FAP, UN-Habitat, IFRC, etc.) proved particularly fruitful.

The approach effectively bridged the gap between the social and engineering sciences. It allowed for the comparative study of hypotheses and analyses, experimentation and modelling, and the interesting alternation between research and applied fieldwork. The initial intuitive approach, based on the fine observation of local building cultures and know-how, as well as of the damages, facilitated the rapid identification of priorities and choices for the project. At the same time, technical hypotheses were studied, verified, calculated, scientifically tested (going as far as doing tests on vibrating tables), rendering available the tangible elements that made modelling possible. The valorisation efforts achieved by the project team, who went so far as to obtain the system certification by national authorities, should also be noted.

Project RepairH is at the origin of many other initiatives and results. Beyond new scientific knowledge, hundreds of housing units that have been (re)built or repaired, Haitians have appropriated these construction systems and architectural models have been developed. Most important yet, some organizations have adopted the knowledge transfer process. Several NGOs, but also UN-Habitat, with support for the Atelier de Jacmel, are still continuing to disseminate information, with a focus on prevention and the strengthening of local populations' resilience. Furthermore, many lessons have been learned about the intervention modalities and necessary conditions for the success of this type of intervention. Such results meet and exceed the expectations of the ANR programme. The partners in this project did an outstanding job, which we hope will be further supported, disseminated and accompanied by a reinforced institutional presence, a key element in the passage into a larger scale.







THE HAITIAN CONTEXT

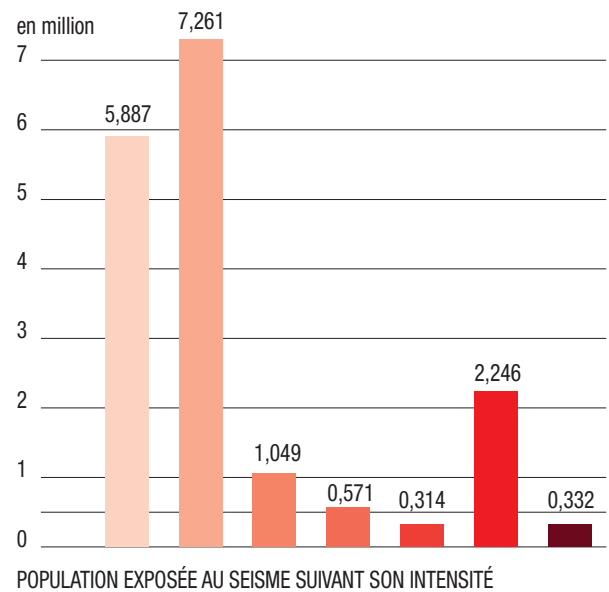
Above: map of Haiti presenting the repartition of the intensity of the earthquake and the number of people affected in each zone

Below: population at risk according to earthquake intensity (millions)

In January 12 2010, an earthquake struck Haiti, ravaging mainly its capital city Port-au-Prince but also the cities of Léogane, Jacmel, Petit Goâve as well as their adjacent rural and peri-urban areas. Over 220,000 people were killed, and 300,000 were injured. In total, 1.5 million people were affected, finding themselves without a home. There was an estimated \$US 8 billion in damage, and reconstruction costs of approximately \$US 11.5 billion.

This heavy toll results from the combination of an extremely violent natural disaster with the country's high degree of vulnerability (high population density, fragile buildings, non-compliance with building standards, poverty and a «deconstructed» society). The country is already heavily burdened by regular damage resulting from the hurricane season and heavy flooding, which has been a major obstacle to development for many years.

Ranked amongst the poorest nations in the world, even before the earthquake, Haiti was already in need of substantial aid to rebuild. The Haitian government therefore suggested: «Rebuilding Haiti does not mean going back to the dominant conditions which existed before the earthquake, but rather tackling the very elements of vulnerability, so that never again may a natural disaster inflict so much suffering, damage and loss».





Top and above: some pictures of the situation just after the earthquake

Below: another risk in Haiti, cyclones and associated floods



In this context, CRAterre collaborated with diverse national and international organisations and developed different activities to contribute to a sustainable recovery in Haiti, in particular through fundamental and applied research.

Partnerships were progressively multiplied following the first positive results, particularly in rural areas, within the framework of projects supported by Misereor and Caritas France/Secours Catholique and with the NGOs PADED and PAPDA.

Tangible results were thus achieved, not only in terms of reconstruction and rehabilitation and the social integration of projects, but also in terms of building standards and the reinforcement of technical and institutional capacities.

The support brought by the ANR to the RepairH research project facilitated the establishment and development of operations, and it has contributed especially to see the larger picture. This helped to draw lessons regarding social and technical approaches, for a more effective perusal of reconstruction and prevention efforts in Haiti, as well as in other areas at risk.

INTERVENTION PHILOSOPHY

From the beginning of the projects, the technical reflection process was enlarged to encompass social, environmental, economic and cultural aspects. This drive was fuelled by previous post-catastrophe emergency response related experiences, and the will to apply the principles of sustainable development.

The idea was to maximise benefits for local populations by allowing them to reach a better level of resilience (techniques within their means) and offer living conditions adapted to the diversity of environments, ways of life and their specificities, including artistic expression, which is omnipresent in Haiti.

For this, the reflection process was based on the valorisation of traditional Building Cultures and the principles of ownership, scalability and large-scale reproducibility. This led to surprising technical choices, quite varied, depending on the characteristics of intervention sites. Traditional organisation modes such as the Kombit, a system of mutual assistance between neighbours based on solidarity and reciprocity and an important asset for community resilience, were also privileged.





Opposite, left: the PADED agro-ecological programme supports the development of family-run plant nurseries

Above and opposite, the farming community is organised around construction sites: meetings, extraction of materials, transportation and meal preparation. Families organised into Kombits build their houses together with the assistance of one or two «bosses»

Below: awareness and motivation meeting conducted by the agroecological programme facilitator from EPPMPH. This farming community lives in the Malanga region, a 12-hour walk from the city of Carrefour

Below, right: construction sites are often located several hours away by foot from the materials' depot, managed by farming organisations



APPROACH



A multifaceted, iterative approach

The experiments conducted by CRAterre and shared by numerous organisations promote an approach based on science, common sense, and most especially the know-how of local traditions.

The result is a three-tiered approach: Recognise, empower and mobilise. Most of the time, the actions take varied and complementary forms. In addition to field projects, these activities also include research, training and the dissemination of results.

Exchange meeting between Haitian organisations and involved communities allow a participatory approach to rural housing reconstruction projects

Above: various traditional Haitian architectures - practiced for centuries by the local people, they involve the use of locally available resources (stone, earth, wood, sisal, etc.). Habitually, this type of construction is chosen by families with little financial means. They unfortunately carry an image of out-datedness and impoverishment, in contrast to modern buildings that involve the use of industrial materials (cement, steel...), which are, alas, perceived as modern and strong



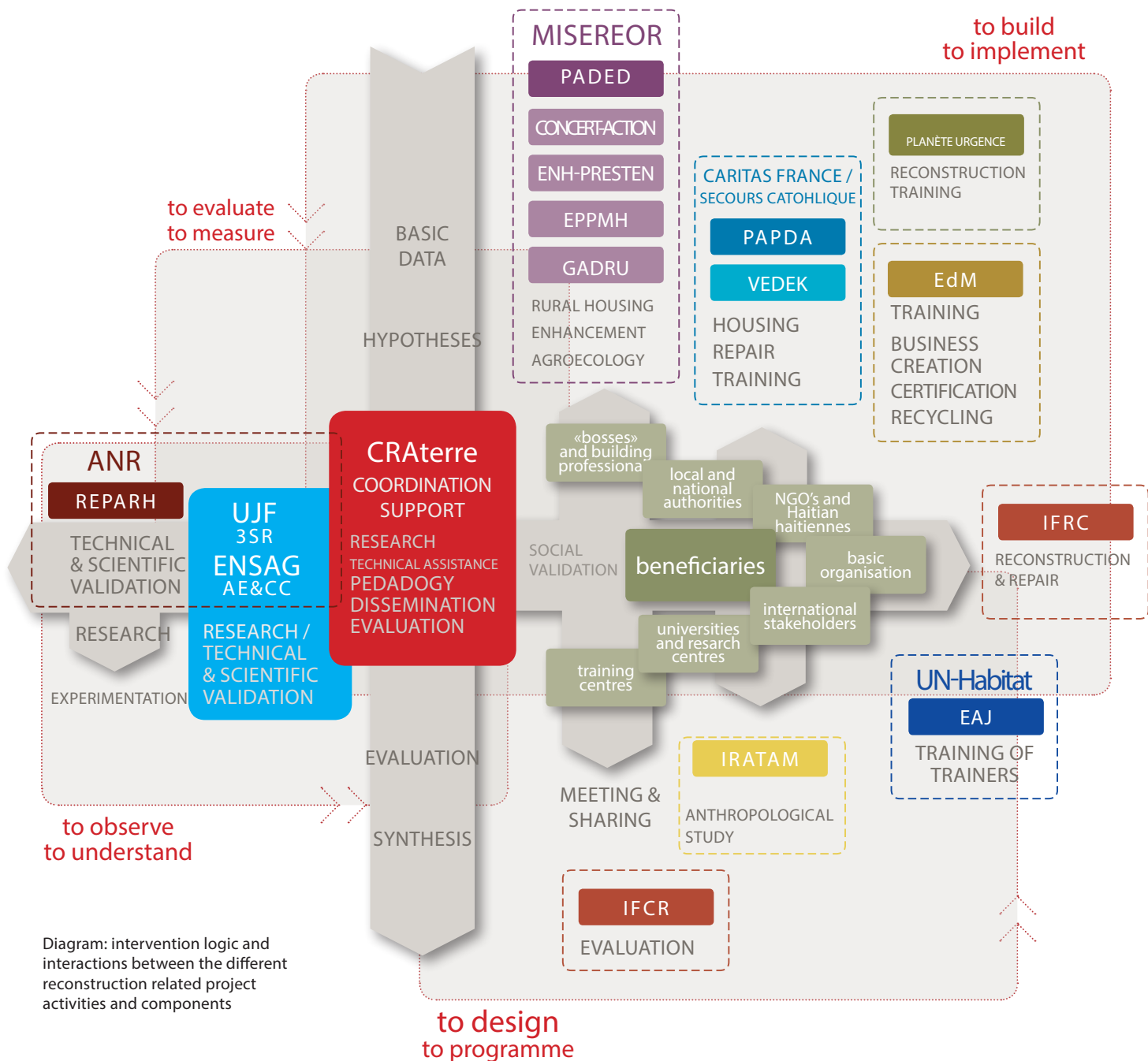


Diagram: intervention logic and interactions between the different reconstruction related project activities and components

Community sensitisation as an integral part of the project



MAIN PARTNERS

MISEREOR www.misereor.de

German Catholic Development Assistance Organization. Founded in 1959, MISEREOR fights poverty in Africa, Asia, Latin America and Oceania and helps people in need, regardless of religion, race or gender. In Haiti, MISEREOR has been supporting the PADED agro-ecological programme for over 20 years. Their knowledge of the Haitian context, given their longstanding involvement, led MISEREOR to support reconstruction/repair programmes for farmhouses damaged by the earthquake.

As soon as the emergency response was underway, and with the scientific support of CRAterre, Misereor supported PADED-affiliated organisations following 4 main directions:

- The recognition of local building cultures;
- Compatibility between housing and agro-ecological activities;
- Reinforcing of the abilities/competences of farming families;
- The extension of buildings by the families, subsidised from 22 m2.

PADED www.paded.org

Agro-ecological and Sustainable Development Platform supported by MISEREOR, which includes 24 Haitian organizations, 4 of which were directly involved in reconstruction/repair programmes for the rural housing, with an emphasis on local building cultures, mutual assistance, and earthquake-resistant construction with local materials.

These 4 organisations, GADRU, ENH-PRESTEN, EPPMPH and CONCERT-ACTION formed a Steering Committee to unite their efforts, experiences and logistics. Subsequently, two other organisations, which were not directly affected by the earthquake, focused on earthquake-resistant building cultures: IRATAM in Cap-Haïtien and ACAPE in Les Cayes.

PAPDA www.papda.org

Haitian Alternative Development Advocacy platform created in 1995, bringing together several local organisations. It aims to contribute to the transformation of living conditions of the Haitian population. For over 5 years, PAPDA has been working with VEDEK in Cap-Rouge (pilot areas).

VEDEK is a 1,500 member-strong farming organisation and PAPDA member. It was established after Hurricane

Georges in 1998 with the goal of ensuring food sovereignty in the country. PAPDA and VEDEK have received support from SECOURS CATHOLIQUE CARITAS FRANCE and, with the help of CRAterre, developed a rural housing reconstruction approach based on the reuse of materials and the support of local professionals.

SECOURS CATHOLIQUE CARITAS FRANCE

www.secours-catholique.org

Founded in 1946, Secours Catholique-Caritas France is a member of the Caritas International confederation, the largest network of catholic charities in world, with activities in three areas: Emergency situations, Sustainable Development and Restoration of Peace. The objective of Secours Catholique is to «provide non-denominational material or non-material aid and assistance, direct or indirect, wherever it is needed, regardless of the national, religious or philosophical affiliation of its beneficiaries.» It provides assistance to the PAPDA/VEDEK project.

ENTREPRENEURS DU MONDE

www.entrepreneursdumonde.org

Founded in 1998, Entrepreneurs du Monde supports initiatives of women and men in vulnerable situations, to improve their living conditions by setting up social micro-finance projects, entrepreneurship, and small business development assistance. With the support of CRAterre, Entrepreneurs du Monde has established a programme which revolves around three goals: an architectural and (re)building system adapted to the Haitian context, which reuses debris from the earthquake; the training of artisanal Haitian construction professionals; and the establishment of a specific credit-system to facilitate access to housing for impoverished persons.

