Natural hazards, disasters and local development

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BUILDING CULTURES and SUSTAINABLE DEVELOPMENT

Natural hazards, disasters and Local Development





CRAterre Editions

Natural hazards, disasters and Local Development

Integrated strategies for risk management through the strenghtening of local dynamics: from reconstruction towards prevention.




CRAterre Editions

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table of contents

foreword

The international community demonstrates solidarity when a territory and its people are victims of a disaster. Earthquakes, hurricanes, floods, tsunamis, are all natural hazards that threaten an increasing portion of the world's population, especially the poorest and most vulnerable. Aware of the difficulties encountered by affected populations in the reconstruction of their built environment (housing, infrastructures), some organizations in charge of disaster reduction programs raised the issue of the impact of reconstruction aid. While a number of successful operations were noticed, most evaluations highlighted deficiencies at various levels, particularly with regard to the sustainability of operations. On the one hand, accessibility issues were noted: high costs, technologies impossible to master locally, problems linked to the availability of materials. On the other hand, the architectural typologies presented as solutions were questioned: often too technical, they did not take sufficient account of the realities of local living. Aware of these shortcomings, these organizations seek to make things change. This, among others, is the case of CRAterre, a research laboratory at the National School of Architecture of Grenoble, which manages, at the same time, research and field activities, in order to develop and offer alternative concepts and implementation strategies. It is high time that the research conducted over several years be more widely known and shared.

preface

This publication is aimed at individuals and institutions aware of the need to integrate reconstruction programs as part of a strategy to achieve the sustainable improvement of the living conditions of populations. The objective of this document is to show the interest, relevance and potential of local materials in at-risk situations but also and particularly to demonstrate that ignoring or banning the use of local materials and their associated know-how, as part of reconstruction, risk prevention and management or development projects, inevitably leads to even more vulnerable and dependent affected (or likely to be affected) populations. Beyond housing reconstruction, the idea is to implement sustainable conditions for better prevention and risk preparedness, for and by local populations, by taking into account and valorizing their knowledge and know-how: their own building culture. Through the organization of seminars and international meetings, and with the proliferation of operational partnerships in the field, our team was able to begin structuring the knowledge in the field. This document is therefore intended to present the conclusions of a shared reflection process. The theoretical and methodological elements proposed are illustrated by case studies of several recent initiatives, reflecting the different approaches developed and their results. This document does not provide instructions to be followed, but is intended as a basis for reflection. It opens new doors into more effective programs of reconstruction and prevention in high-risk areas.

introduction

Consciously or not, humans have always been able to produce, adapt and develop their habitat, according to their needs, interests and abilities, making the best use of available materials. The strategies developed to take advantage of natural resources and, at the same time, protect populations from the destructive forces of nature, have generated rich and varied knowledge at local levels, but such knowledge is rarely documented and scientifically explained. Hence, this knowledge, although conveying viable solutions, is not taught, nor subject to sufficient research and not taken into account by today's construction sector, which intends to persuade everyone that all the risks to which populations are exposed to can only be avoided through the use of new technological inventions. But should we not consider that the constant adaptation of human societies and building cultures to the changes taking place in their natural and technical environments, in accordance with their own values, is precisely the foundation of the concept known today as "sustainable development"? To discover the intelligence of traditional architectures, to carefully analyze them, to understand them systemically, to enrich them through the reasoned use of new materials, new knowledge and new techniques available today, can lead to the creation of disaster resistant architectures in tune with contemporary lifestyles, which can be properly maintained, meet aesthetic requirements, are respectful of the local environment and culture, and are adapted to the technical and economic capacities of local populations.

ORAL TRANSMISSION

"When the water lapping the shores of Yan Chiak in Myanmar suddenly drew back on December 26, the Moken recognized the signs. La Boon was about to strike. Dropping everything, the entire village headed for higher ground and safety. The Moken owe their survival to tales passed down by the elders, of the seven waves which came to kill the Moken in their parents' day. As the story goes, the Moken who had anchored their boats close to the shore were crushed by the waves, whereas those who had reached for higher ground were spared. La Boon is the Moken word for tsunami." (UNESCO, 2005)

culture and education save

FORMAL EDUCATION

"There was also the tale of ten-year old Tilly Smith from the UK, who had been sitting on Mai Khao beach in Phuket on December 26, when the tide suddenly rushed out and boats began bobbing up and down on the horizon. Recalling a recent geography lesson at school on giant waves, Tilly had urged her mother to leave the beach, telling her, 'I think there is going to be a tsunami.' Tilly's parents had hastily alerted others and within seconds the beach was deserted. Mai Khao turned out to be one of the few beaches along the Thai coast where no one was reported killed or seriously injured." (UNESCO, 2005)

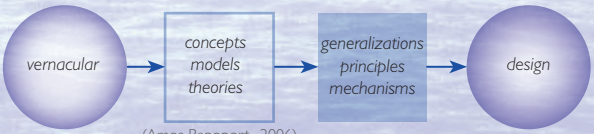
issues

300 million people live at risk of natural hazards and this phenomenon continues to grow. How to consider better disaster management options concerning built environments? In the face of difficulties, risk prevention has become the leitmotif of specialized organizations. With such an approach, it is no longer sufficient to implement reconstruction programs, but it is necessary to limit future risks and to ensure that, in addition to the relocation of affected families, they benefit from an adequate framework adapted to their own development. This implies a mobilization to encourage responses that increasingly involve the participation of local populations, through the implementation of programs based on local knowledge and modes of organization. Although time-tested, knowledge traditionally applied locally lacks recognition. Therefore, it is difficult for national and international leaders and technicians within the humanitarian aid sector to use such knowledge in risk prevention and reconstruction projects. Too often, only quantitative parameters are taken into account at the expense of other criteria relating to social aspects, which are less easily evaluable. The organization of urban structures, for example, and even the notion of urban planning, both directly related to the way of life of local populations and their culture, are not sufficiently taken into account.

Thus, once the rebuilding phase is "completed", local populations find themselves in a difficult position, often impoverished and lacking solutions for the continuation of projects designed without their involvement.

Bas-relief, Borobudur, Indonesia, VIII and IX centuries: disaster resistant housing

The valorization of local disaster resistant solutions allows for communities to move forward in the path toward sustainable development, through the application of viable technical, economic and social solutions. The valorization of local resources developed through the efforts of concerned populations is fundamental if we are aiming at reducing physical and social vulnerabilities in the face of major risks at large scales. Materials such as earth, stone, bamboo and wood are (eco) logically adapted to such approaches, and have the potential to offer possibilities for the creation of adapted located architectures, controlled urbanization systems and strong cultural landscapes.



(Amos Rapoport , 2006)

major stakes ...

"Most disaster mortality and asset destruction are intensively concentrated in a very small portion of the earth's surface exposed to rare but extremely violent hazards. However, the low-intensity damage observed on housing, local infrastructures, crops and livestock, which disrupt and erode livelihoods, is extensively spread within many countries and occurs very frequently. Such damage represents a significant and largely unaccounted for facet of disaster impacts."
(Risk and poverty in a changing climate, United Nations, 2009)

The lack of urban governance, the precarious livelihoods of populations in rural areas, and the degradation of ecosystems leads to the increased exposure of disadvantaged groups around the world. The effects of natural disasters are thus both a cause and a consequence of poverty.

Emergency responses depend too often on international expertise, as insufficient efforts and investments are made for the strengthening of local capacities and skills, and thus to reduce the vulnerability of populations exposed to disasters.

"A home encloses a family, it provides safety, security, a sense of place and of history. In working with survivors to restore these elements, Oxfam also hopes to help restore dignity."

(Oxfam International Briefing Note, December 2005, concerning emergency programs after the tsunami in the Indian Ocean, 2004)

"We fear, once again, that a developmentalist, technocratic and functionalist vision, under a pretext of urgency and efficiency, can prevail over a culturally relevant vision of development in projects of habitat and infrastructure rehabilitation."

(M. Gossé, architect and urban planner, Institut d'Architecture de la Cambre, Le Monde Diplomatique, February 2005, concerning the earthquake in Morocco, 2004)

"Vernacular constructions can teach us how people responded once to the need to build structures to live and work under the threat of adversity."

(R. Langenbach, architect and member of the Federal Emergency Management Agency, United States, Sources, December 2000, concerning Turkey Earthquake, 1999)

"Culture is essential to the survival of populations. Some consider it also as the fourth pillar of sustainability, together with the three pillars that are environment, economy and society."

(J. Duyne Barenstein anthropologist, World Habitat Research Unit, Switzerland, Un seul monde, June 2007, concerning post-tsunami in the Indian Ocean, 2004)

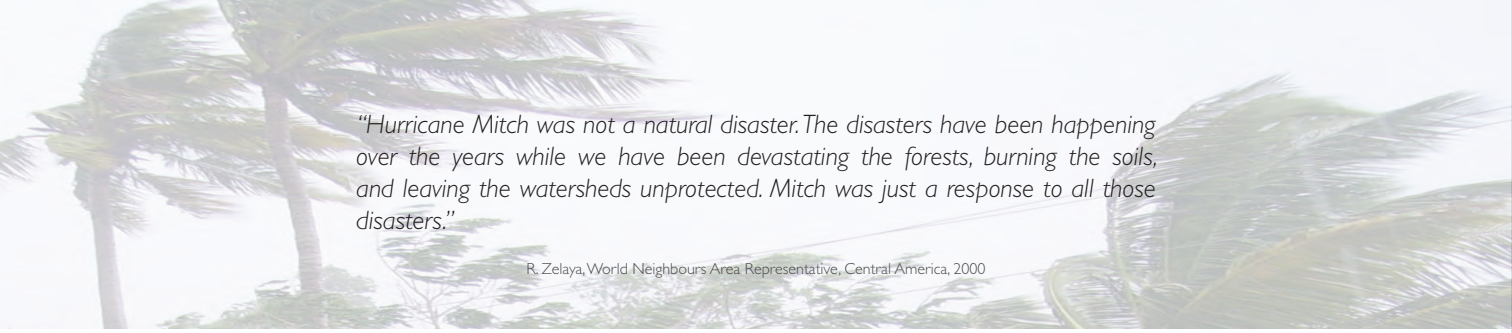
... and findings

The lack of culturally sensitive local actors does not yet allow to meet the requirements and needs of contemporary communities, while reinterpreting local knowledge.

The weak connection between basic research (mainly developed in the academic sector) and the reality on the ground hinders the scientific recognition of the potential of natural materials and the construction techniques associated to them.

An approach based solely on industrial engineering and building cultures contributes to the current scarcity of access to housing for the poorest populations around the world, and blocks potentialities for building creativity that could generate contemporary vernacular architecture solutions as a way to meet the needs of many.

The idea is not only to reconstruct built environments, but to reconstruct the social and cultural fabric of communities, strengthening links between populations and their environment. The goal is to restore human dignity, beyond the repair of built structures.



"Hurricane Mitch was not a natural disaster. The disasters have been happening over the years while we have been devastating the forests, burning the soils, and leaving the watersheds unprotected. Mitch was just a response to all those disasters."

R. Zelaya, World Neighbours Area Representative, Central America, 2000

Resilience

The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, namely through the preservation and restoration of its essential basic structures and functions.

Vulnerability

The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard.

Disaster

A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceed the ability of the affected community or society to cope, using its own resources.

Natural hazard

Natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Origins:

- *Geophysics: earthquakes, volcanoes ...*
- *Geomorphological: landslides ...*
- *Hydrometeorological: cyclones, floods ...*

Exposure

People, property, systems, or other elements present in hazard zones that are thereby subject to potential losses.