ANR, PROJET REPARH / CRAterre / ENSAG / UJF-3SR / GADRU

ReparH is a joint project between CRAterre, ENSAG, UJF-3SR and GADRU, supported by the French National Research Agency. Its aim is to meet the demands for reliable earthquake and hurricane-resistant housing solutions both accessible and culturally appropriate for Haitians. The stance taken by ReparH is based on the observation that traditional structures, and mainly wood-framed houses, suffer less damage in an earthquake than other types of buildings.

It is expected to scientifically validate the building systems, and adapt reconstruction efforts to local realities as well as to the social, cultural, economic and technical dynamics that will contribute to strengthening resiliencies and support sustainable development locally.

CRATERRE www.craterre.org

Since 1979, CRAterre, International centre for Earthen architecture, has been working to obtain recognition in the architectural community of earthen materials as a viable option to meet environmental challenges, preserve cultural diversity and fight poverty. CRAterre has three main objectives:

- Improve the use of local, human and natural resources;
- Improve housing and living conditions;
- Valorise cultural diversity.

CRAterre is composed of an association and a research laboratory, based out of the National School of Architecture of Grenoble, which brings together researchers, professionals and lecturers and works with many partners, which allows for creative cooperation between research, field work, training and dissemination of knowledge activities.

ENSAG - RESEARCH UNIT AE&CC (LABEX)

www.grenoble.archi.fr

The AE&CC research unit was created in October 2009 under the AERES evaluation campaign. It is composed of two laboratories in the National School of Architecture of Grenoble (ENSAG): CRAterre, founded in 1979 and functioning as a research laboratory in 1986; Cultures constructives, founded in 1978 and originally named «Dessin-Chantier», becoming the «Cultures constructives» (Building cultures) laboratory in 2002.

It was Ranked A+ by AERES and labelled a «Laboratory of Excellence» (LABEX) in 2011, in recognition of the value of the scientific work conducted by the research unit and laboratories which comprise it, as well as the quality of research at the School of Architecture of Grenoble, which has operated under the authority of the French Ministry of Culture and Communication for the last several decades.

UJF-3SR www.3sr-grenoble.fr/3sr/

The «Soils, Solids, Structures - Risks» laboratory regroups the academic authority on geomechanics, civil engineering and associated risks as well as mechanical and multiphysics couplings in complex

solid media. It is a joint research unit (UMR 5521) that brings together the CNRS-INSIS, Joseph Fourier University and the National Polytechnic Institute in Grenoble.

FONDATION ABBE PIERRE

www.fondation-abbe-pierre.fr

The Abbé Pierre Foundation for the housing of the disadvantaged is a founding member association of Emmaus International and Emmaus France, and is recognised as serving the public interest since 1992. The Abbé Pierre Foundation considers that shelter is a vital need, along with food, health and employment. It therefore strives to ensure that «the most disadvantaged have access to decent and sustainable housing, regardless of the amount of their resources and their social status». The foundation supported reconstruction efforts in Haiti by assisting the Haitian association «Initiative Développement», focusing on the self-building of earthquake-resistant housing structures.

IFRC www.ifrc.org

The International Federation of the Red Cross and Red Crescent is composed of National components. 124 of them took part in the reconstruction efforts in Haiti. More than 30,000 families have directly benefited from relocation aids.

ONU-Habitat www.onuhabitat.org/Haiti

UN-Habitat works in Haiti to support the government and local authorities on urban development and municipal and housing issues. Following the earthquake in Port-au-Prince, UN-Habitat favoured an approach in which individuals and communities were at the centre of reconstruction efforts, thus adhering to the principles agreed upon by the United Nations member countries and the Prime Minister of Haiti.

PLANÈTE URGENCE www.planete-urgence.org

Founded in 2000 around the original Congé Solidaire® model, Planète Urgence is headed by former leaders of Médecins du Monde, Handicap International, Greenpeace and business leaders. A recognised public utility, its actions are centred on the training and accompanying of adults, socio-educational support activities, the protection and restoration of biodiversity, agro-forestry and the fight against deforestation. In Haiti, Planète Urgence assists the areas surrounding Jacmel, Caye Jacmel, Marigot, and La Vallée by supporting the construction of housing for 60 vulnerable and isolated families, and teaching artisans and self-builders the skills and know-how which are adapted and accessible for sustainable (re)construction.

PARTNERS: ANR : CRATERRE/ENSAG & UJF/3SR,
PADED/GADRU, PAPDA/VEDEK
PLACE OF INTERVENTION : CRATERRE
TIME OF INTERVENTION : JULY 2010 - JANUARY 2014
TYPE OF INTERVENTION: RESEARCH IN THE AREA
OF EARTHQUAKE-RESISTANT RECONSTRUCTION



ReparH

ReparH is a research project supported by the French National Research Agency (ANR), to scientifically verify the hypothesis of the interest of the valorisation of resources and local dynamics related to the reconstruction of earthquake-resistant housing.

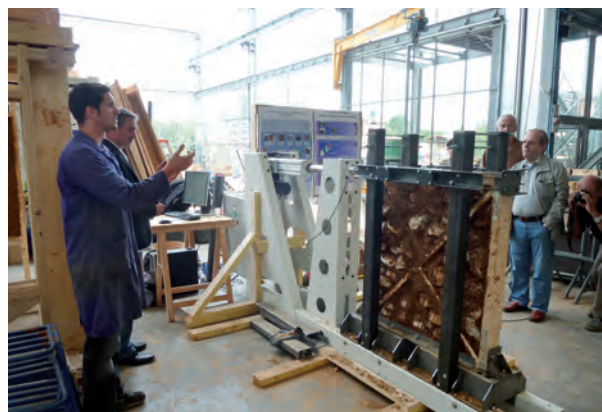
It was launched in the post-disaster context following the earthquake on January 12 2010, in parallel with the field-work conducted mainly by the PADED Platform and with support from Misereor. The goal was the reconstruction of 5000 houses in rural and peri-urban areas.

Around CRAterre, ReparH regrouped the research unit AE&CC of the National School of Architecture of Grenoble, the 3S-R laboratory of Joseph Fourier University, Grenoble, and GADRU.

This research project is an analysis of the rebuilding strategies used in Haiti, and an interdisciplinary «co-assessment» aiming to define adapted methods in both preventive and post-disaster situations in Haiti and elsewhere.

The expected results are the documentation of the «building cultures» approach, an understanding of the mechanisms involved in the decision making process, and the identification of decision-making tools which integrate technical aspects (hurricane and earthquake resistance) and social aspects (lifestyle, organisation of production, existing know-how, etc).

The chosen approach is iterative and comprised of different phases: «inventories and studies», «hypotheses», «modelling», «experimentation» (including prototypes), «evaluation and validation» (scientific and field), and finally the «valorisation» of results in the form of two doctoral theses and other media (conferences, articles, presentations, etc.) so as to become accessible to the general public.





Above: analysis of local building cultures and rural housing assessment

Left page, right: wall reaction and vibrating table testing
 Left: development of full-size building system

Below and opposite right: the first construction of homes following the earthquake



PARTNERS: ANR : CRAterre/ENSAG, 3SR/UJF, GADRU/PADED, PADED (EPPMPH, CONCERT-ACTION, PRESTEN, IRATAM, GID, ACAPE, DCCH)
PLACES OF INTERVENTION: PROCY, BONGARS, GRANDE RIVIÈRE, ANGIBEAU, LACHAMBEAU, CAP ROUGE, MAOTHIÈRE
TIME OF INTERVENTION: NOVEMBER 2010 - DECEMBER 2013
TYPE OF INTERVENTION: RESEARCH ON ANALYTICAL METHODS OF LOCAL BUILDING CULTURES IN AREAS AT RISK



ReparH IDENTIFICATION OF LOCAL BUILDING CULTURES IN AREAS AT RISK

Understanding the building practices of a community as well as the factors that influence and shape its built environment is the first step towards undertaking habitat improvement and reinforcing local resilience capacities, particularly in areas affected by major natural hazards.

GOAL

As part of a thesis in architecture for the CRAterre lab at ENSAG, a methodology was developed for the analysis of local building cultures which intends to promote a better understanding of existing contexts. This activity is the starting point for the development of technical and operational principles that can contribute to reducing vulnerability and to strengthening local competences and abilities. Nourished by exchanges with local and international partners active in the field, this work meets two goals. Firstly, it offers a set of methods and supports to identify the characteristics of the buildings, the knowledge and know-how and the practices as well as the resources that can contribute to improve housing in the face of natural hazards. Secondly, it promotes the appropriation of these tools by local organisations, so that this approach can be integrated in a sustainable manner into their practices.

ACTIVITIES CARRIED OUT

In collaboration with PADED member organisations, awareness and training campaigns on local building cultures were undertaken at different levels. Detailed studies were conducted by the GADRU organisation in three different areas, which enabled this partner to acquire specific skills to be shared and disseminated among other PADED members. A first exchange on these experiences took place between technicians of the four organisations involved in the PADED-Misereor reconstruction programme, as well as the project consultants. Later, an introductory seminar on the analysis of local building cultures brought together representatives of other members of this platform by allowing them, through exchanges between participants

Below: introductory seminar on the analysis of local building cultures, field implementation in Lachambeau / collective meeting with members of agro-ecological families





and the implementation of field work, to understand the value of a project approach based on the recognition of local building cultures.

RESULTS

In support of habitat improvement programmes, the work undertaken allowed to meet two goals. First, it allowed to gather detailed information on local expertise, providing technical and practical improvements on on-going programmes. Second, it enabled local stakeholders to develop the skills to self-sufficiently conduct an analysis of existing housing structures and consider future risk prevention and reduction initiatives.

OUTLOOK

The experiences of partners involved in reconstruction programmes as well as the involvement of other PADED members paved the way for the implementation of approaches based on the specificities, potentials and constraints of each site. This in turn rendered the proposals more technologically and economically accessible, and better prepared the communities to handle future crises.

Below: analysis of local building cultures and assessment of rural housing



Above: local housing, Grande Rivière, West department
Below: local housing, Lachambeau, Les Cayes, South department



PROJECTS

PARTNERS: MISEREOR / PADED
PLACE OF INTERVENTION: CARREFOUR, RIVIÈRE FROIDE,
CADJOUT, ST-ROCK, ANGIBEAU, GRAND-RIVIÈRE, COUPEAU
TIME OF INTERVENTION: PHASE 1, SEPTEMBER 2010 TO
AUGUST 2012
PHASE 2, SEPTEMBER 2012 TO DECEMBER 2014
TYPE OF INTERVENTION: RECONSTRUCTION AND REPAIR
OF RURAL HOUSING



EPPMPH TRAINING OF SMALL-SCALE FARMERS IN THE HILLS AND PLAINS OF HAITI

For 20 years, the organisation EPPMPH has been encouraging ecological agriculture amongst farmer families. Today it brings together 23 farming associations and 1,893 families spread over mountainous areas where farmers must accomplish one to ten hour walks to sell their products in the city of Carrefour.

The 2010 earthquake severely damaged the homes of 1,831 farming families (about 15,000 people). Fortunately, damage to these mostly wood-framed houses caused no fatalities.

Given this situation, EPPMPH quickly engaged in a reconstruction process based on the valorisation of local building cultures by strengthening mutual assistance and improving traditional construction systems. In April 2010, the first house was completed, an expandable 35 m2 home, locally styled, built as a show model near the urban area. Numerous awareness and training campaigns helped convince other organisations involved in national reconstruction efforts.

From November 2010 to July 2012, the first phase of the programme allowed 172 agro-ecological families to rebuild a portion of their home: the main room and its extension, a gallery, amounting to 22 m2.

The subsidy per family is of \$US 2,580:
Materials (cement, metal sheets, wood, nails).....\$US 1,720
Artisans (mason, carpenter, joiner).....\$US 460
Transportation of imported materials
(1 truck and 12 mules).....\$US 220
Communal meals on site.....\$US 180
Coordination, technical control, administrative and
financial monitoring: \$US 620 per construction site.



Above: Beneficiaries meeting in the hamlet of Kay Henry in Coupeau.



Above: The traditional houses of the area are composed of 2 rooms, sheltered by a double-sloped roof and surrounded by a covered gallery.



In return, the families work in Kombits made up of 6 families, to implement all of the small constructions in 3 weeks. Beforehand, each family stockpiles a supply of water, stone, earth, sand, palm battens and fibres, often transporting them across difficult mountain trails. Facilitators of agro-ecological programmes who are respected by local communities, are responsible for organising the Kombits and encouraging solidarity.

A local carpenter and a mason manage the construction site and implement new earthquake-resistant construction details such as double-braced corner panels while farmers carry out the work that they are capable of doing, such as making intermediate wicker-covered (clissage) panels and filling them with earth.



Above: traditional buildings in mountainous areas around the city of Carrefour

Five artisans later became quality control foremen on all construction sites, while training new local artisans. Following a precise protocol, a total of 76 artisans trained on-site will have their skills validated by a Misereor consultant and an EPPMPH engineer.

The filling of panels is completely redone to comply with new earthquake and hurricane-resistant construction regulations. Bracing in corner panels, which allows the confinement of stone masonry in small triangular spaces



Above: Maison Joseph Dieujuste, Coupeau area, located a 6 hour walk from Carrefour City. Repair and improvement of the house. Propping of the structure, sawing of posts and construction of the stone foundation



Above: the Ouzier family, residents of the Angibeau area, a one-hour walk from the city of Carrefour. Mr. Ouzier eventually became one of the programme's craftsmen



The first house constructed in Cadjout convinced the sometimes-hesitant villagers of the viability of local materials. Today, it is the villagers themselves that promote these techniques by caring for and decorating their homes





Ms. Georges, a widow, nearly blind, forced to take care of her many grandchildren. She lives in the area of Cajoute a one-hour walk from the town of Carrefour. Her house was completely destroyed in the earthquake.

Since then, she has participated in the construction of 10 houses with her Kombit, which are now complete. She has already added an extra room to her own house

Top and right: Intelligent and decorative local building details, integrated in the construction of houses



In the second phase, in even more isolated and inaccessible areas, EPPMPH multiplies intervention solutions by offering families the possibility of collectively repairing their homes, while at the same time integrating earthquake-resistant details. This option involves more skilled labor and less imported materials and transport, and allows to offer secure and comfortable spaces (30 to 35 m²). In December 2012, the first construction workshop on repair techniques took place in Coupeau, a six-hour walk from Carrefour. Four artisans from the VEDEK project were invited to participate and share their experiences from 2011, during the reconstruction at Cap Rouge.