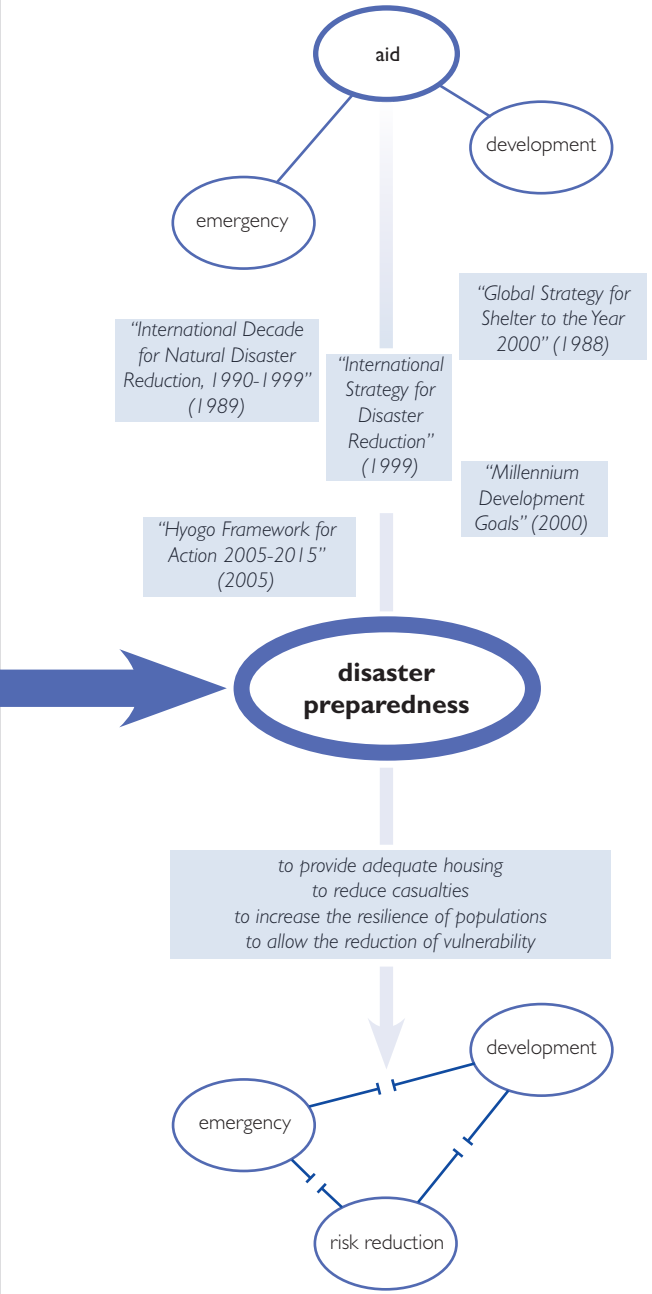
Disaster risk

The potential disaster losses, in lives, health status, livelihoods, assets and services, which could occur to a particular community or a society over a specified future time period.

(definitions: UNISDR terminology on disaster risk reduction, 2009)

Disaster risk reduction

The concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, namely through reduced exposure to hazards, allowing a lessened vulnerability of people and property, the wise management of land and the environment, and an improved preparedness for adverse events.



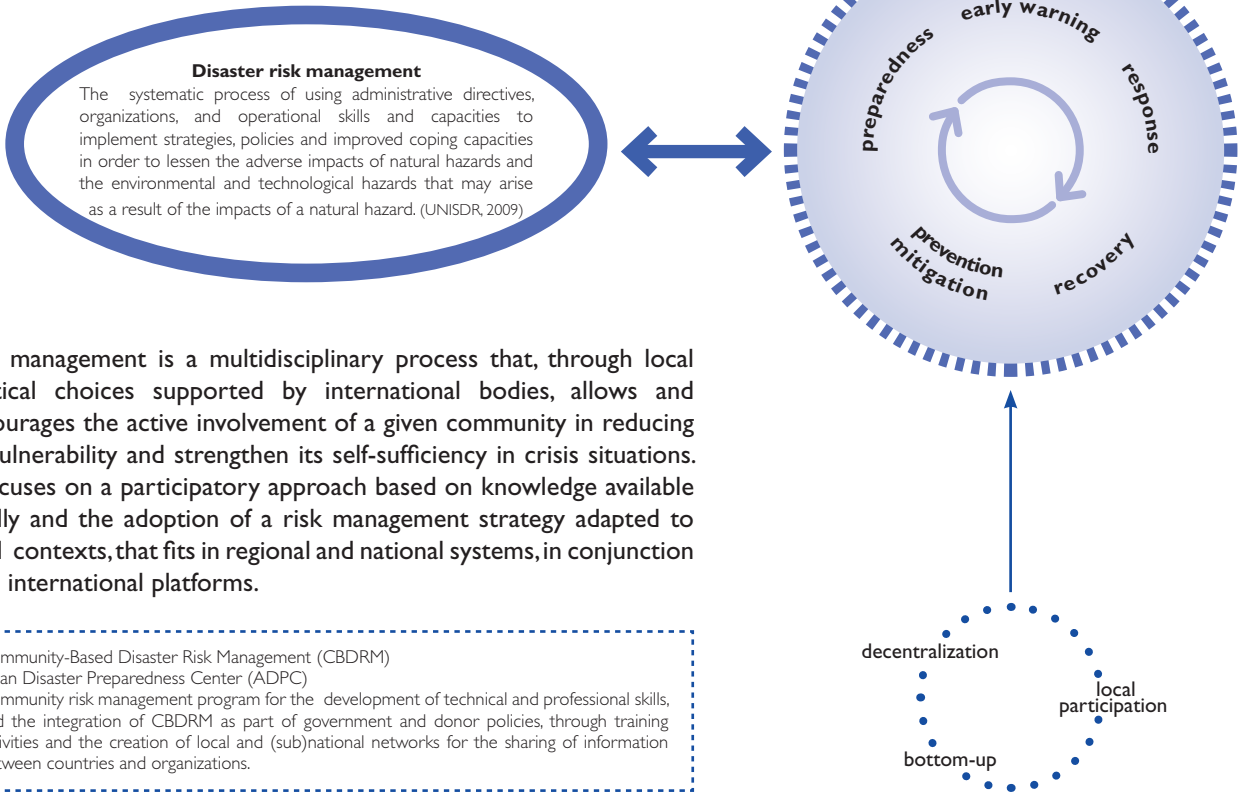
disaster response

After a "natural" disaster, humanitarian aid workers distribute tents and/or implement temporary shelters in affected areas. From that moment onwards, it is important to use materials and construction techniques that will, in adaptation to each context, be viable in terms of implementation and maintenance, while making sure not to break away from local building cultures. It is clear that the imported technologies most commonly used do not meet such requirements. Standards have been developed to improve the quality of assistance to affected populations by advocating a thorough analysis of program requirements and a pragmatic assessment of results through quantitative indicators (The Sphere Project, 2004). The danger is to end up with a levelness of responses by applying these standards in the strict sense, and thus reduce the potentials inherent to local dynamics. In the intention to further promote relevant local development, studies on the possibilities of using variable qualitative criteria are available (Groupe URD). Simultaneously, the scope of humanitarian aid widens towards approaches that emphasize prevention (Disaster-Preparedness Programme, DIPECHO), seeking to bridge the gap between emergency relief and development. The emphasis is not only placed on the "quality of the finished product", but also the relevance of responses to relocate populations, and this, in light of multiple criteria (resistance to risk, ownership by beneficiaries, cultural continuum, reinforcement of local economy...). Since the International Decade for Natural Disaster Reduction 1990-1999, disaster risk reduction has even been recognized by the cooperation sector as a pre-condition for development. However, the sectorization of funding agencies for aid projects (development, risk reduction, emergency) results in a sectorization of professional aid organizations bringing assistance to affected populations, which sometimes makes it difficult to implement programs based on a global approach to risk management.

risk management

For a decade, risk reduction has been acknowledged as an essential component, to be integrated as part of all emergency aid and development programs, through the development and implementation of strategies to reduce vulnerability and increase the resilience of populations (ISDR, 2005).

Phases of disaster response should be considered as interactive processes, based on an integrated risk management which, in synergy with development dynamics and through a multi-sectoral approach, aim at strengthening local capacities (EU, 2001). This implies an awareness and a systematic analysis of hazards and vulnerabilities, at local and national scales.



Disaster risk management

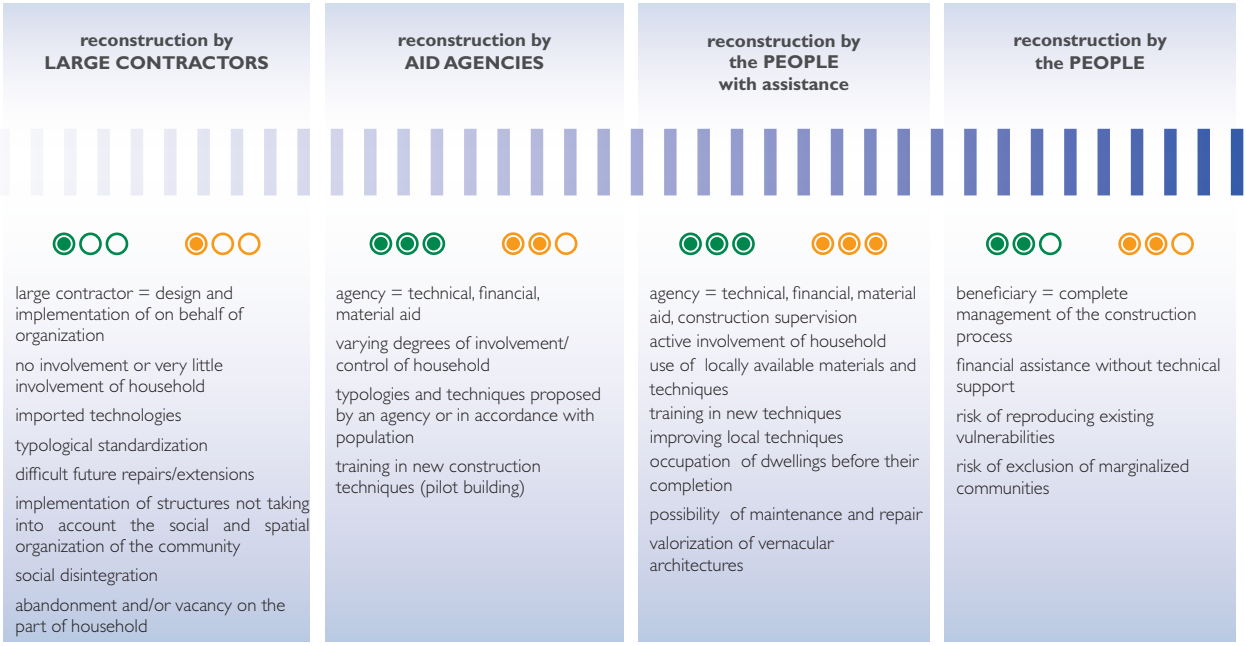
The systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of natural hazards and the environmental and technological hazards that may arise as a result of the impacts of a natural hazard. (UNISDR, 2009)

Risk management is a multidisciplinary process that, through local political choices supported by international bodies, allows and encourages the active involvement of a given community in reducing its vulnerability and strengthen its self-sufficiency in crisis situations. It focuses on a participatory approach based on knowledge available locally and the adoption of a risk management strategy adapted to local contexts, that fits in regional and national systems, in conjunction with international platforms.

Community-Based Disaster Risk Management (CBDRM)
Asian Disaster Preparedness Center (ADPC)
Community risk management program for the development of technical and professional skills, and the integration of CBDRM as part of government and donor policies, through training activities and the creation of local and (sub)national networks for the sharing of information between countries and organizations.

reconstruction

The reconstruction phase after a disaster is a valuable opportunity to implement measures to reduce the vulnerability of local populations and their habitat. The approach adopted by the bodies responsible for organizing relocations has an impact in the long run, not only on the quality of constructions, but also on the lives of communities, restoring their social balance, especially by strengthening their capacities. To recognize that affected populations are not passive recipients of humanitarian aid, but protagonists, responsible for their own survival and future, endowed with skills and aspirations, may allow the adoption of solutions, materials and techniques that are appropriate to local contexts, and thus, to achieve pertinent and effective results. To consider the reconstruction phase as a process generated "by" the people, rather than "for" the people, can promote the self-determination and autonomy of communities, applying strategies to reduce their vulnerability, and thus strengthen their resilience.

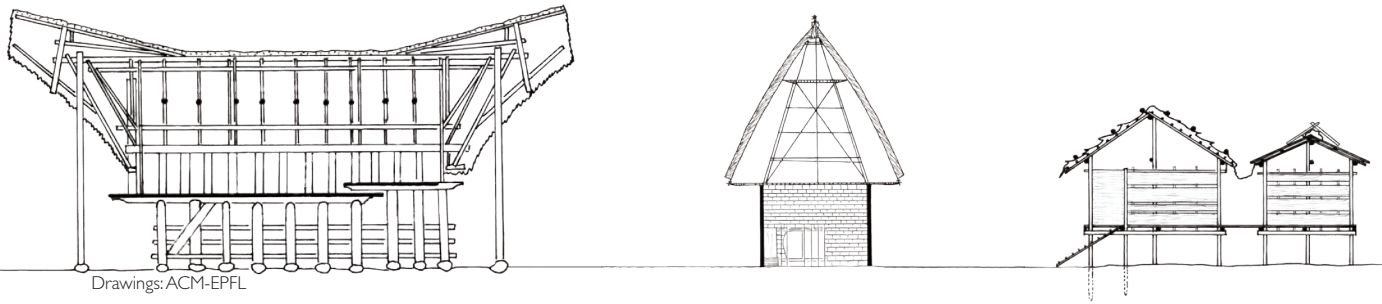


Classification commonly used by international agencies in reconstruction programs.

degree of participation of local populations ◯ satisfaction of local populations ◯ quality of constructions

building cultures

The enthusiasm and appreciation for a reconstruction project depends on its degree of adaptation to the specific aspirations and needs of populations. The adaptation of Man to his environment is connected to his perception of the manifestations of nature, both ordinary and extreme, which led him to play with matter and form shapes, in a quest to find the balanced dynamics adapted to particular situations. Building cultures are thus permeated by an evolved intelligence, transmitted from generation to generation, according to contextual characteristics, resulting in a multitude of vernacular typologies. In areas affected by natural hazards, local cultures can be characterized by social strategies aimed at reducing the vulnerability of individuals and/or by construction strategies aimed at reducing the vulnerability of built structures. Populations have increased their resilience by controlling the use of locally available resources and materials. Empirical, but based on centuries of experience and observation, their understanding can adapt to the evolution of contemporary contexts and help to consider viable (re)construction approaches. Such approaches, relevant to each specific context, can then become part of a local sustainable development, respectful of the environment.



Drawings: ACM-EPFL

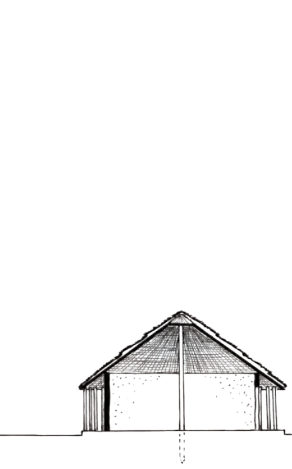
Guantanan Toraja house (Indonesia)
Heavy rains, strong winds

hut (Cameroon)
Infrequent but heavy rains

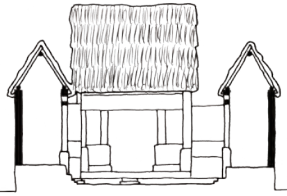
Ringlet, house (Malaysia)
Heavy rains, floods

"In any social context, architecture plays a relative role, historically variable. It can not possibly be isolated as a technology, disconnected from the generality of problems related to it. In this respect, we could at the most write a history of materials, construction types and their local variants. But it is a recognized fact that the architecture of a given historical and cultural ensemble includes a series of varied solutions, resulting from specific historical relationships with a human group, but whose signification within the group depends on the totality of the system."

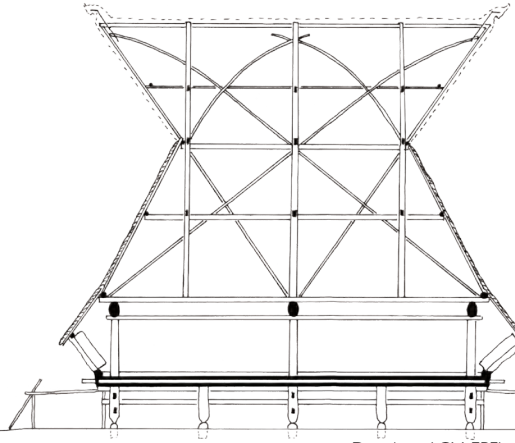
(E. Guidoni, 1980)



hut (Malawi)
heavy rains, constant winds



Ashanti house (Ghana)
heavy rains, tropical storms



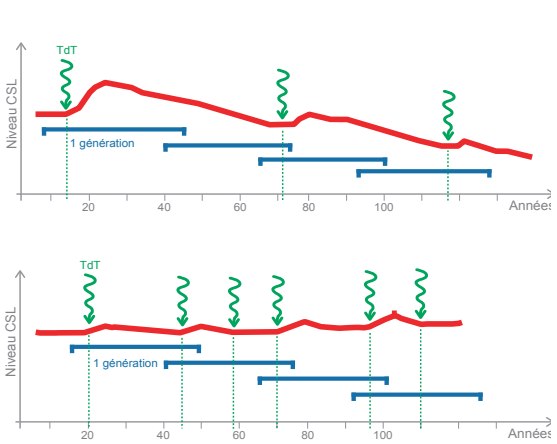
Karo Batak house (Indonesia)
heavy rains, strong winds, earthquakes

Drawings: ACM-EPFL

International scientific recognition of local seismic cultures:

Many countries located in seismic zones feature a rich architectural heritage, whose uniqueness justifies exceptional measures of protection. This is the case of Italy, where, in the 1990s, a campaign for the paraseismic reinforcement of several major monuments was introduced. Heritage professionals in charge at the time opted for the application of technical approaches based on modern engineering techniques, considered more efficient than traditional solutions for the reinforcement of structures, which were still misidentified or misunderstood. In fact, modern calculation methods, used for monuments that were fairly easy to model, whose history and construction techniques were known and mastered, were of little or no use in historic buildings consisting of structures nested into each other and impossible to digitize, with an unknown or difficult to recognize history of construction.

Recurrence of earthquakes and Local Seismic Culture (F. Ferrigni)




© F.Ferrigni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Knowing that in seismic regions the traditional built environment is made up primarily of buildings that have survived several earthquakes, a group of university researchers from various disciplines (engineers, architects, historians, economists) reunited by the Centro Universitario Europeo per i Beni Culturali (CUEBC) of Ravello (Italy), addressed the topic from a different perspective. To answer the question of the protection of ancient buildings, they tried to understand how ancient communities reacted facing seismic shocks time and time again, and discovered that in all seismic regions of the world, a true "seismic culture" characterized the local techniques of construction and reconstruction, exists.

In 1987, the term "Local Seismic Cultures" (LSC) was defined as "the technical knowledge and behavior consistent with such knowledge, constituting an effective way to reduce the impact of earthquakes, locally."
(Ferrigni, 1987)

In 1996 and 1997, an earthquake shook Umbria and the

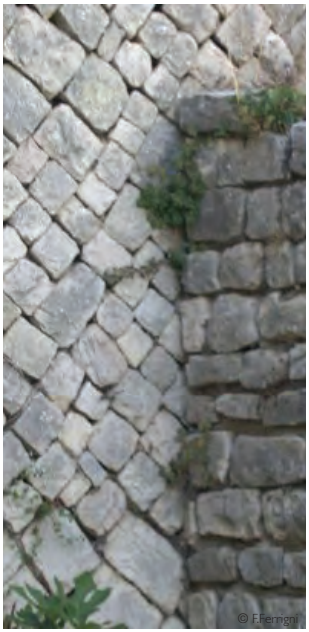
A program of the European University Centre for Cultural Heritage in Ravello (Italy)

Marches, two areas where a number of buildings had been reinforced following a previous earthquake, which had caused, against all odds, the ruin of many of them. Post-disaster analysis showed that that the vernacular paraseismic systems had actually been disrupted by the implementation of modern seismic reinforcements, and that the latter could not secure the stability of structures.

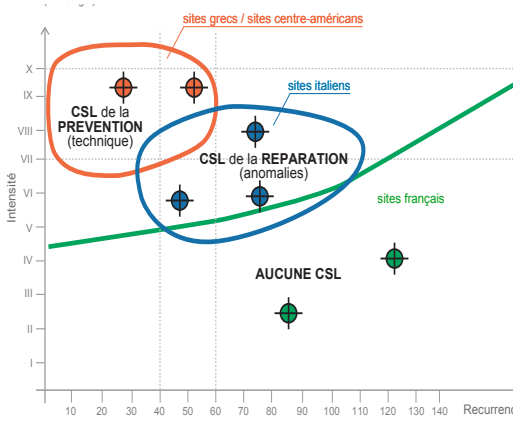
This experience reinforced the researchers' will to understand the intelligence of local seismic cultures and to disseminate this knowledge, allowing the international community to benefit from it, both for the preservation of monuments and for improvement of private housing. Research studies, coordinated by the CUEBC, are structured around three axes:

- Understanding the genesis of a local seismic cultures;
- Developing methodologies for the identification and systematization of local seismic cultures around the world;
- Developing standard protocols to validate these methodologies, scientifically rigorous and easy to apply in the field.

This knowledge, disseminated in many articles, a reference book (Ferrigni et al. 2005) and several university courses, promotes the definition of clear strategies, applicable to current problems in seismic zones.



Recurrence / intensity and and local seismic culture (F. Ferrigni)



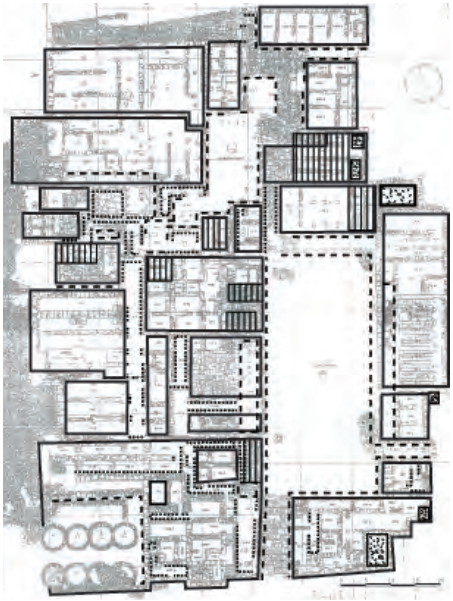
This innovative program contributes to the international recognition of local seismic cultures through an awareness of the relevance of constructive cultures, improved from generation to generation, and underlines the inadequacy of their replacement by modern scientific approaches not based on past experiences. This has led to the creation of an active informal network of skills and to the application of proposed approaches on several sites around the world.

Evolution of a local seismic culture: from the home to the city (Bronze Age Crete)

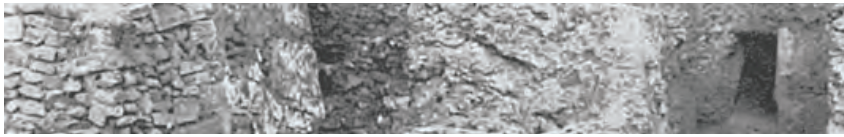
The Minoan culture (Crete, 3000 -1050 BC) provides a nearly perfect example of what men were capable of designing and implementing, in a context where seisms were sufficient recurring and non-destructive, in terms of resistant construction techniques to cope with disaster.

The particularities of the Minoan society in this respect can be summarized as follows:

- A high awareness of risks associated with the local seismicity, relatively moderate and recurrent, typical of the island;
- The evolution of construction techniques over time, with the addition of successive improvements, and the identification of constructive solutions applicable to all critical aspects: the choice of implantation sites, the types of foundations, the depth of the natural rock, the superstructure;
- The application of innovative techniques developed in both the rehabilitation of existing buildings, as evidenced by the considerable modifications made to palatial buildings around 1750 BC., and in new constructions and their articulation to the urban space.



Symmetrical plan divided into dynamic portions, palace of Mallia (G. Poursoulis)



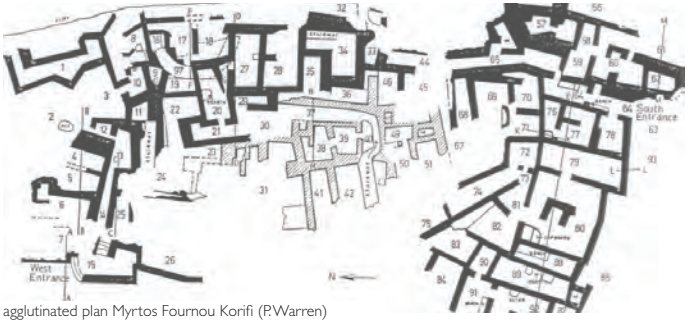
Regarding the evolution of techniques, if wood is used in construction for the linking and framing of openings since the Neolithic, when sedentarization first occurred, and when the first permanent structures were built in Crete, stone for the construction of foundations is introduced around 1900 BC. with the implementation of palaces: the administrative centers of territorial management.

Then, around 1750 BC., the development of a symmetrical plan divided into dynamic blocks, which reduce damage by disconnecting the built blocks forming these large office complexes, was implemented. It is this important innovation that will be applied at the same time in the construction of new buildings across the city.