Twelve mules were made available to farming families, to help with the transport of materials. The mules were left in the rural community for the benefit of all.

From January 2013 to December 2014, 253 families are employed in the improvement of their homes: 184 decide to implement new 22 m² structures and 36 families choose to repair their homes, while 12 families, located too far from water sources, prefer to invest in water tanks and rainwater recovery systems.

Alongside the programme, technical and strategic exchanges with Concert-Action, Gadru and Presten are organised on a monthly basis in the framework of the actions achieved by the steering committee of the PADED reconstruction programme.



PARTNERS: MISEREOR / PADED
 PLACE OF INTERVENTION: 3RD SECTION OF BELLE FONTAINE
 TIME OF INTERVENTION: NOVEMBER 2010 TO AUGUST 2013
 TYPE OF INTERVENTION: RURAL HOUSING RECONSTRUCTION
 IN THE AREA OF BELLE FONTAINE



ENH-PRESTEN

ENFANTS NÉCESSITEUX D'HAÏTI (ENH) PRESSE SWEN TÈ NOU (PRESTEN)

ENH-PRESTEN is an association started by community leaders with the aim of improving the living conditions of farming families. For this, it is important to protect and revitalise the soil that, every day, is carried away by runoff into the sea, and to replenish surface vegetation. Only those who work the land can effectively protect it.

For twenty years, MISEREOR has supported ENH-PRESTEN in its eco-farming projects, thus financing activities related to the construction of dry stone walls, the plantation of species such as vetiver, the implementation of anti-erosion soil-runoff systems, fruit-tree community replanting initiatives, reforestation nurseries and income-generating activities.

Following the 2010 earthquake, MISEREOR responded favourably to the request by ENHPRESTEN to support 215 families in the rebuilding/rehabilitation of their homes around Ducrabon, 3rd Section of Belle Fontaine.

Beneficiary families were organised into Kombits: traditional mutual aid systems which also provide labor and locally available materials. The project provides a portion of the building materials and food needed during the construction phase. Tools are left to the Kombit so that they may be put to use by the community, as needed.

In addition to the reconstruction of housing, families actively contribute to the reforestation of their plot, but also to the replanting of new groves. Each family must plant at least one hundred trees. This difficult reforestation effort is essential to the promotion of new earthquake-resistant building systems, which require large amounts of lumber.

Below: stone and earth mortar masonry





Above: training construction worksite, Belle Fleur: wood frame house filled with Ti-woch and earth bricks

Below: adobe production by the Kombit



Below: Examples of wood-frame and brick houses, filled with moulded earth bricks





Above: stone and earth mortar masonry



MISEREOR consultant architects provide professional coaching. They are in charge of training activities taking place in pilot projects and on-going training activities throughout the housing construction processes. Given the steep topography of the area of intervention of ENH-PRESTEN, the construction types are quite variable. They are influenced by local building cultures, and integrate earthquake-resistant structural improvements. Thus, existing wood-frame structures and fillings were implemented in contexts where they previously existed. Structural fillings were composed as follows:

- Wicker-covered (clissage) with commercial wood wattle (gaulettes), to limit deforestation
- Moulded raw earth brick (adobe) reinforced with sisal (pit);
- Small stone masonry, «Ti-woch».

Similarly, stone constructions were also offered, with wooden ladder-shaped frameworks, which act as horizontal wall ties, thus reinforcing the ductile resistance of the structure.

This diversity of models, designed to adapt to the variety of local resources, ensures reproducibility, so that locals may themselves pursue the efforts to reduce their vulnerability. This project with PRESTEN illustrates particularly well the willingness to use locally available resources.

Transportation of materials between the depot and the construction site through mountain tracks



Above: horizontal wooden wall ties arranged at a 65 cm intervals

Below and left: different stone masonry houses



PARTNERS: MISEREOR / PADED
 PLACE OF INTERVENTION: BONGAR (KENSCOFF)
 & PROCY (CARREFOUR)
 TIME OF INTERVENTION: PHASE 1, SEPTEMBER 2011 TO
 MAY 2013 - PHASE 2, NOVEMBER 2013 TO MARCH 2015
 TYPE OF INTERVENTION: CO-CONSTRUCTION AND
 REHABILITATION OF RURAL HOUSING



GADRU SUPPORT GROUP FOR RURAL DEVELOPMENT



Co-construction and rehabilitation of 250 rural housing structures affected by the January 12 2010 earthquake, located on the communal section of Bongars, municipality of Kenscoff, and the Procy section, municipality of Carrefour.

PROJECT BACKGROUND

GADRU is active in agro-ecology since 1992 in the Central and Northern regions of Haiti. In 2002, with the support of Misereor and CRAterre, GADRU experimented with the use of locally-sourced adobe and wattle and daub for the construction of its Welcome and Training Centre (Centre d'Accueil et de Formation) in Carice, in the North-East. Shortly before the earthquake, the parish of Chauffard, located in the Bongars and Procy areas, sought the support of GADRU to help train family farmers in agro-ecology techniques.

The destruction caused by the earthquake forced GADRU officials to become even more involved. They began the reconstruction programme, cautiously, in January 2012. In the meantime, they focused on the construction of their regional office using local materials, on selecting the first 125 beneficiary families and beginning their outreach and sensitisation activities aimed at farming groups, in preparation for agro-ecological and reconstruction activities.

GOAL

Revive local building cultures and strengthen farmers' capacities for an improved and sustainable rural housing.

PROJECT APPROACH

This co-construction and rural housing rehabilitation programme is part of a wider agro-forestry programme, integrating the establishment of reforestation oriented tree-nurseries and the cultivation of wood useful in carpentry and joinery.

For GADRU, «farming families are entitled to decent housing and to the continuous improvement of their living conditions. The lack of living space and the poor sanitary conditions in which the majority of them suffer from a clear violation of their rights and an infringement upon their human dignity. To defend the rights of peasant families to decent housing means not only tackling causes (regarding land speculation, real estate speculation, property titles, etc.), but also giving them the means to be part of the solution to their problems. Access to decent housing is a means of fighting poverty. GADRU's contribution in this area is consistent with agro-ecological options, aesthetic concerns, the respect of traditional building cultures, and the defence of the dignity of farmer families. The rural habitat we wish to promote is one that is affordable, aesthetically pleasing, strong and durable. A habitat which combines tradition and modernity, and which uses and improves upon building techniques unique to each region of the country».



Above: rural housing helps protect the environment. Reforestation, anti-erosion walls, livestock pens

Below: Bongar - start of construction of locally-styled homes, incorporating stone masonry «half-walls» and lighter upper walls

One of the developers of the agro-ecology programme, participating in an adobe production workshop. Reforestation, soil management and the use of local materials are all presented as components of agro-ecology through a sensitisation campaign.





The GADRU Centre in Belot built on the construction training site, using the same techniques as in houses.



Haitian engineers, involved since the beginning of the programme, provide on-site training when necessary.

PROJECT RESULTS

The first phase of the programme consisted of agro-ecology awareness campaigns and the establishment of tree nurseries. It demonstrated the effectiveness of the «Kombits» (mutual-aid groups) that participated in the programme, and enabled the approval of the proposed strategy. 175 houses were rebuilt before the start of the second phase. Most importantly, about sixty local masons and carpenters and 4 foremen were trained in wood, stone, lime and raw earth construction techniques. The escort team is now more experienced in housing improvement issues, with 2 Haitian engineers who received specific training in local building cultures. The surveys and diagnostics that they carried out have already provided important results, namely regarding the development and planting of specific tree species suitable for construction.



CHALLENGES

Access to water is the major problem for a large part of the area. Mainly women and children bear the burden of water transportation, and they face many difficulties in supplying their homes. Thus, bringing water to the construction site is challenging. The transportation of construction materials on foot via dangerous paths, sometimes for several hours, requires a massive effort on the part of the entire local community, and is made even more difficult in the rainy season. It also became apparent that the training of constructors who very rarely had access to a structured formal education, is a long process that requires regular supervision.

POTENTIAL PROGRAMME IMPROVEMENTS

- Integrate water management (rainwater collection and storage, ecological water-treatment) and energy management.
- Pursue efforts to enhance roads and paths accessible to vehicles (Kombits already spend one day per week on this task).
- Set up a materials' inventory management protocol in the community in anticipation of destruction by hurricanes.
- Continue to train local artisans, especially in repair methods for older housing structures.
- Promote construction using locally sourced wood, once re-forestation and salt boron treatment have been fully mastered.

On construction training sites, farmer-constructors have become «bosses» or even foremen specialized in green building



PROJECTS

PARTNERS: MISEREOR / PADED
PLACE OF INTERVENTION: PETIT GOÂVE,
SECTIONS 8 AND 10
TIME OF INTERVENTION: PHASE 1, NOVEMBER 2011
TO MARCH 2013
PHASE 2, NOVEMBER 2013 TO MARCH 2015
TYPE OF INTERVENTION: RECONSTRUCTION AND
RURAL HOME IMPROVEMENT



CONCERT-ACTION



The 8th and 10th sections of Petit Goave are among the most affected by the earthquake of January 12, 2010. The Haitian Association Concert-Action, supported by MISEREOR in the 8th section, has been leading an agro-ecological reforestation and soil protection programme for over 7 years. It was here that the first phase began with 90 reconstructions, followed by a second phase in the 10th section, to assist 100 earthquake victims.

Faced with this disaster and with the collective desire of PADED partners to strengthen local abilities and avoid any form of handout, the reconstruction of 190 houses began, based on a mutual-aid system.

44 local artisans, 2 foremen and 2 engineers were trained over 4 construction training workshops carried out with 2 consultants from Misereor. For 14 months, they accompanied the families grouped in Kombits in rebuilding their homes. Concert-Action also organised several local awareness meetings on building cultures aimed at beneficiaries, artisans and authorities in the area.

In the region, buildings are exposed to tropical storms. Rural houses are small, low and protected by 4-sided pitched roofs with little overhang. Houses are rebuilt next to the temporary shelter: 2 closed rooms topped by a roof with four slopes. The entire timber frame structure is braced by multiple St. Andrew crosses, which guarantee the stability of the stone filling. Wicker-covered (clissage) panels filled with earth panels are used indoors.

Access to sites and the transportation of materials were very difficult due to the poor state of roads and were made even more difficult by torrential rains and an instable local security situation. But many difficulties could be overcome, largely thanks to the implication and participation of the beneficiary communities.





Above and left page: beneficiaries choose paint colours. The care they take to decorate the walls of their homes shows their pride

Awareness meeting in Boucan Mapou: Fécu and Hector, agronomists, show photos of local construction materials used around the world



Below, right: family-run tree nursery developed in the framework of the agro-ecological programme implemented by Concert-Action





In January 2014, the second phase begins in the area of La Ferme, 10th section of Petit-Goâve. Following exchanges with the EPPMPH, technical managers carry out a training session on the first repair training construction site. This phase aims to assist 100 families, victims of the earthquake, through the traditional mutual-aid process.

More than half of the beneficiaries chose to repair their homes rather than building a new but smaller structure. All families got involved in building community spirit through the social organisation and reforestation of plots.

Concert-Action recognises the importance of strengthening the local timber industry, a source of income for local populations. Specific work is engaged by technicians to control the processing of imported and local woods, ensuring their sustainability.

Below and opposite right: the three stages of the nearly completed reconstruction of a typical house in La Ferme





The project's first phase was completed in December, 2012. The following year, Concert-Action devoted its time to the analysis of the first results in order to prepare a second phase aimed at the improvement of rural housing, using local materials, by:

- Introducing repair techniques for wood-frame houses, while integrating seismic and hurricane-resistant architectural elements.
- Integrating sanitation infrastructures.
- Implementing rainwater collection systems.



PARTNERS: CARITAS FRANCE / SECOURS CATHOLIQUE - PAPDA – VEDEK
 PLACE OF INTERVENTION: CAP ROUGE
 TIME OF INTERVENTION: FEBRUARY 2010 - DECEMBER 2013
 TYPE OF INTERVENTION: POST-EARTHQUAKE REPAIR OF RURAL HOUSING IN HAITI



VEDEK VIVE ESPOIR POUR LE DÉVELOPPEMENT DE CAP ROUGE

Post-earthquake rural housing repair. Reconstruction of 100 houses and repair of 20 water tanks.
 Source: VEDEK - 205 houses destroyed and another 550 damaged.

The first stage of the project consisted in the study of local building cultures, the reasons behind them and their associated values, strengths and weaknesses

Secondly, in tune with the economic and technical capacities of the local populations (families, artisans), technical improvements to existing structures were explored to achieve a better performance of existing structures in the event of new hazards (earthquakes, floods, hurricanes, etc.).

Thirdly, the different strategies linked to the implementation of the project were discussed and developed in collaboration with all the local stakeholders (selection of beneficiaries, assessment of needs, methods of implementation of activities, etc.).

It was decided to support populations by contributing

to the repair and reconstruction of existing homes, on a case-by-case basis, taking into account original construction sites and house sizes. An amount of US\$ 700 was granted to each beneficiary family in the form of direct help (the total cost of projects by beneficiaries amounting to US\$ 2,000, including the participation of beneficiaries, aid brought through international and local support systems, the development of training materials, the implementation of the necessary training activities, sensitisation campaigns, etc.).

Through the project, local populations succeeded in reinvesting their living spaces and now benefit from safer homes. In addition, the techniques are replicable by most and accessible in technical and in economic terms.