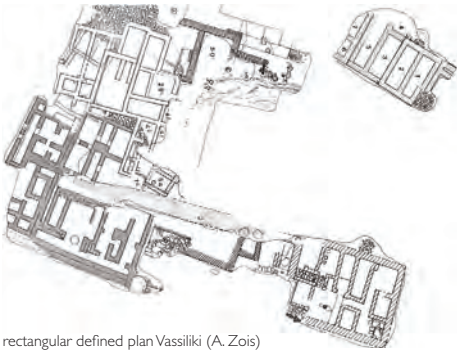
In terms of urban planning, we notice an evolution in the implementation patterns of buildings, along with the improvement of construction techniques. During the Neolithic, two types of plans both for buildings and for urban spaces coexist:

• the agglutinated plan

buildings are imbricated together as they develop and it is not possible to distinguish one structure from another without noticing functional differentiations in interior spaces.



agglutinated plan Myrtos Fournou Korifi (P.Warren)



rectangular defined plan Vassiliki (A. Zois)

• the rectangular defined plan
each house is individual and interiors are differentiated from the functional point of view.

Kato Zakros (G. Poursoulis)

This last type of plan will continue to be used primarily throughout the Minoan civilization with the application of divisions into dynamic blocks, leading to the individualization of built spaces with the implementation of circulation lanes at the urban scale since 1750 BC.
This demonstrates a capacity for reflection and strong design, as well as a political risk management will, within a society repeatedly confronted to seisms.

Turkmenistan
frustoconical shape
weak horizontal joints - strong vertical joints
paraseismic system

The existence of disaster management strategies at all scales, from the house to the city, from the social organization to mythological stories, reveals the importance of the idea of reducing vulnerability in the process of evolution of a building culture. It also demonstrates the importance of developing approaches increasing the resilience of populations endogenously, so that, for each particular situation, responses can be studied, generated, evaluated and, if necessary, improved accordingly.

Bangladesh
windbreak trees
roof with four slopes
hurricane-resistant system

Indonesia
post-frame connection
paraseismic system

Algeria
wooden rods on column
paraseismic system

Uzbekistan
reeds in adobe masonry
paraseismic system

Bangladesh
changeable pole-pile fixing
flood-resistant system

El Salvador
horizontal reinforcement
paraseismic system

Peru
vertical reinforcement
paraseismic system

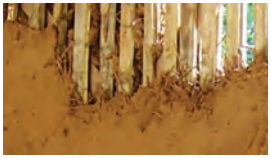
El Salvador
bamboo and earth wall
paraseismic system

Indonesia
wooden structure
paraseismic system

"*At a time when all the possibilities offered by steel and glass, plastics and other new materials have not yet been tested or applied, the appropriate use of traditional materials in a way that makes full use of their properties, is a principle and a standard applicable to new materials. Vernacular architecture provides another moral rule: the proper adaptation of a material to its use, by extending its reach and exploiting its capacity, but without forcing it to act contrary to its nature.*" (P. Oliver, 1969)

case studies

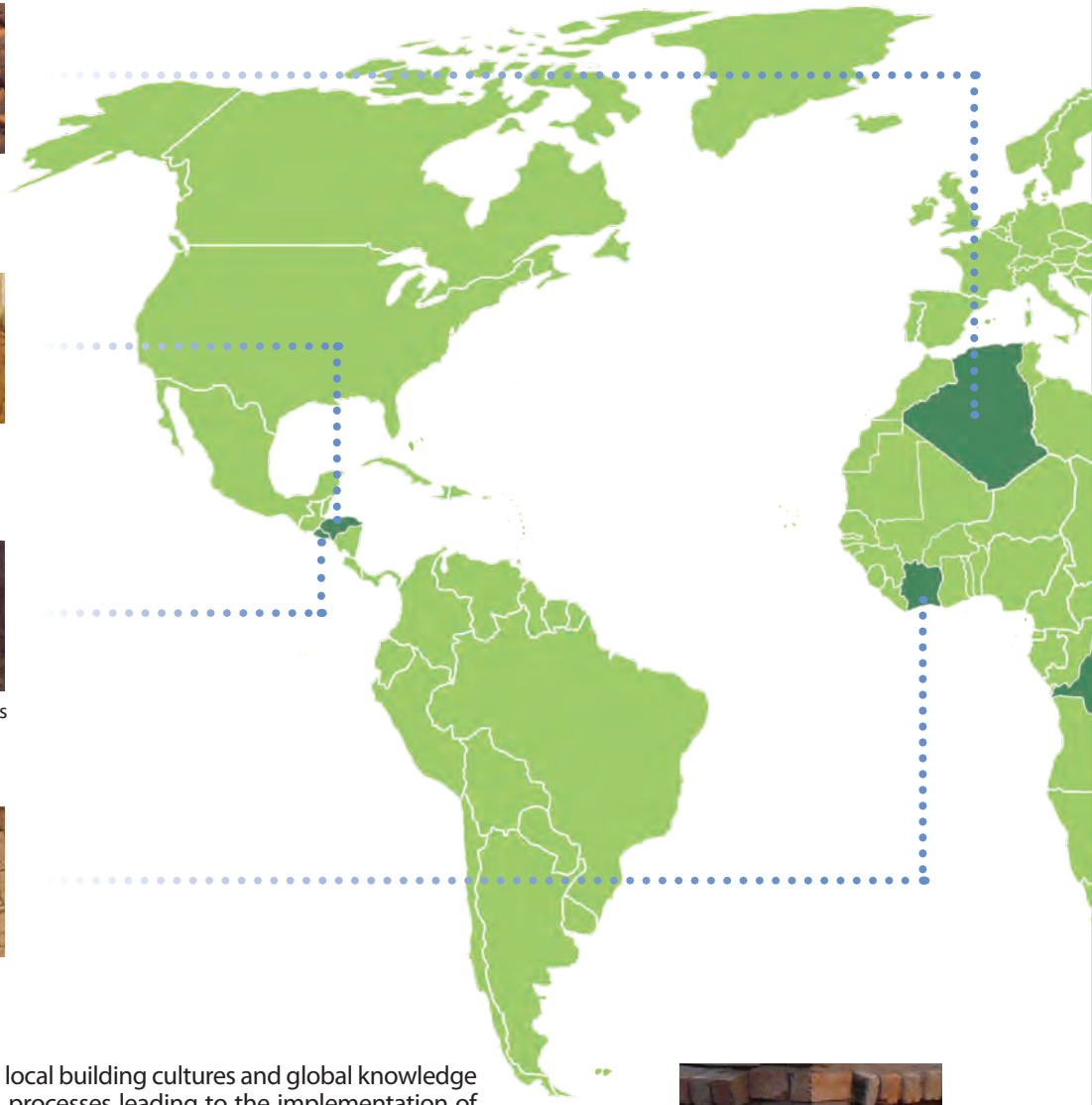
Reducing risks
Algeria
page 34



Accrediting local materials
Honduras
page 26

Strenghtening local capacities
El Salvador
page 24

Improving resilience
Ivory Coast
page 40



The interaction between local building cultures and global knowledge is an essential part of all processes leading to the implementation of projects by CRAterre and its partners, going back and forth between practice in the field and research activities within the laboratory and, more broadly, within the network "Earthen Architecture, Building Cultures and Sustainable Development" of the UNESCO Chair.

Reducing vulnerabilities
Democratic Republic of the Congo
page 38

case studies

Rebuilding homes and populations
Pakistan
page 30

Rethinking aid relief responses
Bangladesh
page 36

Accompanying local dynamics
Indonesia
page 32

Preventing catastrophes
Vietnam
page 42

Learning lessons from disaster
Iran
page 28

The case studies that follow illustrate several recent initiatives that reflect specific approaches from CRAterre and / or its partners, to promote local development, reducing vulnerability and improving the living conditions of many. This is not an exhaustive list, many other projects deserved to be included in this selection.

Strenghtening local capacities

development of local networks for a wider dissemination of knowledge

El Salvador is located on the Caribbean plate, in a highly seismic Central American region. Since pre-Columbian times, builders have developed simple, intelligent construction techniques, taking into account and adapting to the hazards associated with earthquakes. However, confronted to modern principles of construction, these local cultures involving risk-resistance strategies and the know-how associated with them are rapidly disappearing. They are no longer recognized by universities and today's regulations applicable to the construction industry do not encourage their use, which comes in contradiction with local population's expectations to be housed in buildings both affordable and earthquake resistant.

The program for the construction of paraseismic housing structures for inadequately housed populations in rural and peri-urban areas of El Salvador began in 1994. It aims to reduce the vulnerability of populations to seismic risks through an approach ensuring the sustainability of results and an optimum involvement of all local stakeholders.

For over 15 years, local partners have been aware of the need for long-term thinking to deal with a permanent seismic threat, based on a local coordination network (Caritas, la Plataforma). Existing skills are enhanced through the support of training and research centers to which information and appropriate tools are provided (units of production/construction, didactic and sensitization materials). The know-how linked to local building cultures is valorized. A strategy for sensitization and the dissemination of results is developed to promote local access to safe and healthy homes.

Cáritas El Salvador · FUNDASAL · UCA · CRAterre ENSAG · MISEREOR IHR HILFSWERK

Demonstration buildings were constructed: an earthquake resistant module at the UCA campus (1995), three "La Semilla" prototypes located in each region of El Salvador and two "Bahareque Cerén Mejorado" modules (2001) in the central region (Zacatecoluca) and the eastern region (San Miguel). This has fostered the full ownership of proposed technical approaches, based on the study of the seismic characteristics of pre-Columbian habitat (Joya de Cerén archaeological site). (Research on Bahareque Cerén Mejorado, W. Carazas-Aedo, CRAterre-ENSAG).

Training activities involved more than 100 artisans, 50 engineers and architects and 20 technicians. More broadly, it is estimated that more than 100 communities have benefited from the program and have built thousands of homes across the country, according to the technical prescriptions developed.

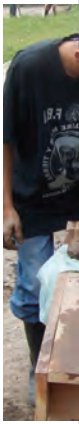
An evaluation of the program showed the relevance of the proposed approaches, whose key ideas t**ake into account local building cultures** and enable the optimal use of local knowledge, skills and materials, offering **disaster preparedness** skills to institutions and populations, for a better anticipation of seismic risks, and the **strengthening of competences** democratizing knowledge, by making it available to all and bringing it closer to beneficiaries.

Accrediting local materials

experimentation, training and dissemination to spread awareness

In October 1998, Hurricane Mitch hit Honduras with an extreme violence. In a state of urgency, reconstruction activities through international cooperation with the participation of many local NGOs favored the use of industrial materials at the expense of traditional building practices. Gradually, this type of response became the only one accepted as valid, which contributed to discredit construction practices involving the use of local materials in the eyes of populations and institutions.

In 2002, the Foundation San Alonso Rodriguez (FSAR) launched a project aiming to provide access to safe and adequate housing through the valorization of traditional knowledge and techniques, and their recognition, at the institutional level, as viable options adapted to the climate and the economy of the region. Actions implemented aimed at **projecting with the people**, supporting local dynamics and the development of sustainable processes, taking into account the experience, knowledge, and lifestyles of communities. This approach aimed to generate a range of appropriate independent responses and, in the long term, reduce social phenomena linked to the lack of local economic perspectives.



Through communication and the dissemination of information via exhibitions, debates and initiation workshops, civil society and institutions are becoming involved in a process of sensitization to the use of local materials and to the importance of maintaining constructive practices and popular knowledge.

Prototypes are used to study the feasibility and the behavior of proposed principles, under the test of time and hazards. The realization of public buildings contributes, through the training of craftsmen, to generate capacity building opportunities and the promotion of the potential of local materials adapted to contemporary designs and aesthetics. More specifically, the validation of the technical and hygienic qualities of buildings linked to public health, by relevant government authorities, has had a significant impact on the social recognition of applied techniques.
In addition, social housing programs based on the direct involvement of beneficiaries are established through a **process of support to self-builders**. Participatory workshops for designing and validating architectural proposals, as well as understanding building systems and the potentials of materials, allow the ownership of solutions and their adaptation to the needs of future residents.

As a national forum to **share the result**s of experiments that contributed to the sensitization of institutions and more specifically of governmental institutions, was taking place, a discussion regarding the implementation of constructive responses as part of housing programs started, and this discussion generated the idea to create a course on earth construction. Such a course is being developed as part of the masonry certification at the National Institute for Vocational Training. In addition, the Government is seeking projects involving the use of earth materials, under its Housing and Solidarity Credit program, established in 2006, with the support of the Honduran Council of Solidarity Housing and the Network for Solidarity Housing, to which the FSAR belongs.

Based on a local scale, the project has gradually integrated collaborations with other neighboring countries such as El Salvador and Mexico, with a view to put in place the foundations of a **Mesoamerican platform** focused on an active exchange of experiences among partners, thereby focusing the debate on the acceptability, dissemination and reproducibility of the proposed principles, in the political and geo-cultural Mesoamerican contexts.

From Bam to Ardekan: learning lessons from disaster

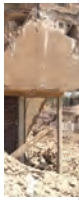
reducing the vulnerability of the cultural landscape through local development

Analysis of an announced catastrophe

The earthquake in Bam, on December 26 2003, took the lives of 26,000 people and injured 40,000. 70% of buildings were destroyed, including the earthen citadel of Arg-e Bam. In a few seconds, the city became a ruin, an open catalog of construction defects showing the human causes of the disaster. Local geophysical characteristics (faults, alluvions) and those of the earthquake proved disastrous for the vulnerable city.

Taking the time to understand before intervening

After a diagnosis of the situation through national and international expertise, recommendations for support were made to define a backup strategy for the cultural landscape. The declaration of Bam, made at the International Workshop of April 2004, laid the principles that would define all interventions: "keep the full meaning of Arg-e Bam and its environment", "safeguarding the character and heritage of the city and its landscape" and "integrating heritage into the reconstruction process."



Taking a step back in order to learn and avoid repeating mistakes

No building material is earthquake resistant. It is knowledge that saves built structures and lives. While industrial materials have been tested scientifically and their characteristics are known universally, "local materials" have stood the test of time and their characteristics are known empirically. But in Bam, where earthquakes are a rare occurrence, time has not allowed the development of knowledge.

An integrated approach but with slow results

CRAterre and its partners have proposed to revitalize the earth construction sector around three complementary areas: matter, heritage and habitat. This approach encourages and supports the development of socio-economic activities that valorize the resources and strengths of the territory. Over a few months, various activities were deployed: diagnostic tests, development and testing of materials and construction elements, installation of a laboratory and a production line, housing prototype design and construction, reconstruction of the Second gate of the citadel, implementation of workshops for professionals and the staff of ICHHTO, NDRII and IHF These activities have contributed to achieve significant progress and to make earthen materials acceptable. Despite this, dozens of families who had chosen the earthen seismic resistant prototype, validated by Iranian authorities, could not obtain it.

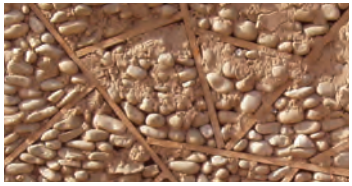
Anticipate and prepare before a disaster

Due to resistances resulting from ignorance, it is almost impossible to quickly implement solutions using local materials if such materials have not been validated before the disaster. Once the emergency phase is over, the poorest populations lack access to industrial materials, which are both unaffordable and too sophisticated. The exclusion of local materials increases the vulnerability of these populations, the majority, who have no other choice but to turn to local solutions, that are by the way better adapted environmentally, economically and culturally. To instill local development upstream is the surest way to reduce risk. This objective is also pursued in the town of Ardekan, with local authorities, Hamyaran and the ICHHTO, thanks to the support of the European Union, in an urban regeneration and risk management project. The idea is to set up, with stakeholders, a development strategy that integrates prevention and the use of local materials in a historic center built entirely of earth.

Rebuilding homes and populations

development and renewal of local seismic cultures

In October 8 2005, an earthquake ravaged Kashmir in Pakistan, killing more than 73,000, wounding 69,000 and destroying nearly 500,000 homes. Given the scale of the disaster, and the lack of resources available, aid for reconstruction was considered from a new angle. ATLAS Logistique, with the technical support from CRAterre, proposed an approach based on the study and improvement of local seismic resistant building cultures, taking into account the technical, social and economic context of affected populations. Major institutions such as UN-Habitat, the French Red Cross, the Swiss Agency for Development and Cooperation, addressed the issue of reconstruction following the same approach. Thanks to their strong involvement in Pakistan, they have been able to put these strategies to the test, and obtain encouraging results.

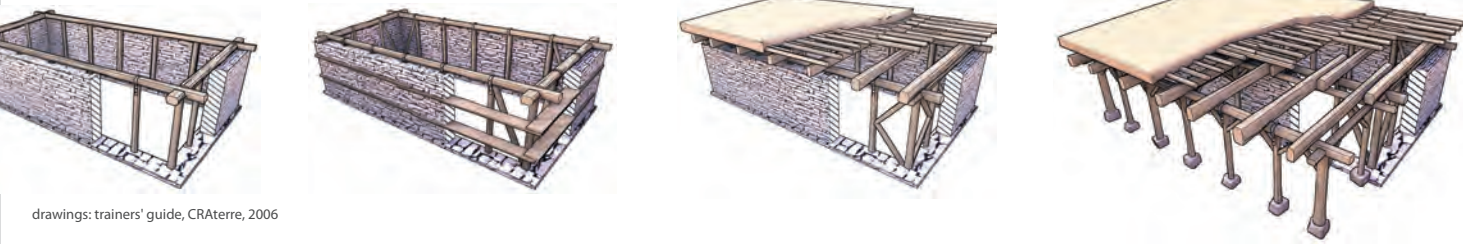


Endorsing local knowledge and making it accessible

Seismic constructive cultures developed locally for hundreds of years in this region regularly hit by earthquakes have been documented. A scientific program was developed to model these endogenous seismic resistant structural systems. The compilation of collected data became a "Trainer's Guide" and was made available to target populations and organizations involved in reconstruction after the crisis. This guide includes recommendations on possible improvements to be made to the existing local know-how. Three demonstration buildings were also designed and implemented, with the collaboration of 40 local managers and craftsmen who were thus trained so as to further develop and disseminate the techniques learned.

Educate organizations in charge of reconstruction

Initially, local populations took many initiatives to rebuild their habitat to the best of their abilities, by adopting seismic resistant solutions observable in the less damaged buildings. Later, the state and international aid organizations were confronted to a lack of knowledge on local building cultures which, naturally, are quite diverse and varied. Unable to guarantee the "scientific" relevance of these techniques, they finally turned to so-called conventional techniques, mainly based on the use of reinforced concrete. An important advocacy work has been conducted with these organizations through the project, but much remains to be done to better take into account local building cultures as part of building reconstruction efforts in Pakistan.



drawings: trainers' guide, CRAterre, 2006

Being in line with the overall dynamics of aid while anticipating crises

The project showed that significant improvements in terms of time and efficiency would be obtained if local contexts were better prepared to accept, from the aftermath of a crisis situation, a variety of technical solutions, and to recognize the value of local know-how. This would require the establishment, in all regions at risk, of high-level skills, with universities and technical schools delivering training on local building cultures.

Accompanying local dynamics

auto(re)construction with materials recycled from debris

A major earthquake occurs on average once every 75 to 100 years in Indonesia.
On May 27, 2006 at 5:55, the region of Yogyakarta at the center of the island of Java was struck by a M5.9 earthquake, damaging 140,000 homes and killing 6000 people. The analysis of the disaster showed that the **behavior of traditional wooden buildings**, using light and elastic structures, proved better than that of buildings using reinforced concrete, a material more recently introduced and poorly controlled.

In the village of Ngibikan, NGOs offered temporary small shelters (15-18 m2) for an average cost of 200 Euros. Residents, dissatisfied with this proposal, initiated a project to **rebuild using recovered materials** with the families affected, supported by the artisans of the village and the architect Eko Prawoto, as well as the financial help from the newspaper Kompas. In less than 90 days, 65 houses were built by 50 volunteers. New homes conform to Indonesian paraseismic norms. Families were relocated in a sustainable manner into homes they can be proud of, because they contributed to their implementation, in keeping with their own traditions and culture. Although the construction system is the same for all units, each home is different, reflecting the "identity" of its occupants. This experience has demonstrated the importance of **local dynamics** and the ability of people to quickly restructure their living environment in an almost autonomous way. Affected communities remain the main actors in post-disaster reconstruction situations. This, too, is often overlooked.

It became clear for Karina KAS and Caritas France that the exemplary project of Ngibikan could serve as reference for their own work. During the mission of experts, contacts were made with architect Eko Prawoto to understand the project and assess the possibility to be inspired from it, for a project of construction of 57 houses in the districts of Bantul and Wedi-Klaten.

Although located in very similar sociocultural contexts, the methodology and construction systems could not be fully transferred. The construction of houses in Bantul was inspired from the experience in Ngibikan with some adjustments, while at Wedi local actors chose to build based on national plans instead (T36 Rumah Prototype). Conditions failed to organize awareness campaigns to explain the process and its relevance to the population. The decision was made to build, in the framework of one project, using two different approaches: in Bantul drawing from the project in Ngibikan and in Wedi in a more "classic" fashion. Innovative approaches often require extra time for training and sensitization.

In an area that we could consider homogeneous, we may indeed face different situations. The evaluation of the 57 housing unit construction project shows that the valorization of the socio-economic potential of cultural territories allows to obtain more interesting results than the mechanical application of solutions that, even through technically accurate, pose problems of ownership and duplication. Thus, projects such as that of Ngibikan deserve better recognition, as they show what can be accomplished through the use of heritage resources and the mobilization of local actors.

Reducing risks

methods and techniques for an autonomous range of responses developed by local populations

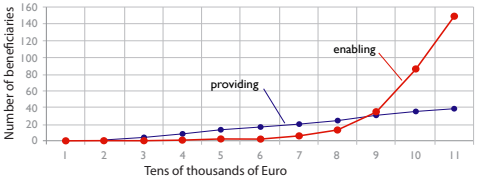
In February 2006, severe floods affected the region of Tindouf, in Algeria. Several Sahrawi camps were destroyed. This disaster left 12,000 families homeless. OXFAM-Solidarité initiated a mitigation program, bringing support for reconstruction and the reduction of collapse risks. The idea was to prepare the population to flooding risks, by improving housing structures and disseminating information and technical solutions while valorizing local skills.

Throughout the period of implementation of the project (2007-2010), appropriate and accessible construction techniques, reducing the impact of natural disasters on existing and new buildings, were adopted and reproduced by the people.
Trainers received adequate tools to teach the different technical solutions and assess and repair the damage caused to structures by incorporating new technical measures.

The diagnosis of situations and possible solutions were determined by stakeholders under a participatory approach:

- Study and analysis of the construction sector and its environment;
- Definition and development of architectural solutions based on economic capacities, knowledge and local potentials;
- Creation of educational materials to train local actors;
- Building of housing prototypes;
- Training of trainers and craftsmen, sensitization and information campaigns for beneficiaries,. Activities relying on local structures to sustain the project;
- Actions to promote local initiatives and ownership of the project, to assess relevant approaches and to achieve objectives;
- Regular evaluation of the project and revision of strategies depending on the evolution of results.

Number of beneficiaries according to invested budgets



After 18 months and less than €100,000 investment, construction techniques developed have been adopted for several public buildings of quality. Populations have reproduced some details to improve habitat or for new construction. 110 artisans were trained by local trainers or sensitized by the project activities.

In 2008, over 2,500 people were directly aware. 900 heads of families have benefited from the project activities. The number of people directly sensitized should be increased to over 2000.

The main lessons learned from this project demonstrate the following:

- Achieving **balance between technical solutions, potentials and capabilities** based on existing local knowledge and know-how is important, in order to guarantee their application;
- **Informing beneficiaries** about the nature and effects of hazards on the sustainability of built structures and understanding their weak points is also important. Indeed, when populations have not experienced a previous disaster, or if they do not have access to appropriate solutions, they may tend to be satisfied by their current living conditions and just hope never having to face hazards;
- **Developing local human resources** to implement the proposed technical approaches and methodologies is essential;
- **Transferring the project management to local structures** to sustain actions locally after the departure of non-permanent partners is key.

Rethinking aid relief responses

multidisciplinary knowledge sharing between local communities and organizations

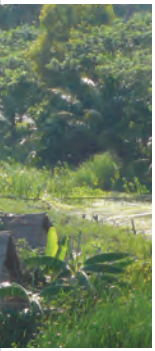
On November 15 2007, Bangladesh was hit by a powerful cyclone named Sidr, with a 500 km radius, with winds of up to 240 Km/h. Most of the territory, only a few inches above the sea level, was engulfed. 80% of the families living in areas affected by the cyclone were affected, and housing accounted for 50% of the damage.

Secours Catholique - Caritas France and its partner Caritas Bangladesh quickly initiated a project aimed at empowering not only local populations, recurrent victims of natural disasters, but also the organizations and agencies that support them.

The project revealed some difficulties from the outset, as noted by the organizations responsible for disaster relief:

The limitations of delivering "finished products"

Many agencies working in different action zones in Bangladesh proposed their own building models, some being up to two times more expensive than others. This created tensions between beneficiaries who had to compare different models within the same village. It was also difficult for these families to fully adopt "ready-made" solutions, which do not take into account all their relocation needs.