Below: a house repaired in the framework of the project



OVERVIEW / CAP ROUGE

- 40 % AFFECTED HOUSES
- 15 % DESTROYED
- 25 % DAMAGED
- 16,000 HABITANTS
- 550 DAMAGED HOUSES
- 205 DESTROYED HOUSES
- A RURAL EXODUS THAT FEEDS THE SLUMS OF JACMEL AND PORT-AU-PRINCE



Above: example of a house repaired in the Cap Rouge area through the repair programme conducted by VEDEK

Below: training construction site in Cap Rouge, repair and reinforcement of existing structures



Below: some of the achievements of the project - houses and water tanks repaired in the framework of the project



PARTNERS: EDM / CRATERRE
 PLACE OF INTERVENTION: CAMP CORAIL & CARREFOUR FEUILLES
 TIME OF INTERVENTION: APRIL 2011 TO NOVEMBER 2014
 TYPE OF INTERVENTION: CONSTRUCTION OF SUSTAINABLE
 WOODEN FRAME BUILDINGS



EdM REBUILDING HAITI FOR THE PEOPLE OF HAITI, BY HAITIANS ARTISANS

After the earthquake of January 2010, Entrepreneurs du Monde quickly initiated discussions to develop housing models both accessible and adapted to families most in need and affected by the earthquake. This action was made possible thanks to the organisation's long-term involvement in Haiti.

An exchange was immediately initiated with CRATERRE on the basis of housing models developed with PADED. Entrepreneurs du Monde's team was inspired by this and decided to adapt said models to the urban context, in particular by developing the possibility of adding extra levels to the buildings. Through the reuse of debris from the earthquake as backfill and of gravel and sand as structural filling and the manufacture of roofing tiles, the issue of recycling became fully integrated as part of the building process.

In May 2012, the Ministry of Public Works, Transport and Communication (MTPTC) validated this method of construction, assuring the Haitian public of its viability and resistance capacity. Moreover, all the housing units built by Entrepreneurs du Monde weathered Tropical Storm Isaac (August 2012) and Hurricane Sandy (October 2012). Notably, not a single tile was torn, testimony to the relevance of this type of roofing in cyclonic areas.

To facilitate the access of disadvantaged families to housing, Entrepreneurs du Monde experimented with a sustainable financing method, including home loans. This financial product, developed jointly with ID Microfinance, is tested with families from the neighbourhood of Carrefour Feuilles and Christ-Roi.

SUPPORTING HAITIAN ARTISANS

Construction projects are an opportunity for Entrepreneurs du Monde to train artisans in timber frame building through technical training courses adapted to the major stages of construction.



Wood frame wall panels filled with masonry debris



Above: clearing and collection of earthquake debris in the streets of Port-au-Prince

Below: some of the implemented structures





Above and right: community buildings, future bus station, Port-au-Prince

Below: two-storey building, business incubator, Corail Croix des Bouquets



To date, more than fifty artisans have been trained and their skills have been validated. Following this training, Entrepreneurs du Monde offers to accompany artisans in the creation and management of their own business, with the goal of enabling motivated entrepreneurs to enhance their expertise and create an income-generating activity.

With the support of Entrepreneurs du Monde, artisans and entrepreneurs founded the association @ProCom (Association des Techniciens et Professionnels en Construction Moderne) with the goal to pool their expertise and be better prepared to respond to customers' orders. @ProCom promotes timber frame construction and will eventually replace EdM in the training of new artisans and the supervision of construction sites.

BUILDING MODE DIVERSIFICATION

Early 2012, with support from the United Nations Development Programme, through funding from the Haiti Reconstruction Fund, Entrepreneurs du Monde constructed community buildings on behalf of the administration authorities of Port-au-Prince. This project has enabled to implement two-level buildings, comprising a chained masonry ground floor and a wooden frame upper level.

As part of the requalification project for the area of Christ-Roi, financed by the European Union, Entrepreneurs du Monde joined efforts with Solidarités International to focus on the «housing» component. This project will enable the construction of twenty house extensions, increasing the housing supply in the neighbourhood.



In 2014, the school construction project of Grand-Boulage (4th communal section of Thomazeau) for the Diocesan Office of Education of Port-au-Prince, funded by Misereor, represented a new step in the development of larger scale building: the 300 m² building hosts three classrooms and an administrative space over two levels. The originality and quality of the school demonstrate the multiple possibilities that timber construction can offer. By the end of 2014, a similar school was built in Baudin (6th communal section of Grand-Goâve).

This construction project is an initiative of the school community of Grand Boulage, involving students, parents, teachers and the priest responsible for the school. From the design phase, the community took part in the decision-making process, with over 150 community members actively involved in all stages of building, as simple manual labourers or as skilled workers having benefited from specialised training.



The project is in line with the principles of environmental protection and the valorisation of local knowledge. It is organised around several complementary components of environmental, technical, socio-cultural and economic nature.

Wood, which is all imported, is perceived as an expensive material. But its cost represented only 10% of the construction budget. However, its treatment, cutting and implementation required a large workforce, representing 2/3 of the construction budget, resulting in a very positive economic impact at the local level.

Below and top of the page: the school of Grand-Boulage, designed by architect Julien Hosta, built by the enterprise l'Atou under the technical supervision of EdM





INFORM, TRAIN, VALIDATE



The analysis of the January 12 earthquake shows that massive destructions are largely due to knowledge gaps, a lack of skills and shortcomings in terms of taking responsibility on the part of construction stakeholders, at all levels.

In response to this situation, CRAterre implements an educational workshop. The goal is to accompany the Haitian partners involved in reconstruction so that each site may become a place of transfer of skills at the three levels of responsibility (involving engineers, foremen and workers).

Several educational tools are developed. These comprise technical data, models and posters. In order to valorise the achievements of learners and facilitate the recognition of their capacities in the construction market, CRAterre and its partners have implemented a protocol to validate skills.

The skills of Haitian engineers and forepersons are validated following 4 criteria: design, organisation, technical control and communication. Confirmed foremen can in turn transmit and validate the skills of workers having completed several construction training sessions. For this purpose, a list of criteria was defined for five trades: excavation, bricklaying, joinery, carpentry and roofing work.

This way, CRAterre partners, namely EdM, École Atelier de Jacmel and UN Habitat could implement several instructor-training activities, involving different organisations from across the country. A long-term goal was to reinforce the link with the National Institute of Vocational Training (INFP) to formalise the teaching of building systems based on improving local building cultures and certify the skills validation protocol.



PARTNERS: GADRU- PADED / MISEREOR-CRATERRE
 PLACE OF INTERVENTION: BELOT, KENSCOFF
 TIME OF INTERVENTION: MAY 17 - MAY 19, 2012
 TYPE OF INTERVENTION: NATIONAL SYMPOSIUM
 «RECONSTRUCTION BY FARMER FAMILIES»



SYMPOSIUM ON RURAL SUSTAINABLE HOUSING

After one year of project implementations and the accomplishment of very concrete results in quantitative and qualitative terms, EPPMPH, PRESTEN, CONCERT-ACTION, GADRU, PADED member organisations, wished to meet with others to discuss experiences and share the variety of approaches stemming from the history and commitment of the groups of farmers involved.

This was accomplished through a seminar that brought together more than 50 professionals where presentations, discussions and group work allowed to establish progress reports and study the advantages and disadvantages of the proposed methodologies and habitat models. The sharing process enabled all participants to expand their vision of the issues related to the reconstruction of rural housing in Haiti, and all the challenges linked to it.

THE 50 PARTICIPANTS REPRESENTED:

- PADED MEMBER ORGANISATIONS
- TECHNICAL CONSULTANTS FROM PROGRAMMES FUNDED BY MISEREOR
- NGOS INVOLVED IN CONSTRUCTION ACTIVITIES (EDM, FOKAL FONHABISA, ITECA)
- REPRESENTATIVES OF VOCATIONAL TRAINING INSTITUTIONS (SALESIAN DON BOSCO)
- REPRESENTATIVES OF UNIVERSITY FACULTIES OF HAITI
- DONORS (MISEREOR, CARITAS FRANCE / SECOURS CATHOLIQUE)
- REPRESENTATIVES OF CONCERNED MINISTRIES (ISPAN, MTPTC)
- REPRESENTATIVES OF RESEARCH LABORATORIES (CRATERRE-ENSAG AND 3S-R)

CONCLUSIONS

Symposium participants drew the following conclusions:

Needs regarding rural housing:

- To strengthen the understanding of existing habitat;
- To meet the expectations of local populations in terms of housing improvement;
- To perceive the concept of housing in the broad sense: built and unbuilt spaces and their various functions (habitat, agricultural activities, crafts...).

In terms of costs, economy and financing:

- To increase cost breakdown knowledge in order to make more informed and, therefore, more relevant choices;
- To launch a process leading towards the implementation of relevant and sustainable building loan systems;



In terms of sustainable rural development:

- To ensure that projects stem from the community and that actual needs are met;
- To check the compatibility of projects with local development plans;
- To further reinforce capacity building, while taking careful account of cultural aspects, through checking the long-term validity of offered solutions.

In terms of land use:

- To avoid high risk areas (mapping);
- To check compliance of proposed projects with national policies;
- To check the validity of intervention logics in terms of development, based on the local territorial potential;
- To consider the two management systems: traditional and legal;
- To identify intervention areas, homogeneous or complementary, geographically as well as socio-economically;
- To work on the establishment of favourable conditions and, beyond housing, reflect on the improvement of accesses and basic needs;
- To encourage local leaders in establishing development plans and participate in the monitoring of their implementation.

PARTICIPANTS' COMMITMENTS

IN TERMS OF RESEARCH

Research must be pursued, but also structured, and it should focus, first and foremost, on fulfilling social needs through rapidly applicable solutions.

For this, it is necessary:

- To let demand emerge and clarify needs, through the PADED, by making use of its network;
- To make an inventory of needs and on-going research studies, and of the institutions that have a role to play in the area of habitat;
- To organise a national seminar focused on research, to find complementarities.

RECONSTRUCTION PROJECTS

Multiply and extend the project to other areas in order to achieve a satisfactory pace:

- To put forth prevention projects in areas prone to risk;
- To insist on implementing diagnosis practices and on the need for strategic planning;
- To get closer to other projects, especially projects dealing with infrastructures;
- To publish a guide on «programming and implementing reconstruction projects/improving rural housing».

IN TERMS OF TRAINING

Training is essential to ensure the quality of productions and the sustainability of results. Training must be strengthened and evolve towards becoming formal; for this purpose, it is suggested:

- To identify institutions that could introduce training modules into their curriculum, and to get in touch with competent National authorities;
- To write technical manuals tailored to the needs of each area;
- To implement training programmes for trainers;
- To develop more accurate certification protocols to validate skills, in terms of knowledge, know-how and experience.

COMMUNICATION

- To improve communication: internal communication between institutions and external communication to efficiently disseminate projects and promote the solutions that work;
- To organise specific meetings at PADED level;
- To identify other organisations and to organise other seminars;
- To consider adapting contents according to target, also taking language issues into consideration.



Above, group photo of participants at the conclusions meeting

PARTNERS: EDM / CRATERRE
 PLACE OF INTERVENTION: NATIONAL TERRITORY
 TIME OF INTERVENTION: FROM LATE 2011 TO MAY 2012
 TYPE OF INTERVENTION: NATIONAL CERTIFICATION OF BUILDING SYSTEM FOR SUSTAINABLE HOUSING MADE FROM RECYCLED EARTHQUAKE DEBRIS.



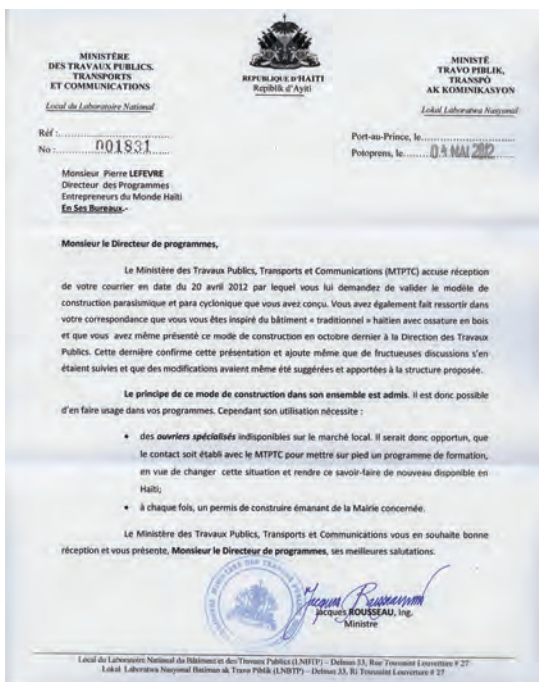
TECHNICAL CERTIFICATION

At the launching of the first buildings made in collaboration with Entrepreneurs du Monde in late 2011, engineers representatives of the Ministry of Works, Transport and Communications (MTPTC), inspired by the potential offered by the proposed construction system and its possible variants, suggested that a procedure should begin, leading to its official certification. This suggestion was also backed up by the UNDP - United Nations Development Programme, that supported the wide dissemination of the timber frame construction technique.

CRAterre and EdM compiled the technical file to be studied by the MTPTC, which carefully demonstrated the viability of timber frame technologies by reference to Haitian traditional buildings: the «kay peyi» rural homes and the large «gingerbread» townhouses. Foreign examples of constructions such as the «Pombalino» wall developed in Portugal after the 1755 earthquake reinforced the point.

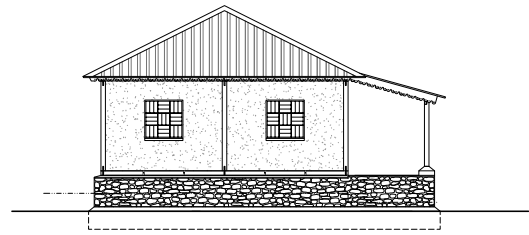
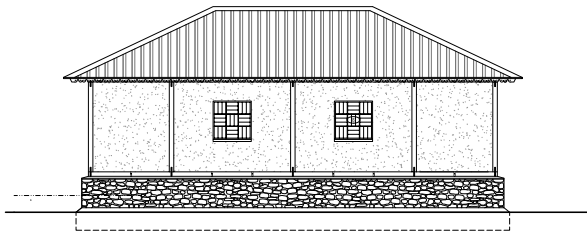
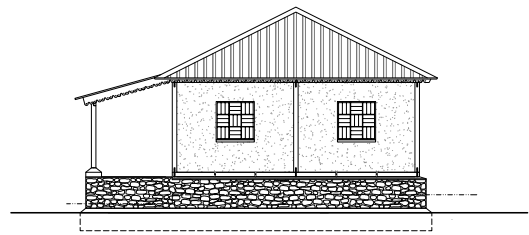
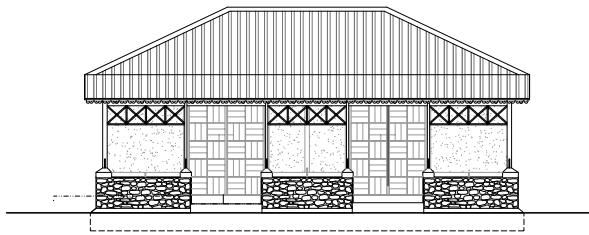
In May 4th, 2012, after several exchanges, the MTPTC validated the proposed construction system and its many variants. Recognising the need to develop skills so as to promote the dissemination of the technique, the MTPTC completed this validation with a request to further develop training efforts.