Non-recognition of local building cultures

The first models of low-priced housing that were presented were the result of studies conducted by engineers and technicians who carry with them an aura of knowledge. The fact that these professionals did not, in the beginning, take into consideration the building cultures developed by local populations, sometimes mislead the latter into consider their own knowledge as obsolete, or worse, irrelevant. The fact that these technicians did not integrate such knowledge into their projects was mainly due to the type of formal education they received (or the lack thereof) and does not imply a judgment on their part over the quality of such knowledge.

Local building cultures are indeed the result of hundreds of years of experience, on which new technical proposals should be based, for them to have a chance to be reproduced by local populations.

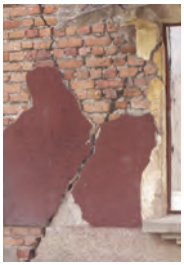
After three years of activity (2007-2009), the first models offered to 1600 beneficiary families were improved by **better taking into account the local human and cultural contexts**. A fruitful exchange was developed between actors "on the ground" and the universities of Bangladesh, which allowed to introduce some of the latest scientific results conducted on low-cost housing. Target groups have adopted new methodological approaches and techniques that make them less vulnerable in facing natural disasters.

Reducing vulnerabilities

Rediscovery of local know-how to reduce the vulnerability of housing structures

The riverside region of Kabalo suffers from major floods each year, which cause damages and sometimes ruin homes. Every ten years, several zones are flooded and once every thirty years the whole city is submerged under water. Kabalo is also located in an area affected by earthquakes (recurring every thirty years), of medium to high intensity.

The region of Kabalo had just overcome a situation of armed conflict and had no crisis management plan. Appropriate architectural solutions present in traditional buildings were no longer understood by local populations, who eventually replaced them in favor of modern techniques and materials, which have a heavy impact on the environment (deforestation) and that are costly, so their implementation does not often comply with best practices of construction, resulting in buildings unable to withstand the natural hazards affecting the region.



Working for many years in the area of Kabalo, the local NGO FDH initiated a program to promote architectural styles adapted to wetlands and seismic areas, to improve housing and public infrastructures and allow a better socio-economic impact of local investments in the construction of public buildings.

Through a process involving an awareness campaign, the implementation of a demonstration building for training, bringing together all local stakeholders, the project allowed local populations to gain access to building principles and economic solutions making the best use constructive cultures and locally available resources.

Several documents and educational materials were developed to allow local decision makers, artisans and citizens **to understand seismic and flooding related phenomena** and their effect on the built environment, the intelligence of the know-how developed by local communities, as well as the **potentials and limitations of available materials** for the production of modern housing. These outreach and training activities were carried out through a process leading students **to discover for themselves** the most viable building logics.

A technical file supports populations and artisans in their choices for new constructions; this document is aimed at primary schools, and contains recommendations on how to behave in case of an earthquake. A proposed working methodology advises local decision-makers on how to set up a plan for crisis management.

Over the course of the project (2008-2009), a local NGO, AMICOR, trained technicians and local leaders **to identify the existing know-how and building systems** available.

Four demonstration buildings were completed. They offer a range of technical solutions that can be applied in housing and public infrastructures. They can be used as a reception center for first aid during future crises. Many demobilized young soldiers were trained, gaining the opportunity to access technical skills that facilitate their integration into the local job market.

Improving resilience

identification of risks and reinforcement of local capacities and networks

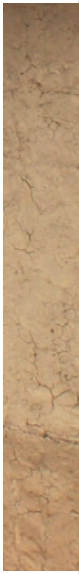
In recent years, West and Central Africa have experienced a steady increase in floods, causing damages to housing and other properties, augmenting the vulnerability of local populations.

Facing the extent of needs, noting the constant increase of risk areas and the financial limitations of local populations, the International Federation of the Red Cross decided, within the framework of the "Programme Mondial Logement" (World housing program) launched in 2007, to support strategies to reduce vulnerability based on the development, dissemination, and, if necessary, the improvement of existing local construction practices.

Divided into three phases (pilot phase in 2009, targeted application in2009-2010, dissemination in 2010-2013) over a period of 4 years, the project aims to:

- **Strengthen the technical and operational capacities** of National Societies of West Africa and Central Africa and their local networks, in the development and implementation of strategies for the evaluation and the management of risks following crises, based on dynamics available locally;
- To provide local populations with **technical solutions to improve existing and new housing structures**, adapted to local contexts and capacities, to increase the resistance of constructions to flooding and prevent potential disasters.

The development of methods and tools of investigation for the diagnosis of risks, constructive cultures and local resources, allows to identify the potentials and weaknesses of current situations. The creation of a **network of expertise** in the fields of risk reduction, construction and technical training, bring local support.



During the pilot phase (April-October 2009), two major aspects were noted:
- The existence of building cultures effective against the risk of flooding, but insufficiently exploited by populations who expect to receive "technological miracles" from aid agencies;
- The ability of stakeholders both at national and local levels, to adopt and adapt proposed tools and methods and use them to assist beneficiaries.

The first activities to be implemented, defined in consultation with Red Cross partners, aim at sensitizing local populations, through the work of local volunteers of the Red Cross, on the application of best practices associated with local building cultures, and to create training activities for building professionals, to improve techniques, making them more resistant to flooding.

Preventing catastrophes

preventive consolidation strategy for strengthening local resilience

Every year, the central coast of Vietnam is hit by cyclones and floods causing the destruction of houses and infrastructures, reducing the quality of life of residents. Instead of developing and improving their living conditions, many villagers live in an almost constant state of recovery. In recent decades, about 70% of rural houses were rebuilt by families, but such investments have not resulted in an improvement of the quality and resistance of new constructions.

Since 1999, Development Workshop France works in the province of Thua Thien Hué with communities, policy makers and the civil society, in the development of community capacities to reduce their vulnerability to natural disasters. With an approach that channels resources towards a strategy of prevention rather than reconstruction, local capacity building and the development of social and institutional processes help increase resilience in a sustainable manner through the preventive reinforcement of structures. Based on the education and active involvement of the community, the project takes shape in the form of sensitization and practical demonstration activities, and induces policy changes in each community.

10 points for damage prevention

development of the social and institutional environment

Collaboration with local authorities, trade unions and associations, aims at strengthening local institutional capacities through the definition of an action plan for prevention. Damage Prevention Communal Committees support families in activities to reduce vulnerability.

local capacity building

Technical training for builders, managers and facilitators, and institutional support to communities can improve the overall quality of the built environment and the development of disaster resistant construction skills, at an affordable cost and without the need for outside help.

sensitization
A participatory program aims to stimulate long-term awareness through traditional advertisement, school activities or actions targeted around a specific theme.

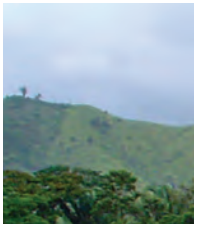
credit for the reinforcement of housing
The study of financial mechanisms, sustainable locally, gave way, in 2001, to a system of access to small loans for the consolidation of houses and, since 2008, to a new program in partnership with the Vietnam Bank for social policies.

consolidation of housing structures
A strategy of "prevention-consolidation", encouraging the integration of appropriate construction details in new and existing buildings, allows to reinforce structures at a cost lower than the cost of reconstruction, thereby contributing to an investment towards improvement rather than repair. Actions are based on the promotion of the ten principles of hurricane-resistant construction, that valorize materials and resources available locally, and respond to the specific weaknesses of each building. Practical demonstrations of consolidation methods are accessible, sustainable and respectful of traditions and local resources.

in constructions (Development

All these actions led to an attitude shift on the part of populations and policy makers in favor of investing in prevention.
The adoption of this approach and the work done for the prevention of natural disasters led Development Workshop to receive international recognition, as recipients of the World Habitat Award (Building and Social Housing Foundation, 2008) and the Sasakawa Award Certificate of Distinction (United Nations International Strategy for Disaster Reduction, 2009).

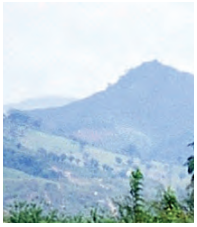
case studies



Reinforcing local capacities

Location El Salvador
Partners and sponsors
La Plataforma (Caritas El Salvador)
The Salvadoran Foundation for Development and Basic Housing
ConsciousnessfortheSpiritualandEconomicRecoveryof Humankind association(CREDHO)
Simeon Cañas University of San Salvador Misereor

Hazard earthquakes
Project duration 2001 - 2009 (project "Semilla")
Results 1 institutions sensitized (1 donor, two universities, eight NGOs)
170 construction professionals trained
1,000 families rehoused



Accrediting local materials

Location Honduras
Partners and sponsors
Foundation San Alonso Rodriguez (Honduras)
National Institute for Vocational Training (Honduras)
Honduras Solidarity council (Honduras)
The Honduras Solidarity network(Honduras)
Housing Program and Citizen Solidarity Credit (Honduras)
Misereor (Germany)
Trocaire (Ireland)

Hazard floods - hurricanes - landslides - earthquakes
Project duration 2002 - 2010
Results 13 institutions sensitized (1 Ministery, 9 NGOs, 3 donors)
1 National Forum
72 self-builders trained
23 construction professionals trained
3 coordinators trained
7 micro-enterprises established
78 school sites (72 houses, six public buildings)

Learning lessons from disaster

Location ville de Bam - Iran
Partners and sponsors
Organization for Iranian Cultural Heritage, Handicrafts and Tourism (ICHHTO)
City of Bam
Research Center for Conservation of Cultural Relics (RCCCR)
Islamic Housing Foundation (IHF)
Iranian Institute for Research on Natural Disasters (NDRII)
University of Yazd (Iran)
Ministry of Culture and Communication
Ministry of Foreign Affairs
United Nations Program for Development
Fondation de France

Misereor
General Council of Isère (GC38)
UNESCO
Hazard earthquake - 2003
Project duration 2004 - 2008
Results post-disaster assessment, one production unit + one analysis laboratory set up, two paraseismic prototypes, training and awareness, writing of Bam declaration

Rebuilding homes and populations

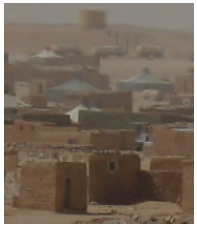
Location Pakistan
Partners and sponsors
ATLAS Logistics
Fondation Abbé Pierre
Fondation de France
Indus Earth
Helpers Foundation
ENTPE Lyon (France)
European University Centre for Cultural Heritage (Italy)

Hazard earthquake 2005
Project duration March-July 2006
Results 6 institutions sensitized (2 donors; 1 university, 3 NGOs)
1institution formed (1 NGO)
40 masons trained
1,000 families sensitized
3 families rehouseds

Accompanying local dynamics

Location Ngibikan village / districts of Bantul and Wedi Yogyakarta - Indonesia
Partners and sponsors
Architect Eko Prawoto
Karina Kas - Caritas Indonesia
Caritas France - Secours Catholique
KOMPAS newspaper (Indonesia)

Hazard earthquake 2006
Project duration 90 days (2006) + 12 months (2006)
Results 65 + 57 rehoused families



Reducing risks

Location Sahrawi Refugee Camps
Tindouf - Algeria

Partners and sponsors
OXFAM - Solidarity
Sahraoui Ministry of Construction
ECHO

Hazard floods - 2006
Project duration 2007 - 2010
Results
8 institutions sensitized
(2 donors, NGOs 6)
5 institutions formed
100 masons trained
10,000 families sensitized about
80 families have duplicated the techniques learned

Rethinking aid relief responses

Location Bangladesh

Partners and sponsors
Caritas Bangladesh
Project Implementation Committee
Bangladesh University of Engineering & Technology, Dhaka
Caritas France - Secours Catholique

Hazard cyclone Sidr - 2007
Project duration 2007 - 2009
Results
3 institutions sensitized
(1 donor, 1 NGO, 1 university)
One institution formed (1 NGO)
7300 families rehoused

Reducing vulnerabilities

Location
Region of Kabalo
Democratic Republic of Congo

Partners and sponsors
Federation of Human Rights (DRC)
Amicor (DRC)
Swiss Cooperation Office in Burundi
École de la Paix (France)
Fondation Abbé Pierre (France)
Secours Catholique / Caritas France

Hazard earthquakes and floods
Project duration 2008 - 2009
Results
7 institutions sensitized
(5 donors, 2 NGOs)
3 trainers trained
5 technicians sensitized
38 artisans trained
1 training center
7 neighborhood leaders sensitized
500 families sensitized
3 building models (4 buildings made)

Improving resilience

Location West and Central Africa
(pilot phase: Ivory Coast)

Partners and sponsors
International Federation of Red Cross and Red Crescent Societies, Geneva (Switzerland)
Regional coordination, Dakar (Senegal)
National Red Cross and Red Crescent societies of West and Central Africa
(pilot phase: National Society Ivory Coast)

Hazard floods
Project duration 2009 – 2013
Results
10,000 people helped
(pilot phase)

Preventing catastrophes

Location Thua Thien Hué province - Vietnam

Partners and sponsors
Vietnam Development Workshop
Provincial Committee for the Control of Floods and Storms
Consulting and Engineering Society, Thua Thien Hue
ECHO
Ford Foundation Canadian International Development Agency Viet Nam-Canada Foundation
ECHO
Fondation Ford Aide Canadienne de Développement International
Fondation Aide Viet Nam-Canada

Hazard cyclones et inondations
Project duration 1999 - 2013

some lessons to learn from

valorization of local resources

The use of local resources, materials and skills is a durable process that ensures the opportunity for local populations and stakeholders to build, maintain, repair and extend all types of constructions, allowing the implementation of projects answering to needs and expectations, contributing to the enrichment of local knowledge.

relying on local skills

Greater involvement of population ensures a better understanding of the local culture and allows a continuity of action in time. These skills are often more important than we imagine.

relying on local knowledge

Recognition of easily accessible local knowledge enables the valorization of the individuals and organizations that hold this knowledge and lead to the adoption of relevant approaches, sustained by strategies of support and enrichment of knowledge.

relying on institutions

Collaboration with institutional structures (such as universities and laboratories), as well as other involved organizations, promotes a wider dissemination of knowledge, while contributing to sensitization at local and global scales.

strengthening the resilience of communities

The process of harmonization between the local culture and the natural environment, through the reinforcement of local capacities, helps to reduce vulnerability, while encouraging the development of local building cultures.

preparing populations prior to disasters

Creating an environment that is favorable to the acknowledgement of risks, uncertainties, challenges, vulnerabilities and capacities at the local level allows for a positive development of proposed approaches, and to disaster preparation activities involving local populations and including other local actors.

developping integrated and inclusive responses

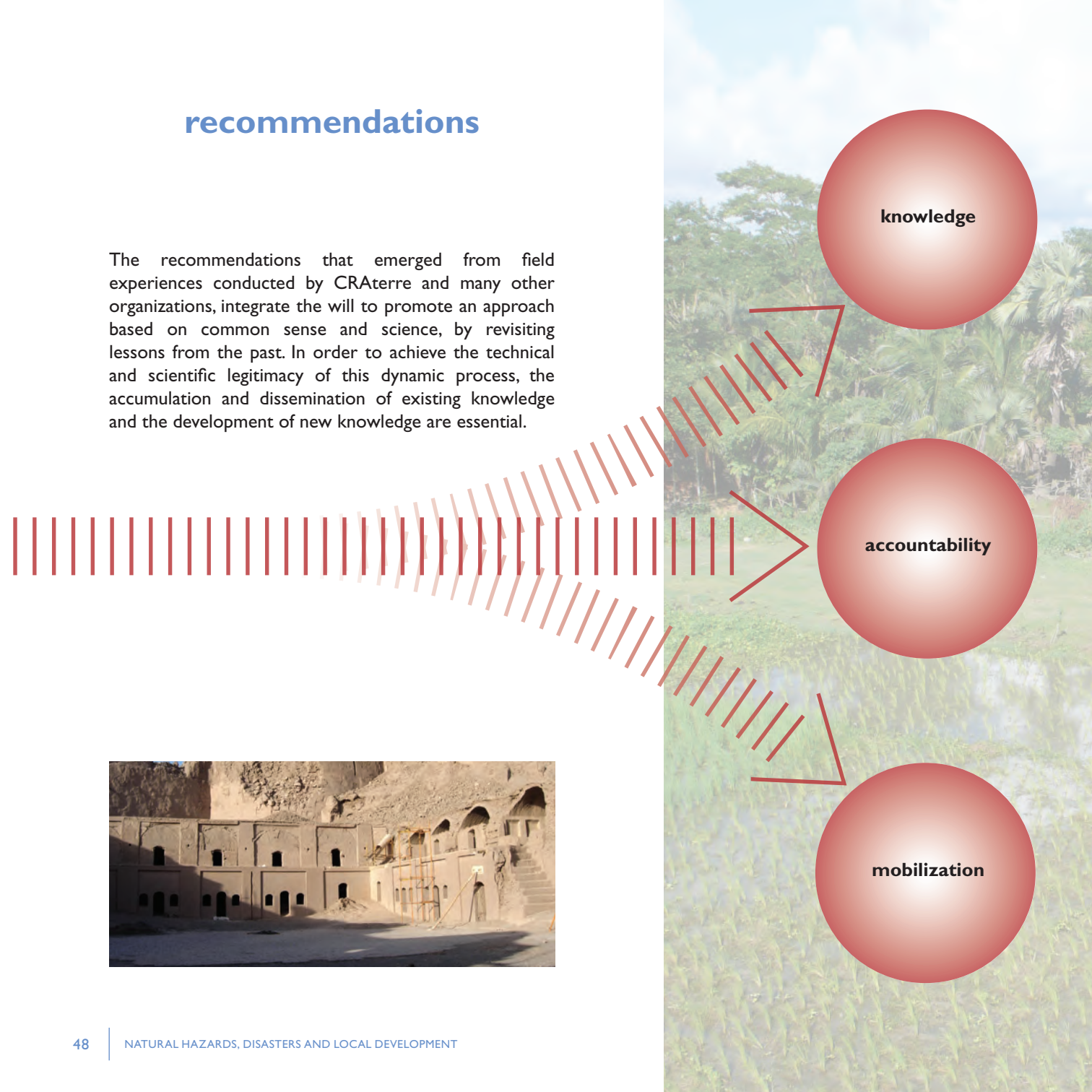
The integration and the non-sectorization of emergency and reconstruction programs, and of programs of development and risk reduction, improves the efficiency and impact of projects and actions.

developping complementary activities

Activities, varied and complementary, lead to relevant results, and to a shared accountability among local actors.

recommendations

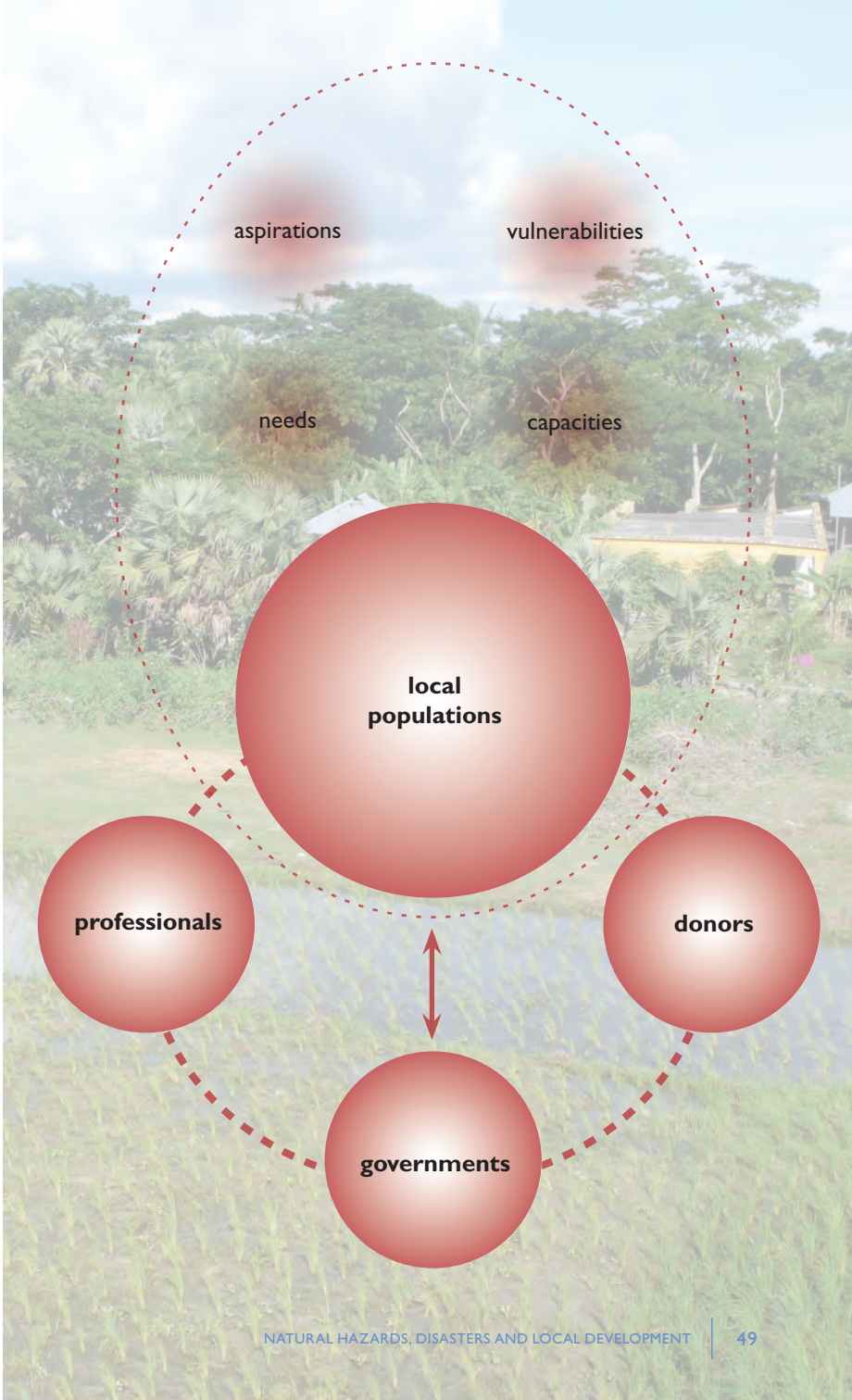
The recommendations that emerged from field experiences conducted by CRAterre and many other organizations, integrate the will to promote an approach based on common sense and science, by revisiting lessons from the past. In order to achieve the technical and scientific legitimacy of this dynamic process, the accumulation and dissemination of existing knowledge and the development of new knowledge are essential.



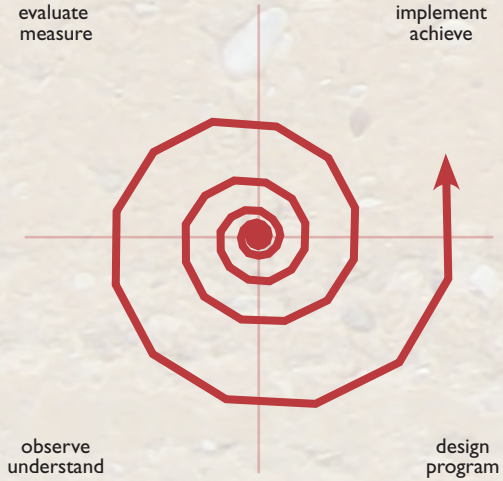
- Know and study ordinary and extreme climate events.
- Deepen scientific knowledge of technical and social cultures related to natural hazards.
- Information on the prevention of natural disasters in areas at risk.
- Disseminate knowledge concerning natural hazards.

- Adopt a transversal approach and implement projects to take into account all issues pertaining to specific contexts.
- Qualify experts to make them capable to consider the potential of vernacular knowledge in responding to crises.
- Enhance the skills of professionals through customized training.
- Legitimize the persons involved.

- Encourage the multidisciplinary analysis of vernacular knowledge.
- Promote the research and study of local materials and their potential.
- Supply networks and disseminate technical, vocational and academic knowledge.
- Codify and document the local know-how for the formulation of best practices, guidelines and standards.



general principles



"Each individual has a number of habits in his gestures, his thoughts and reactions, which we call individuality, when we differentiate it from others'. When we consider a society, we see a set of individuals and more importantly, that individuality is the basis for the creation of everything - each feature in action, thought and reaction is developed under the pressure of many other features that surround it and according to the requirements of climate, work and trade. Individuality is not mysterious and abstract, but the sum of many tangible details: the time when a man rises, shaves, the clothes he likes, his habits of language, the people under his command and those to whom he obeys, but more than anything else, his home."

(H. Fathy, architecte, 1969)

Reconstruction as an opportunity to start the process of restoring the dignity of a community and strengthening its resilience **I.**

Valorization of processes and methods of action (qualitative) rather than of products (quantitative) **II.**

Dialogue between beneficiaries, professionals, aid agencies and donors **III.**

Adoption of a multidisciplinary approach: coordination and creation of links with other activities and areas concerned **IV.**

Establishment of an experimental iterative research approach, based on local materials, knowledge and know-how **V.**

VI. Development of various educational materials suited to different target groups, contexts and situations

VII. Local capacity building based on knowledge, practice and research-experimentation

VIII. Extending the analysis, from the scale of habitations to that of human settlements

IX. Taking into account vernacular heritage, knowledge and local expertise in defining best disaster resistance practices

X. Implementing an endogenous development strategy with local stakeholders, systematically integrating management and risk prevention

vulnerability...