Left: MTPTC letter for the validation of the building system



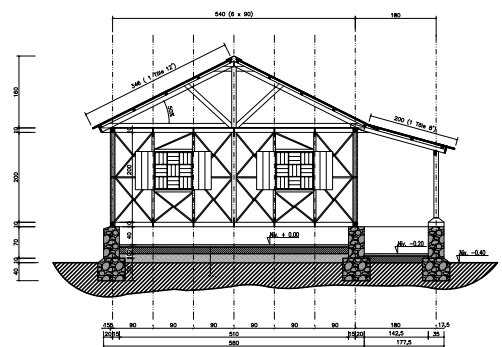
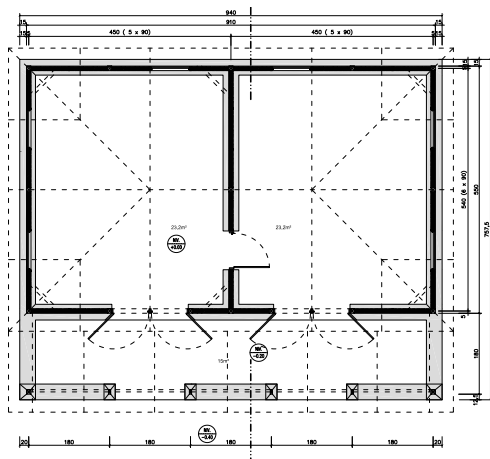
Below, and above on next page: example of a structure achieved through the application of this building system: business incubator, Osez l'Entreprise programme, Corail Croix des Bouquets





Plan, sections and facades of one of the building types certified by the MTPTC.

Above: Building implemented at business incubator, Osez l'Entreprise programme, Corail Croix des Bouquets.





Gingerbread model: wood-framed urban architecture with various filling types (earth, stone, brick) and/or cladding. The behaviour of these constructions during the earthquake was remarkable.

ARCHITECTURE & BUILDING SYSTEMS

From the preliminary missions, just after the earthquake, the initial approach consisted in the analysis of traditional architectures, in terms of technical relevance and their behaviour in disaster situations.

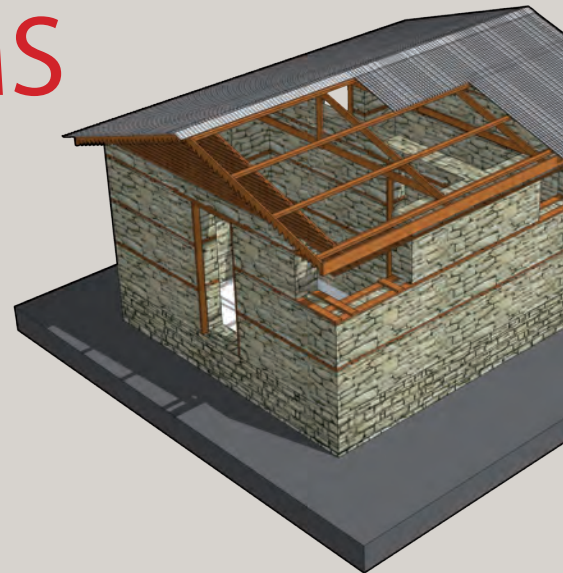
The idea was to extract meaningful and intelligent building principles and propose technical solutions that could valorise and improve them, as and when needed.

The project also considers rural housing as part of broader context involving agro-ecological activities. By valorising local skills and materials, the goal was also to make the farmers proud of what they could accomplish by making use of their own resources and cultural identity. It is also expected for housing units to be built based on the social production model for traditional housing: *boss+Kombit* (traditional system of mutual aid), thus contributing to strengthening social cohesion.

The idea was also to propose earthquake resistant design technologies that are accessible to most by being affordable and therefore easily replicable, in order to strengthen the capacity of rural families to relocate through their own efforts, with the support of engineers, foremen, carpenters and masons.

The basic models proposed are designed so that a core, basic housing unit may be built (or repaired) and later extended, depending on the needs and the means of each family.

«Ti'kay» house model, stone masonry, 22 m² basic module, 2 rooms without porch.



Below, the models proposed in the mountainous areas through the ENH-Presten project: stone masonry, chained with horizontal wooden seismic board arranged every 60 cm.





Above: housing model in stone masonry, one room with porch



«Ti'kay» home. The basic 22 m² module features one 15 m² main room and an adjoining porch.

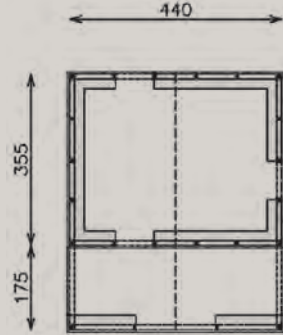
The main unit of the framed house is the panel. Depending on how the «boss» is used to work, and depending on the wood available, the panel size varies between 75 and 90 cm. The average panel size chosen for the projects is 85 cm.

Depending on regional preferences and contexts, different building and architectural solutions have been proposed, in which the size and proportions of the wood frame and stone wall base may vary.

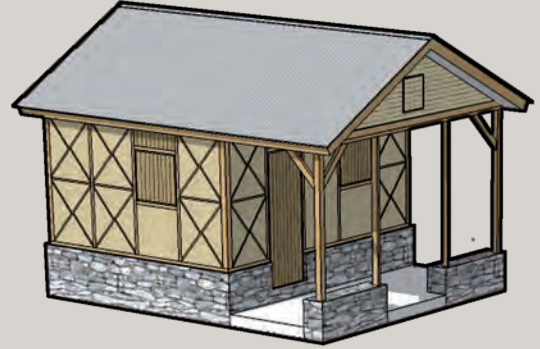


EXAMPLE OF MODULAR BUILDING PROPOSAL

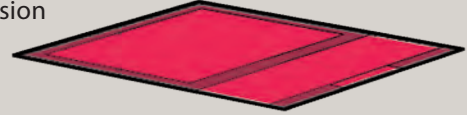
According to rural housing type, as identified locally Reconstruction in stages, starting from a 22 m² new built area (main room + adjoining porch). Other spaces are added later on, depending on the needs and resources of the family.



Basic module TYPE 2
5 x 4 panels, 15 m² +
front porch: 22 m².



Possible extension
by the family:
1 bedroom
Total: 38 m²

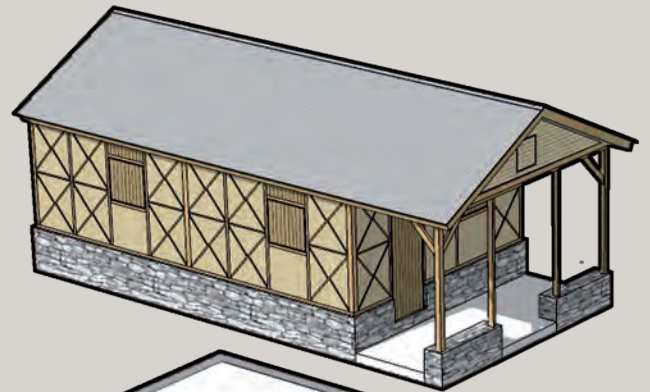


BASIC MODULE AND UPGRADEABILITY

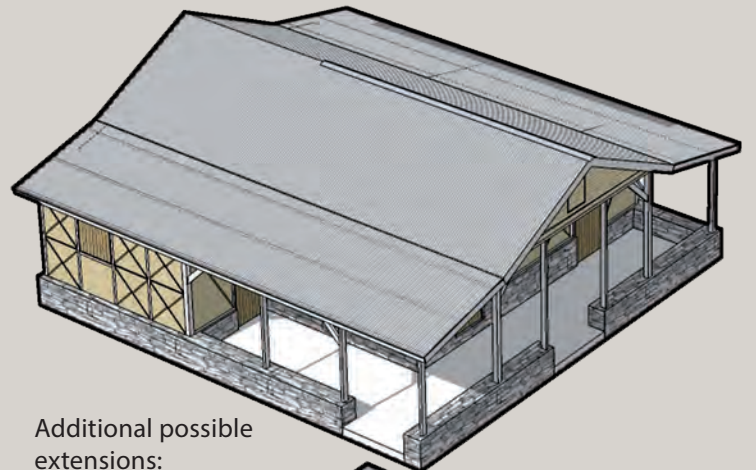
Each Haitian house or rather each compound corresponds to one family unit. When a young couple gets married, a house is built, with the assistance of a «boss» (artisan). Farmer families extend their homes over time, according to their means. Most of the time, homes are built in stages.

The traditional typology of structural spaces in rural houses features region-specific spatial variations, according to locally-available materials, site topography, needs, etc.

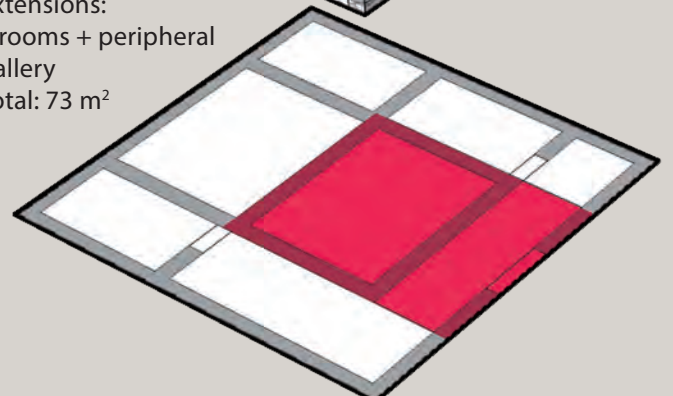
The flexibility and modularity of the basic housing system developed allows to offer a number of technical and spatial solutions that take into account the identity of each region. Different options in terms of materials, roofs, porches, and finishes are possible.



The economic situation is improving gradually, a few beneficiaries starting to build on their own, extending their home while following earthquake-resistant principles



Additional possible
extensions:
3 rooms + peripheral
gallery
Total: 73 m²



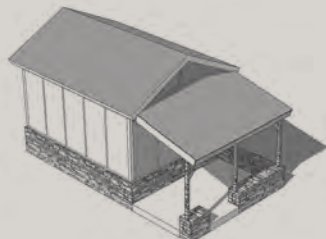
The first construction training activity at Petit-Goâve was completed in 17 days, despite daily rains. Eleven artisans were trained. To counteract the initial scepticism expressed by some, sensitisation meetings were held, to explain and promote the ingenuity of local building cultures. At the end of the training programme, all the artisans were proud to have participated in the completion of such a beautiful home!



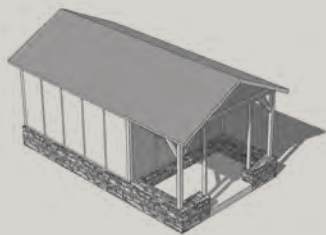
BASIC MODULE EXAMPLES offered according to different programmes

MODULE TYPE 1 / 5 X 4 - 7 X 4
Total surface 22m²

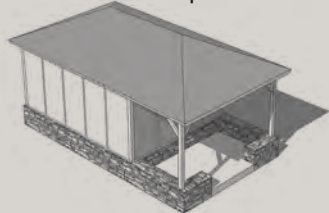
1 room / front gallery



1 room / front porch



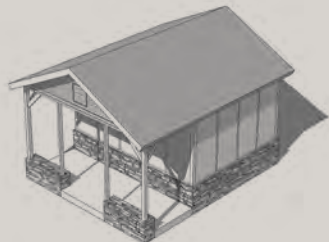
1 room / front porch / 4 roof slopes



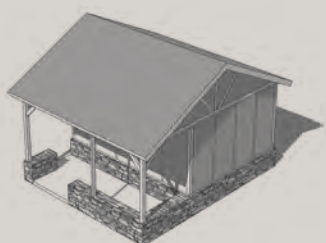
1 room / front porch



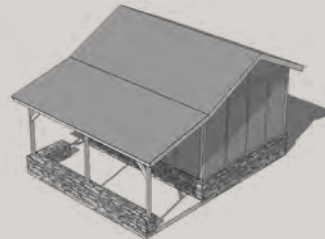
1 room / front porch



1 room / lateral porch



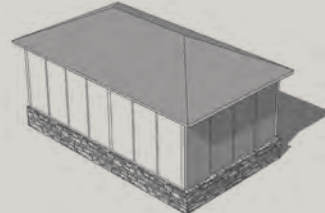
1 room / side gallery



2 rooms

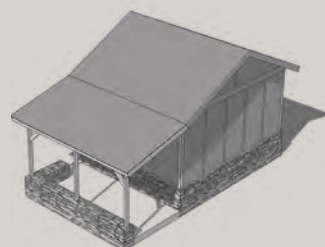


2 rooms / 4 roof slopes

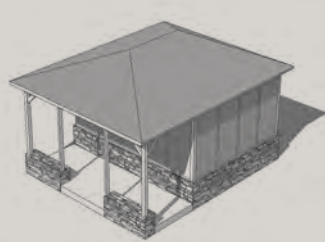


MODULE TYPE 2 / 5 X 4
Total surface 22m²

1 room / side porch

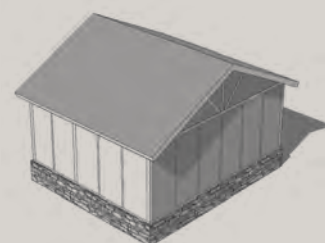


1 room / front porch / 4 roof slopes



MODULE TYPE 3 / 4 X 5 to 6 X 6
Total surface: 22m² basic module

1 room / 29m²



Improved wicker-covered (clissage) panels, with panel dividers and central stiffening rod for wattle structure.



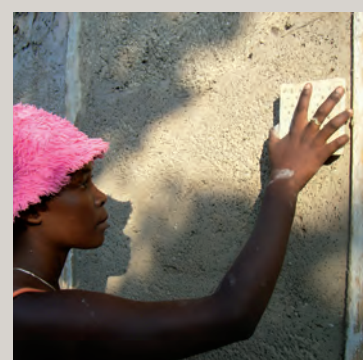
BUILDING SYSTEMS & MATERIALS



BUILDING IMPROVEMENTS

Different improvements on traditional techniques have been achieved through the project. Improvements are based on the enhancement of the structural behaviour of buildings over time, in the following situations:

- Earthquakes: height of buildings, strategic positioning of openings, strengthening of structural bracing, improved joints and connections, improved constitution of stone walls, masonry confinement, etc.
- Cyclones and floods: placement of buildings, improved roofing and framing anchors, improved wall base quality, etc.
- Problems dealing with «normal» wear: water and moisture management, wood preservation, protection against termites, quality finishes, maintenance management, etc.



Training and involvement of women at various stages of the construction process, namely on the treatment of surfaces (coatings/finishes) in which women excel



Farmers use local materials: stone, sand, wood, earth, sisal. The latter is used in cob, adobe blocks, and added to mortar for stone masonry



«Ti-woch» partition panels with stone and earth infill and confined masonry. Sand and lime plaster finishing



Training on the laying of stone walls and on the need to use tabs to bond masonry



Introduction of adobe as a new infill alternative in areas where stone is hard to find, and as a way to limit the use of palm wood for wattle



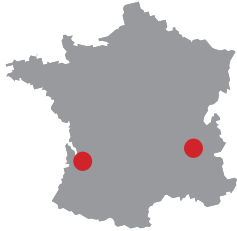
Wooden frame reinforced with metal connectors, metal strip in this case

LOCAL MATERIALS

All materials meant to constitute the wall bases, the bearing walls or to be used as structural infill are naturally selected among the locally accessible resources. The extended use of such materials offers a triple benefit:

- **Affordability:** these materials are collected near construction sites, or are cheap and may be inexpensively transported;
- **Accessibility of resources:** construction sites are often located far from materials' supply centres and/or are not easily accessible;
- **Technical accessibility and replicability:** the use of these materials often relies on local expertise in the areas of intervention.

PARTNERS: ANR : CRATERRE/ENSAG & UJF/3SR
 PADED/GADRU, PAPDA/VEDEK
 PLACE OF INTERVENTION: GRENOBLE / TRENTO
 TIME OF INTERVENTION: JULY 2010 - JANUARY 2014
 TYPE OF INTERVENTION: RESEARCH IN THE FIELD OF
 RECONSTRUCTION OF EARTHQUAKE-RESISTANT HOUSING
 STRUCTURES.



ReparH EARTHQUAKE-RESISTANCE EVALUATION OF TIMBER-FRAMED STRUCTURE AND INFILL

Earthquake resistance study of a wooden frame filled with stone and earth mortar

OBJECTIVE

Following various earthquakes (Haiti, Pakistan, Italy, etc.), it was noted that traditional braced timber-frame structures were relevant in disaster situations. However, technicians responsible for reconstruction programmes do not consider such constructions as possible options for reconstruction. This study aims to provide scientific evidence of their resistance, so as to grant them greater recognition in (re)construction projects, in Haiti and elsewhere.

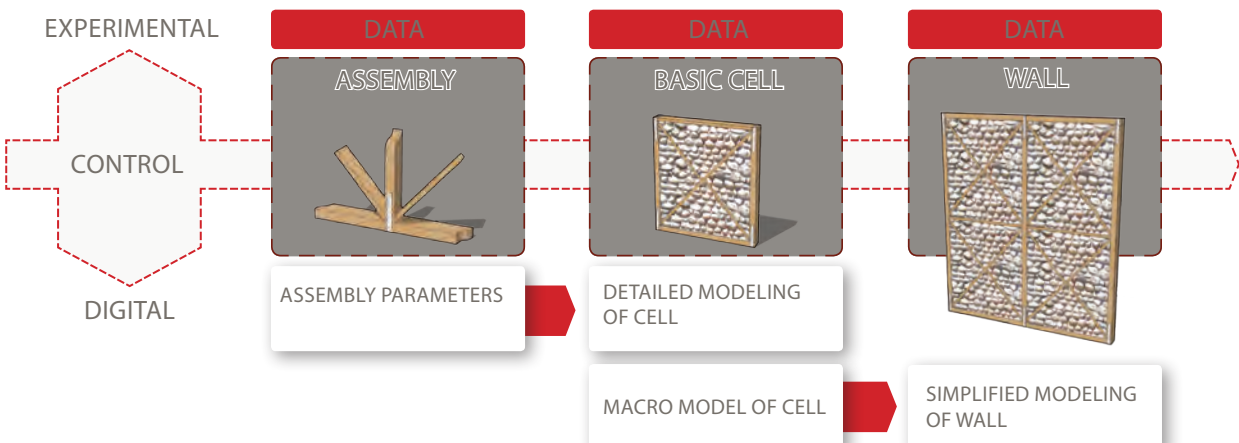
STUDY PRINCIPLE

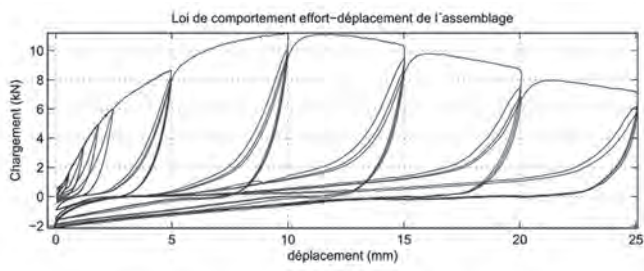
In order to study these structures, a basic model was chosen: the one used in Haiti in the projects supported by Misereor and Caritas France/Secours Catholique. This

model results from the observation and adaptation of traditional buildings in rural contexts. The study was done at different scales (assemblies, cell, wall, whole house) to allow for an understanding of the behaviour of each element within the structure. To achieve this, tests were made on the different elements composing the structure, until rupture was reached. Computer modeling simulations (stress computation software) were done simultaneously, expecting to predict behaviours without going through testing.

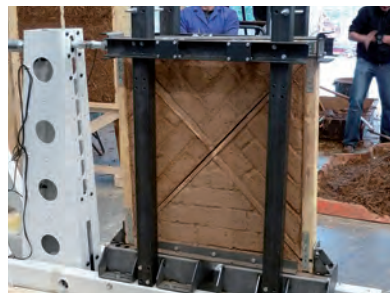
RESULTS AND OUTLOOK

The study confirms that these structures perform excellently during earthquakes (in terms of resistance and behaviour). While different models can be tested, it is also important to tests building models composed of two or more storeys, a challenge to the rational urbanisation of peri-urban areas.

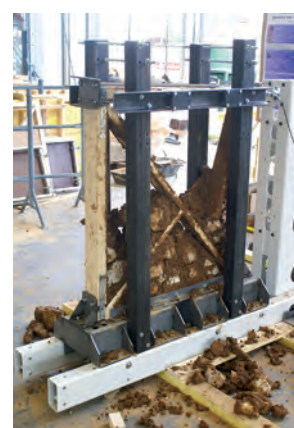
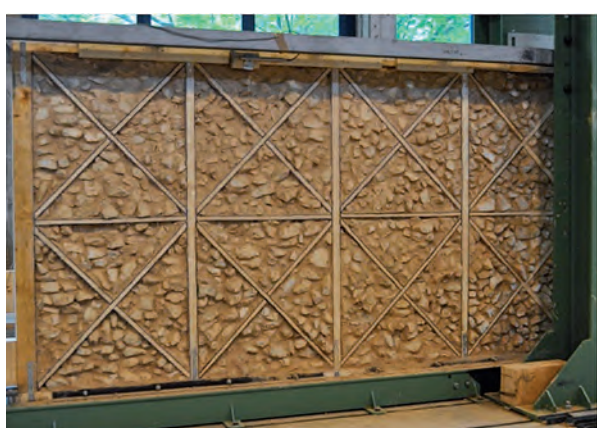




Different tests made to understand the behaviour of the structure under stress

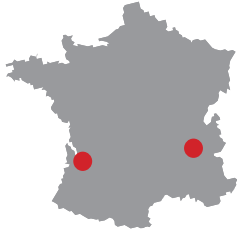


Above: a series of tests with the mini reaction wall on wall cell unit with different infill



Left and right: tests with the reaction wall with stone and mud mortar

PARTNERS: ANR : CRATERRE/ENSAG & UJF/3SR
 PADED/GADRU, PAPDA/VEDEK, FCBA
 PLACE OF INTERVENTION: FCBA-BORDEAUX
 TIME OF INTERVENTION: APRIL-MAY 2013
 TYPE OF INTERVENTION: SEISMIC TESTS FOR A HOUSE
 ON VIBRATING TABLE, PERFORMED AT FULL SCALE



ReparH SEISMIC TESTING OF WHOLE HOUSE



Seismic study of a structure filled with stone and earth mortar, performed at full scale

OBJECTIVE

To provide scientific proof of the stability of proposed structures, from a technical point of view but also taking into consideration the protection of its occupants.

PRINCIPLE OF THE STUDY

The house is built on a vibrating table that can be controlled to simulate earthquakes through a digital signal. This way, different seismic signals, including that of the Haiti earthquake in 2010, could be tested.

RESULTS

The house resisted very well to all the forces it was subjected to. The first visible effects on the structure occurred only after testing 300% of the amplitude of the Haiti earthquake signal, where two stones fell. More damage appeared after testing the distant signal of Guadeloupe at 380% (maximum possible level for the vibrating table) where two triangular-shaped infill portions fell under the effect of a peak acceleration of 1.2 g and the wooden frame remained almost unscathed (see photo on previous page). This is remarkable if we consider the violence of the simulated seism. Finally, not even the white noise (steps 11 and 12) succeeded in destroying the structure. This proves the excellent performance and durability of such structures relative to seismic risk.

PERSPECTIVES

A considerable amount of recorded data must now be analysed. This will help to refine the modelling strategy and consider the study of more complex buildings, including multiple-level structures.

KEY STAGES OF TESTING

1. **MODAL ANALYSIS:** VERY LOW AMPLITUDE SEISMIC SIGNALS (WHITE NOISE) CAN DETECT THE NATURAL FREQUENCIES OF THE STRUCTURE AND THUS CONFIRM THE DIGITAL MODEL USED.
2. **HAITI EARTHQUAKE AT 100%:** THE CHOSEN SIGNAL SIMULATES THE ACCELERATION, VELOCITY AND DISPLACEMENT OF THE HAITI EARTHQUAKE OF 2010.
3. **WHITE NOISE:** ALLOWING TO MONITOR THE EVOLUTION OF FREQUENCIES WITHIN THE STRUCTURE. INDEED, THE LOOSENING AND DAMAGE TO BUILT STRUCTURES CAN BE ANALYSED THROUGH THE VARIATION OF THESE FREQUENCIES.
4. **HAITI EARTHQUAKE AT 200%:** THE ACCELERATION, VELOCITY AND DISPLACEMENT OF THE EARTHQUAKE WERE MULTIPLIED BY 2.
5. **HAITI EARTHQUAKE AT 300%:** MULTIPLICATION BY 3
6. **WHITE NOISE**
7. **GUADELOUPE EARTHQUAKE 100%:** A VERY POWERFUL SEISM.



Below: hydraulic jack activating the vibrating table



Below, down: instrumentation of the house - accelerometer, LVDT, sensor network and data acquisition bench



Below, down: the team that implemented the construction of the timber structure filled with stone and sisal reinforced earth mortar



Above: testing during final white noise stage (step 12)

Below: the house before testing



PARTNERS: IRATAM/SOCIETE CAPOISE D'HISTOIRE ET DE PROTECTION DU PATRIMOINE/ANR/CRATERRE/MNHN

PLACE OF INTERVENTION: CAP HAÏTIEN

TIME OF INTERVENTION: MAY 2012 TO AUGUST 2013

TYPE OF INTERVENTION: ETHNOLOGICAL RESEARCH ON DISASTER-RESISTANT BUILDING CULTURES



IRATAM INSTITUT DE RECHERCHE ET D'APPUI TECHNIQUE EN AMÉNAGEMENT DU MILIEU CAP-HAÏTIEN STUDY

OBJECTIVES

As part of an internship with CRATerre and the Haitian organisation IRATAM, the study aims at opening new paths for research, linking the «ethno-ecological» and «building cultures» approaches in the region of Cap-Haïtien, which is characterised by its remarkable architectural heritage exposed to hazards of recurrent nature (floods, fires) or perceived as imminent (earthquakes, tsunamis). It allows to move forward on research on local disaster-resistant building cultures, incorporating all possible contributions linked to social sciences and the humanities.

ACTIVITIES IMPLEMENTED

A 2-month field survey study was developed in Cap-Haïtien, combining participant observation, semi-structured interviews and theoretical and methodological exchanges with local stakeholders. It was supplemented by an analysis of the categorisation and representation of housing systems and of natural risks as perceived by stakeholders.



Above, right: «A» street, main artery of the city

Here, an example of an «atypical» mid-Twentieth century house



RESULTS

This new approach has opened tracks in which ethnographic methods could bring about useful data. Living modes and the use of space have been analysed, and the ways in which they are reinvested and redefined by urban populations have also been studied. A description of local specificities in housing production allowed to understand its evolution, technological patterns and the social organisation linked to it. The ethno-ecological approach offered an overview of the use and categorisation of natural resources as building materials. It also contributed to reveal the importance of the representations and appropriations of «natural hazards» by local populations, and their integration into building practices.

PERSPECTIVES

Field experience opens up new avenues into more in-depth research, by contributing to define a methodology for the interdisciplinary analysis of local building cultures. These approaches could potentially be adopted by local organisations wishing to develop their own analysis tools.

Left and above: 1890-1915 architectural style, masonry storey with wood and iron balcony

Left: low house with gable roof, late 19th century, and recent arrangement of a storey, 21 D street

PARTNERS: INTERNATIONAL FEDERATION OF RED CROSS AND RED CRESCENT SOCIETIES
PLACE OF INTERVENTION: ALL AREAS AFFECTED BY THE EARTHQUAKE
TIME OF INTERVENTION: APRIL - MAY 2012
TYPE OF INTERVENTION: CONSTRUCTION OF SUSTAINABLE HOUSES FROM RECYCLED EARTHQUAKE DEBRIS



Below: provisional relocation camps in Port-au-Prince, IFRC



ASSESSMENT OF RELOCATION ACTIVITIES IFRC

Mr. Peter Rees-Gildea, in collaboration with CRAterre, contributed to the evaluation of relocation activities (2010 – 2012, with more than 30,000 families supported) set up by the International Red Cross and Red Crescent Movement. CRAterre was also involved in the coordination of seminars following this evaluation study.

Lessons learned and good practices from rehousing programmes implemented by the IFRC in Haiti between 2010 and 2012

As part of one of the largest resettlement operations ever implemented, the IFRC deemed appropriate to analyse the strengths and weaknesses of the various actions set up, in order to draw lessons and good practices for the future.

The IFRC has contributed to the permanent or temporary relocation of more than 30,000 families. The main lessons learned from this experience have to do with the quality of projects, and are closely linked to their adaptability, flexibility and to the development of capacities to understand and learn from local initiatives, as well as to the integrated approach applied to situations encountered.

The relocation of affected populations is a complex enterprise. It requires not only a physical structure, but also a contextual understanding of the environment and of local social, cultural, technical and economic aspects. Such relocation assistance programmes, when based on the correct understanding of the strengths, weaknesses and evolution of local architectures, are great opportunities to strengthen and support local populations towards achieving a safer, permanent reconstruction.

CRITERIA FOR DEFINING THE ARCHITECTURAL MODELS TO BUILD

ENVIRONMENT

- RISKS
- CLIMATE
- LOCAL AND GLOBAL IMPACT
- ACCESS / LOGISTICS

SOCIAL

- SECURITY
- INTIMACY
- SERVICES
- IMPACT ON THE LOCAL ECONOMY
- COHESION OF LOCAL COMMUNITIES

CULTURAL

- AESTHETICS AND APPROPRIATION
- SOURCES OF INCOME
- LOCAL SPATIAL USE PRACTICES, VALUES LINKED TO HABITAT
- GOOD LOCAL PRACTICES

TECHNICAL / ECONOMIC

- RECYCLING
- DURABILITY AND MAINTENANCE
- POSSIBILITY OF HORIZONTAL AND VERTICAL EXPANSION
- ECONOMIC IMPACT
- IMPACT ON SAFETY OF RESIDENTS AND RESILIENCE



Below: Norwegian Red Cross project



PARTNERS: EDM / CRATERRE
 PLACE OF INTERVENTION: JÉRÉMIE
 TIME OF INTERVENTION: FEBRUARY 2013 - MAY 2014
 DISASTER: HURRICANE SANDY
 TYPE OF INTERVENTION: POST-CYCLONE REPAIR OF RURAL HABITAT IN JÉRÉMIE



IFRC INTERNATIONAL FEDERATION OF RED CROSS AND RED CRESCENT SOCIETIES

SITUATION AFTER HURRICANE SANDY
 DATE : 23-26 OCTOBER 2012
 POPULATION : 195 300 AFFECTED
 20 000 EVACUATED PERSONS
 2 298 HOMELESS PERSONS
 DAMAGE: 6 666 HOUSES DESTROYED
 24 348 HOUSES DAMAGED
 9 352 HOMES FLOODED

Three levels of assistance were offered:

- 100 families received a subsidy of US\$ 2,050 to rebuild their homes and latrines.
- 414 families received a US\$ 750 grant to repair and reinforce their existing housing.
- 1186 families received a US\$ 100 grant to implement minor repairs necessary to improve the quality of their housing.

POST-CYCLONE REPAIR OF RURAL HABITAT IN JÉRÉMIE

Following an emergency-response phase, the project distributed financial assistance to beneficiaries, coupled with technical training. Local artisans were trained in techniques for the improvement of local housing structures, using locally available materials in the territories concerned.

In each region concerned by the project, artisans (a total of 140 artisans in 10 different territories) were trained in the implementation of best practices to improve local housing. Project beneficiaries were encouraged but not forced to hire said artisans to carry out repair/reconstruction works on their homes. The only requirement for beneficiaries was to integrate the construction details promoted by the project.

Responsibility for organising the construction was entrusted to beneficiaries, while the project provided technical support through each stage of the process.





Alongside the repair/reconstruction activities, a sensitisation campaign on good building practices in risk areas was held. Over 10,000 people were thus sensitised.

It is interesting to note that before the end of the project, several non-direct project beneficiary families incorporated many of the technical details developed and promoted through the project.

Testimony of a beneficiary: «I did not understand why I had to buy materials and hire artisans, and why the IFRC did not just build a house for me. But when I completed my house, I realised that I was able to do it by myself, and that I would be able to do it again if necessary».



PARTNERS: UN-HABITAT, ECOLE ATELIER DE JACMEL, GADE HAÏTI, ATECO, MEDAIR, SPANISH RED CROSS, CANADIAN RED CROSS, NETHERLANDS RED CROSS, INTERNATIONAL FEDERATION OF RED CROSS AND RED CRESCENT SOCIETIES

PLACE OF INTERVENTION : SOUTH EAST DEPARTMENT; JACMEL

TIME OF INTERVENTION: FEBRUARY 2013 - MAY 2015

TYPE OF INTERVENTION: POST-CYCLONE REPAIR OF RURAL HABITAT IN JÉRÉMIE



UN-Habitat

STRENGTHEN THE CAPACITY OF LOCAL ACTORS

The overall objective of this project is to strengthen the capacities of institutions and partners that deal with local building cultures, through the training of a significant number of artisans and the implementation of sensitisation campaigns on traditional construction in the South East department.

Specific project objectives are as follows:

1. Develop a teaching module on local building cultures and best practices on traditional construction, and make it available to the Ecole Atelier of Jacmel and its partners.
2. Strengthen the technical capacities of the Ecole Atelier of Jacmel, so that this institution may conduct training activities for the new proposed teaching module.

The stages of the project developed as follows:

- Visit of intervention sites by the different partners and analysis of local building cultures.
- Identification of relevant technical solutions to be developed, proposal of a model house prototype to serve as support for training activities.
- Development of a training-of-trainers programme.
- Development of a Training Kit.
- Implementation of a training construction site, in partnership with the Ecole Atelier of Jacmel, aimed at the technical staff of partner organisations.
- Support of partners reflecting on their training project for artisans specialising in vernacular architecture.
- Implementation, in partnership with UN-Habitat, of a one-day onsite seminar on local building cultures.
- Development of promotional tools of activities implemented through the project (technical manual, videos...).



The Training Kit was developed so that the Ecole Atelier of Jacmel could set up this type of training. The kit contains:

- Course session plan forms for the trainer to prepare the lessons. The forms may be changed according to the needs and objectives defined by the trainer.
- Data forms giving the trainer basic information to prepare the sessions, which can be completed by using the additional documents also made available or by integrating other data from sources selected by the trainer.
- Info and photo cards to be used as support during course sessions. Didactic forms can be made available to students. Depending on the educational resources available to the trainer (projector, flip chart, board), diagrams and principles may be shown or redrawn on board.

A technical manual containing a compilation of educational forms featuring essential data was published. It was distributed among the trained artisans.

Following the training programme, project partners were able to educate more than 500 artisans throughout the Southeast department, through the implementation of more than 1,500 buildings (new or rehabilitated housing, public buildings, development of temporary shelters into permanent housing, etc.).



PARTNERS: **PLANÈTE URGENCE / FONDATION ABBÉ PIERRE**
 PLACE OF INTERVENTION: **RURAL AREAS NEAR JACMEL**
 TIME OF INTERVENTION: **MAY 2014 - JULY 2016**
 TYPE OF INTERVENTION: **HISTORICAL RURAL HOUSING CONSTRUCTION**



PLANÈTE URGENCE A ROOF, A FUTURE



Assisted construction of 60 housing units for rural disadvantaged families and skills' strengthening for local construction stakeholders.

BACKGROUND

This project represents the third phase of the project «a Roof, a Future» that has, since 2010, enabled the construction or improvement of homes for 310 highly vulnerable families living in rural areas, mainly in Lamontagne, near Jacmel.

During the first two phases, the project strengthened the skills of local artisans in the fields of construction and rehabilitation, taking extreme natural disasters into consideration and working around 2 construction techniques: chained masonry and gabion, proposed by Architecture et Développement.

Among the different solutions offered, the approach put forward by CRAterre consisted in valorising traditional materials and know-how. This approach was applied during the training of artisans in Jacmel with UN-Habitat, and seems particularly relevant and complementary to the approach used by Planète Urgence and its partners.





OBJECTIVES

Granting access to housing to disadvantaged families and to the homeless youth in rural areas surrounding Jacmel, Caye Jacmel, Marigot and La Vallée (South East department):

- By supporting the assisted construction of homes for 60 vulnerable and isolated families in rural areas surrounding Jacmel, Caye Jacmel, Marigot and La Vallée.
- By transferring to artisans and self-builders adapted and accessible skills and knowledge for sustainable (re) construction.
- By perpetuating activity and industrial sectors.

The philosophy supporting this phase of the project lies in enabling not only the sustainable and decent rehousing of families in need, but also in promoting the traditional techniques of rural construction, improved through the assistance of an architect responsible for designing the models to build, based on proposals by CRATERre.

The idea is to valorise:

- Families, by granting them access to an aesthetically pleasing, comfortable and well built home that is affordable to them as well.
- Artisans and workers, by getting them acquainted with traditional building gestures and techniques that have been stood the test of time.
- Local timber, by promoting the reforestation of all species exploited in construction; the programme is complemented by PU reforestation activities, amounting to 50,000 planted trees in 2014.

SPECIFICITIES

The design and preparation work conducted in the summer of 2014 by Carolyn Garcia (architect, specialized in disaster-resistant construction, LI'nCS association), and the team of PLANÈTE URGENCE, focused on the development of not only a housing model, both modular and extensible, but also of training materials aimed at artisans and of supports for the supervision of construction works.

Responsibility for site supervision work was given to ATECO (Construction Technicians' Association), a local group, so as to ensure the sustainability and dissemination of all techniques applied. All of this led to making a number of technical choices in order to better adapt the model, including the use of local wood and of tiles manufactured in the area. The option to revive the production of lime locally, using more environmentally friendly processes, was also evoked.

RESULTS

In October 2014, the first house is built in the context of a training construction site where 2 technicians from ATECO and 22 artisans (masons and carpenters) would meet each day. The beneficiary family for this home was selected due to its situation, first of all, but also for its ability to share its experience with other families and visitors.

At the same time, the first beneficiary families started to prepare the ground for their house to be built, by clearing the site and gathering materials.







The work undertaken in Haiti, in partnership with several local and international stakeholders, took different and complementary forms, while enabling important synergies. Five years after the disaster, results are tangible and measurable, in quantitative and qualitative terms, both in the field and concerning the reflection carried out on methods and practices.

The various projects that we have participated in have enabled the construction or the direct rehabilitation of about 3,000 houses. However, the adoption by other organisations of the «building cultures» approach also produced indirect effects, with the wider distribution of models (technical and methodological) and an additional number of basic housing constructions estimated at more than 1,000. This is both too much and too little - insufficient regarding the country's needs, plenty when considering the number of permanent homes made accessible to families in need. All these constructions, soon to surpass the 5,000 units mark, represent a considerable portion of the sustainable buildings that have been achieved as part of the «National reconstruction» process.

After the necessary preliminary stage, where diagnostics and studies were carried out to understand the specific context and dynamics, it soon became possible to launch the first experimental constructions that have allowed demonstrating, convincing, and also identifying needs for adjustments with all concerned parties. It was also necessary to prepare, together with the local partners, the implementation of projects, both from a technical point of view (architecture and construction requirements, training, etc.) as from an organisational perspective (activities, logistics, coordination, administration, financial management).

In this process, the certification of the building system by the Ministry of Public Works (MTPTC) represented a decisive step, enabling the validation of scientific hypotheses and giving confidence to some of the partners and local stakeholders regarding the ability of all construction systems developed to withstand hazards. Later, the excellent results obtained on the vibrating table tests have contributed to dissipate any remaining doubts.

Due to a growing recognition of its qualities, gradually, other organisations started to request a «building cultures» focused approach, first among member organisations of the PADED and later through training and outreach efforts led by Entrepreneurs du Monde. However, this outreach effort was especially developed through the establishment of an educational engineering project aimed at 7 organisations, which was accomplished thanks to the joint efforts of UN-Habitat and the Atelier-école de Jacmel. These organisations are now able to carry out similar actions and train the professionals and trainers required to change practices in a sustainable way at the national level. Their actions therefore add to the capacities of the PADED, which, on its own, sustains a regular pace of construction of sixty houses per month.

Another important result has to do with the decrease of expenses, allowing the inclusion of more beneficiaries but also enabling a more lasting process. The construction costs for the basic models offered is quite reasonable (about US\$ 150 per m² for new structures and between US\$ 40 and US\$ 60 per m² for rehabilitation projects). Another outcome deals with the enhancement of local economic spinoffs. Indeed, the projects involve local populations and professionals mainly, allowing them to start income generating activities.



Since housing models are quite affordable, families are able to extend their homes by applying the proposed improved traditional construction techniques. *Kombits* that were revitalised pursue reconstruction efforts based on the principles learned. The results achieved are very important, given that, currently, international assistance during major disasters hardly covers more than 20% of the actual needs, and Haiti is unfortunately no exception to this rule. This culture of solidarity is remarkable in hard-to-reach areas, where construction *Kombits* remain active for the benefit of local communities, creating pathways and contributing to reforestation activities.

Moreover, an important and complementary set of publications was produced: technical manuals and forms, reference documents on competencies and their assessment, educational materials, plans, as well as articles that describe and popularise the implemented approach.

The project, or rather the collection of projects that were carried out in synergy, resulted in further significant progress. With the support of the ANR, it also became an opportunity to question the social pertinence of science and evaluate its added value, as well as to establish a dialogue between local knowledge and scientific knowledge, humanities and the social sciences, in the specific context of reconstruction activities. In this framework, beyond the two theses that were completed, other research results could be obtained, and new paths, having already been presented and discussed during various international meetings, could be explored.

This series of elements has undoubtedly contributed to achieve short-term goals in Haiti better and faster, but also to consider developing alternative reconstruction and development approaches, beyond the scale of the prototype, and to aim at sustaining an approach that has proven effective.

SOME SIGNIFICANT DATA FROM THE PADED PROGRAMME SUPPORTED BY MISE-REOR (AS OF NOVEMBER 2014):

- 782 22 m² houses (core units) built and 85 repairs of 35 m² existing structures conducted over 3 years.
- Capacity building: 7 engineers, 15 foremen and 273 masons and carpenters trained and validated following an evaluation protocol.
- Building pace: 1 foreman + 6 artisans, in collaboration with the *Kombits* can build up to 4 houses per month. Each construction site is managed by 1 mason and 1 carpenter over a period of 3 weeks, with 2 apprentices, evaluated after 6 projects have been completed.
- Cost of 22 m², excluding external technical assistance: US\$ 3,000 or US\$ 135 per m², including US\$ 1,700 spent on materials, US\$ 200 on transportation, US\$ 50 on tools, US\$ 450 on local skilled labour and US\$ 600 on monitoring and coordination from the local NGO.
- On average, the repair of 35 m² amounts to US\$ 900 for labour costs, plus the reduced sum of US\$ 1,000 covering materials and transportation. Skills are developed and different solutions are offered at a local level.



OUTLOOK, HAITI AND ELSEWHERE...



IN HAITI

The reconstruction of Haiti is unfortunately far from complete. While much has already been accomplished, needs are still great, especially concerning populations still living in camps or suffering due to inappropriate living conditions. Facilitating the construction of suitable housing structures in urban and peri-urban areas of various densities is thus a necessity. Needs in terms of quality infrastructures to ensure viable and sustainable built environments are equally important, especially with regard to the school sector.

The government of Haiti and a number of organisations put efforts into remaining connected to populations and communities still living in poverty or having no access to basic services. Beyond satisfying these basic needs, it remains imperative that efforts are still made so that harmful practices may be stopped, and to ensure that the transfer the knowledge generated towards professional, academic and research circles during the reconstruction process may be pursued.

Such are the major challenges that CRAterre and its partners, among others, are now invited to address, and for which they still need to be supported. From this perspective, it is clear that new methods and additional strategies must be developed to favour dissemination and a transition into a larger scale. This new phase will also be useful to take stock of the situation and generate new skills and knowledge, which will be useful to pursue activities in Haiti by integrating upstream interventions and prevention programmes, extending them to other countries also facing the consequences of hazards.

... AND ELSEWHERE

The rapid urbanisation and demographic changes that can be seen today result in cities growing at a fast and difficult to control pace, which will lead to the construction, in the coming decades, of an unprecedented number of homes and infrastructures. Nobody can be assured, far from it, on whether these new constructions will be climate-compatible and designed taking into account natural and human hazard related risks. Global climate change also tends to amplify the intensity and number of hazards. The multiplication of disasters that result from the combination of such demographic developments, climate change and the increase of hazards is costly and deadly, and will continue to be if we do not change our practices.

Faced with such challenges, the hegemony of an international model and a reduced number of «codified» building solutions, inaccessible to the greatest number, pose a problem. They often lead to the production of unsuitable structures that tend to create a greater dependence of populations on standards and rules that cannot be met.

This trend also has an adverse impact at the global scale (waste of resources, pollution, environmental impact, etc.) and may induce, as it has in Haiti, absolutely dramatic consequences. In Haiti, many concrete structures were improperly built for lack of resources, and this generated great human loss, as too many Haitians perished under the rubble.

In many contexts around the world, the generalised adoption of «exogenous» standards and models, particularly relative to housing, can sadly be observed, and this is even more dramatic when local populations end up denying the



value of local building cultures, which, paradoxically, often present undeniable technical, social and cultural qualities. Indeed, local building cultures result from a long process of adaptation to endogenous conditions, and involve experiments, practices and organisation modes rooted in local realities, taking natural hazards into account.

The need to make a better use of local building intelligences seems evident. By staying close to what is manageable by local populations and professionals, both technically and economically, our chances of success in strengthening local community resilience are greater. This of course does not impede the possibility to supply local populations with viable technical inputs based on research, when deemed necessary and if so requested.

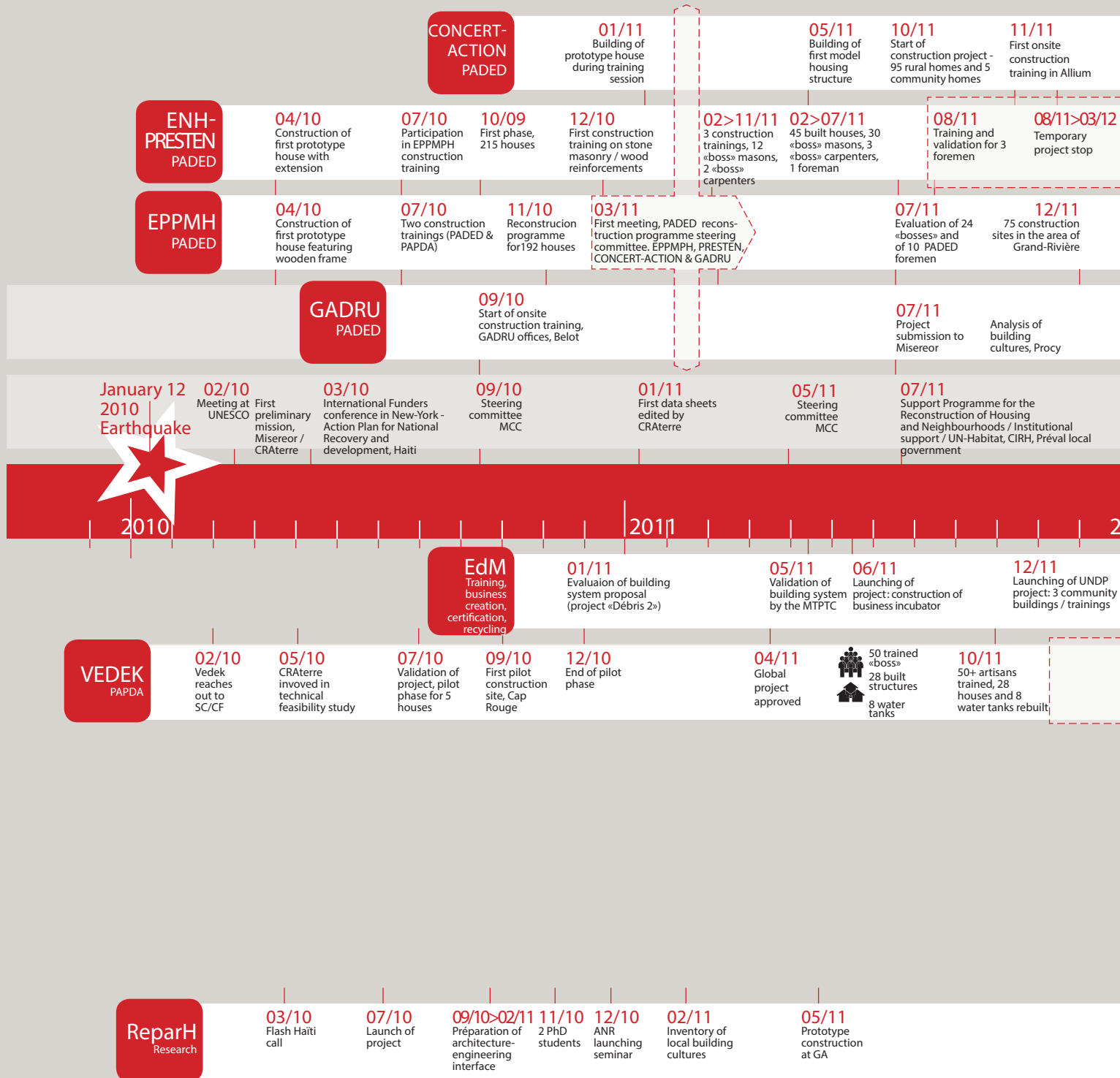
The recognition of the value and diversity of local building cultures is therefore a major issue, much like the need to protect biodiversity, which is generally shared and understood nowadays. This implies the implementation of inventory but also characterization efforts, to grant scientific value to what is too often regarded as empirical and unreliable.

The method allowing to successively identify needs, analyse a situation, characterise and offer elements of valorisation and, when necessary, suggest adaptations or improvements should also be better defined and elaborated/detailed. It would be very useful to conduct further pilot operations and to create opportunities for people to gather and share their experiences; in Haiti, such initiatives have already greatly contributed to build bridges between research and action. In addition, it seems essential to systematically associate reconstruction

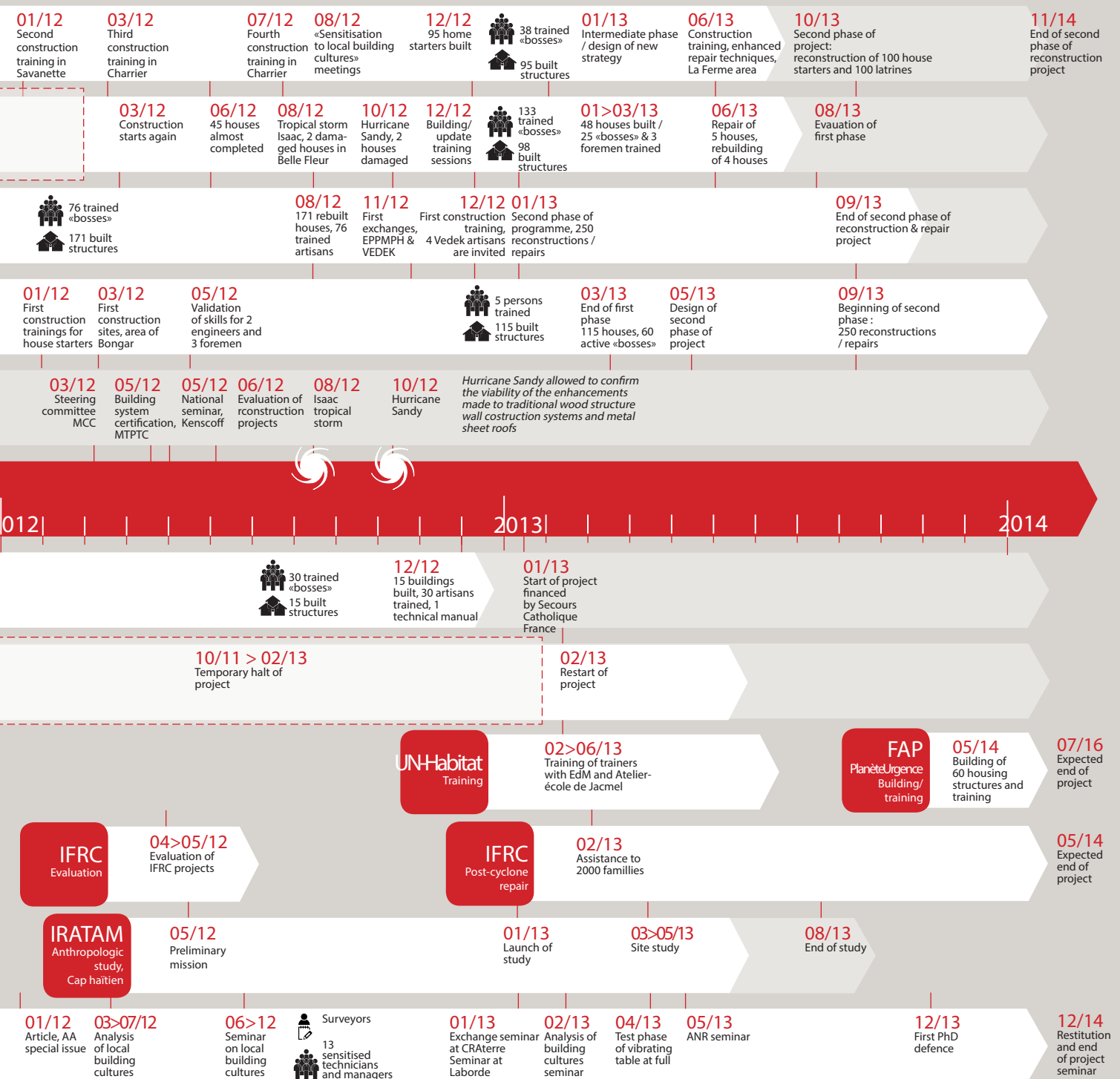
projects with research activities, at all stages: identification, diagnosis, design, planning, implementation, monitoring and evaluation.

It is also clear that the implementation of appropriate strategies requires the wide dissemination of information before disasters strike. It is indeed important that policy-makers, particularly local actors who always play a vital role in reconstruction, are made aware of the importance of taking local cultures into consideration, so that viable decisions can be made quickly from start of reconstruction efforts.

The implementation of prevention and risk-reduction programmes should be reflected upon as well, integrating information on local building cultures for stakeholders at all levels of decision-making, articulating training activities, fundamental and applied research activities, valorisation activities and the dissemination of «good practices».



TIMELINE CHRONOLOGICAL PATHWAY OF THE DIFFERENT PROJECTS





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NOUS VOUS AIDONS À AGIR



UN HABITAT
FOR A BETTER URBAN FUTURE

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