A few questions for a preliminary identification of the potentials of a context at risk ...

natural hazard

1.
Are we dealing with the kind of natural hazard which allows populations to prepare before an impact?

2.
Are the intensity and timing of impacts predictable?

social organization

3.
Are local populations aware of the real risks to which they are exposed?

4.
Are there any components of local cultures that contribute to an appropriate response to risks?

built environment

5.
Have local populations implemented strategies to reduce the exposure of buildings?

6.
Have local populations developed building solutions that increase the resistance of structures to the impact of natural hazards?

NO YES

... for the valorization of local knowledge before and after the impact of natural hazards.

... and resilience?

disaster-resistant techniques

7.
Have any vernacular buildings completely or partially withstood the impact of the most recent natural hazard?

8.
The disaster-resistant characteristics of vernacular buildings, are they implemented in (re)constructed buildings?

natural materials

9.
Traditionally used natural materials, are they available, usable and accessible?

10.
The necessary preparatory steps to make natural materials usable in (re) construction projects, are they affordable?

local skills

11.
Are there any skills concerning the use of traditional materials and techniques, locally?

12.
Are local artisans and beneficiaries directly involved in (re) construction works?

NO YES

conclusion

To rebuild housing structures and to recreate physical environments less vulnerable to natural hazards and more equitable, requires the implementation of strategies and practices that live up to challenges. The strategic choices made by institutions and agencies inevitably influence the vulnerability of individuals, thus playing an important role in the effects that natural phenomena may cause. On the one hand, the benefits granted by reconstruction projects increase on a par with the level of involvement of local populations. On the other hand, truly effective risk management applications directly emerge from local building cultures. It is therefore essential to associate these dynamics and make sure that they enrich each other, to initiate more effective cooperations in situations of exposure to natural hazards, more respectful of populations, promoting the self-determination of communities.

"Post-emergency actors, during reconstruction, must understand and take into account what local populations have already experienced. Rebuilding together is an essential asset to succeed new challenges and to learn from each other. They have a major responsibility in the implementation of programs that may impact, or not, the potential resilience of affected populations."

(D.-C. Varnat, psychologist, Fondation Abbé Pierre, 2009)

abbreviations

ADPC	Asian Disaster Preparedness Center
ALNAP	Active Learning Network for Accountability and Performance in Humanitarian Action
CBDRM	Community-Based Disaster Risk Management
CRAterre	International Center for Earthen Architecture (France)
CUEBC	European University Centre for Cultural Heritage (Italy)
DAEI	Direction of European and International affairs (France)
DDC	Direction of Development and Cooperation (Switzerland)
DFID	Department for International Development (England)
DGPAT	Direction Générale des Patrimoines (France)
DIPECHO	European Commission, Humanitarian Aid & Civil Protection
DKKV	German Committee for Disaster Reduction (Germany)
ECHO	European Community Humanitarian Aid Office
EERI	Earthquake Engineering Research Institute (United States)
EM-DAT	Emergency Events Database
ENSAG	National Superior School of Architecture of Grenoble (France)
ENTPE	Ecole Nationale des Travaux Publics d'Etat (France)
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (Allemagne)
HPN	Humanitarian Practice Network
ICHHTO	Iran's Cultural Heritage, Handicrafts and Tourism Organization (Iran)
IHF	Islamic Housing Foundation (Iran)
IIEES	International Institute of Earthquake Engineering and Seismology (Iran)
IFRC	The International Federation of Red Cross and Red Crescent Societies
ISDR/SIPC	International Strategy for Disaster Reduction / Stratégie Internationale de Prévention des Catastrophes
LSC	Local Seismic Culture / culture constructive parasismique locale
MCC	Ministry of Culture and Communication (France)
MEEDDTL	Ministry of Ecology, Sustainable Development and Energy, Transport and Housing (France)
UN/OCHA	United Nations Office for the Coordination of Humanitarian Affairs
ODI	Overseas Development Institute (England)
SCAC	Cooperation and Cultural Action Office (Iran)
SUPSI	Scuola Universitaria Professionale della Svizzera Italiana (Switzerland)
UNPD	United Nations Development Programme
URD	Groupe Urgence Réhabilitation Développement (France)
UNDP/BCPR	United Nation Development Programme Bureau of Crisis Prevention and Recovery
WHRU	World Habitat Research Unit (Switzerland)

websites

french institutions

CRAterre	www.craterre.org
MCC	www.culture.gouv.fr
MEEDDM	www.developpement-durable.gouv.fr

international organisms

Caritas France	www.secours-catholique.asso.fr
FISCR	www.ifrc.org
DDC	www.ddc.admin.ch
DFID	www.dfid.gov.uk
ECHO	www.ec.europa.eu/echo
GTZ	www.gtz.de
ISDR	www.unisdr.org
MISEREOR	www.misereor.org/
OXFAM	www.oxfam.org/fr
Practical Action	www.practicalaction.org
SKAT foundation	www.skat-foundation.org
Shelter centre	www.sheltercentre.org
UNDP/BCPR	www.undp.org/bcpr
UN/HABITAT	www.unhabitat.org
UN/OCHA	ochaonline.un.org

research groups

ANALP	www.alnap.org
basin	www.basinsa.net
Conservationtech	www.conservationtech.com
CUEBC	www.univeur.org
EERI	www.eeri.org
IIEES	www.iiees.ac.ir
ODI	www.odi.org.uk
SPHERE project	www.sphereproject.org
URD	www.urd.org
WHRU	www.worldhabitat.supsi.ch

platforms

ADPC	www.adpc.net
HPN	www.odihpn.org
PreventionWeb	www.preventionweb.net
Reliefweb	www.reliefweb.int
PPRIM	www.prim.net

bibliography

Abarquez, I. et Murshed, Z. (2004) *Field Practitioners' Handbook, Community-Based Disaster Risk Management,* Asian Disaster Preparedness Centre (ADPC), United Nations Economic and Social Commission for Asia and Pacific (UNESCAP), The European Commission's Humanitarian Aid and Civil Protection department (ECHO), Bangkok

Abhas, K. Jha et al. (2010) *Safer Homes, Stronger Communities, A Handbook for Reconstructing after Natural Disasters*, Global Facility for Disaster Reduction and Recovery, International Bank for Reconstruction and Development, World Bank, Washington

ADPC (2006) *Guidebook on Advocacy, Integrating CBDRM into Local Government Policy and Programming*, Asian Disaster Preparedness Centre (ADPC), United Nations Economic and Social Commission for Asia and Pacific (UNESCAP), Bangkok

Asquith, L. et Vellinga, M. (2006) *Vernacular Architecture in the Twenty-First Century, Theory, Education and practice*, Taylor & Francis, Oxon

Barakat, S. (2003) *Housing reconstruction after conflict and disaster*, Humanitarian Practice Network, Network Paper 43, Overseas Development Institute, n. 43, décembre 2003, London

Benson, C et Twigg, J. (2007) *Tools for Mainstreaming Disater risk Reduction: Guidance Notes for Development Organisations, ProVention Consortium*, Geneva

Brown, O. et al. (2006) *Natural Disasters and Resource Rights, Building resilience, rebuilding lives*, International Institute for Sustainable Development, March 2006, Winnipeg

Capra, F. (2002) *The Hidden Connections: a Science for Sustainable Living*, Random House, New York

CRF (2004) *La prevention des catastrophes naturelles*, Croix-Rouge Française, Haut Conseil de la Coopération Internationale, Dossier d'information, July 2004

Davis, I. et Murshed, Z. (2006) *Community-Based Disaster Risk Management. Critical Guidelines,* Asian Disaster Preparedness Centre (ADPC), United Nations Economic and Social Commission for Asia and Pacific (UNESCAP), the European Commission Humanitarian Aid Office (ECHO), Bangkok

DIPECHO (2004) *Preparing for Disaster saves Lives*, Humanitarian Aid & Civil Protection, European Commission

DKKV (2002) *International Symposium on Disaster Reduction and Global Environmental Change, From a culture of reaction to a culture of prevention: Joining forces for a sustainable development*, German Committee for Disaster Reduction, June 2002, Berlin

Duyne Barenstein, J. (2006) *Housing reconstruction in post-earthquake Gujarat, a comparative analysis,* Humanitarian Practice Network, Overseas Development Institute, n. 54, March 2006

Duyne Barenstein, J. et Pittet, D. (2007) *Post-disaster housing reconstruction, Current trends and sustainable alternatives for tsunami-affected communities in coastal Tamil Nadu, in Point Sud*, EPFL - Ingénieurs du Monde, n. 26, April 2007

Duyne Barenstein, J. (2009) *An introductory Overview of Post-disaster Reconstruction Approaches, in Basin-South Asia*, Regional Knowledge Platform, quarterly newsletter, n. 14

ECHO (2003) Le programme DIPECHO: *réduire l'impact des catastrophes naturelles*, Service d'Aide Humanitaire de l'Union Européenne, mai 2003, Bruxelles

Fathy, H. (1969) "*Architecture for the poor: An experiment in rural Egypt*"

Ferrigni, F. éditeur, (1987) *À la recherche des anomalies qui protègent*, PACT, Ravello

Ferrigni, F. et al. (2005) *Ancient Buildings and earthquakes*,

bibliography

The Local Seismic Culture approach: principles, methods, potentialities, Centro Universitario Europeo per i Beni Culturali, Edipuglia, Bari

GTZ (2002) *Disaster Risk Management, Working Concept*, Deutsche Gesellschaft für Technische Zusammenarbeit, avril 2002, Eschborn

Jigyasu, R. (2002) *Reducing Disaster Vulnerability through Local Knowledge and Capacity. The Case of Earthquake Prone Rural Communities in India and Nepal*, Norwegian University of Science and Technology, PhD thesis, Trodheim

Langenbach, R. (2009) *Don't tear it down ! Preserving the Earthquake Resistant Vernacular Architecture of Kashmir,* UNESCO, New Delhi

Oliver, P. (1969) *Shelter and Society,* Edition Barrie & Rockliff, Londres

Twigg, J (2004) *Disaster risk reduction. Mitigation and preparedness in development and emergency programming*, Humanitarian Practice Network, Overseas Development Institute, n. 9, mars 2004

Schacher, T. et Ali, Q. (2009) *Dhajji Construction. For one and two storey earthquake resistant houses. A guidebook for technicians and artisans*, University of Applied Science of Southern Switzerland, University of Engineering and Technology of Peshawar

UNCHS (2001) *Guidelines for Operational programme Formulation in Post-Disaster Situations*, United Nations Centre for Human Settlements-Habitat, Risk and Disaster Management Unit, Nairobi

UNDRO (1982) *Shelter after Disaster. Guidelines for assistance*, Office of the United Nations Disaster Relief Co-ordinatior, Nations Unies, New York

UN/ISDR (2005) *Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters*, World Conference on Disaster Reduction, Kobe, January 2005

UN/ISDR (2008) *Linking Disaster Risk Reduction and Poverty Reduction*, Programme Nations Unies pour le Développement, Genève

UN/ISDR (2008) *Indigenous Knowledge for Disaster Risk Reduction: Good Practices and Lessons Learned from Experiences in the Asia-Pacific Region*, Union Européenne, Juillet 2008, Bangkok

UN/ISDR (2009) *Indigenous Knowledge for Disaster Risk Reduction: Policy Note*, Union Européenne, Bangkok

UN/ISDR (2009) *Risques et pauvreté dans un climat en évolution, Réduction des risques de catastrophe: Bilan Mondial 2009*, Nations Unies, Genève

UN/OCHA (2006) *Exploring key changes and developments in post-disaster settlement, shelter and housing, 1982-2006, Scoping study to inform the revision of 'Shelter after Disaster: Guidelines for Assistance'*, DFID, Nations Unies, Genève

UNDP (2004) *Reducing Disaster Risk: a Challenge for Development,* Rapport Mondial, Bureau pour la Prévention des Crises et du Relèvement, Programme des Nations Unies pour le Développement, New York

UN/ISDR (2009) *Terminologie pour la prévention des risques*, Nations Unies, Genève

URD (2003) *Manuel du praticien. La participation des Populations affectées par les crises dans l'Action Humanitaire, Active Learning Network for Accountability and Performance in Humanitarian Action* (ALNAP), Overseas Development Institute, London

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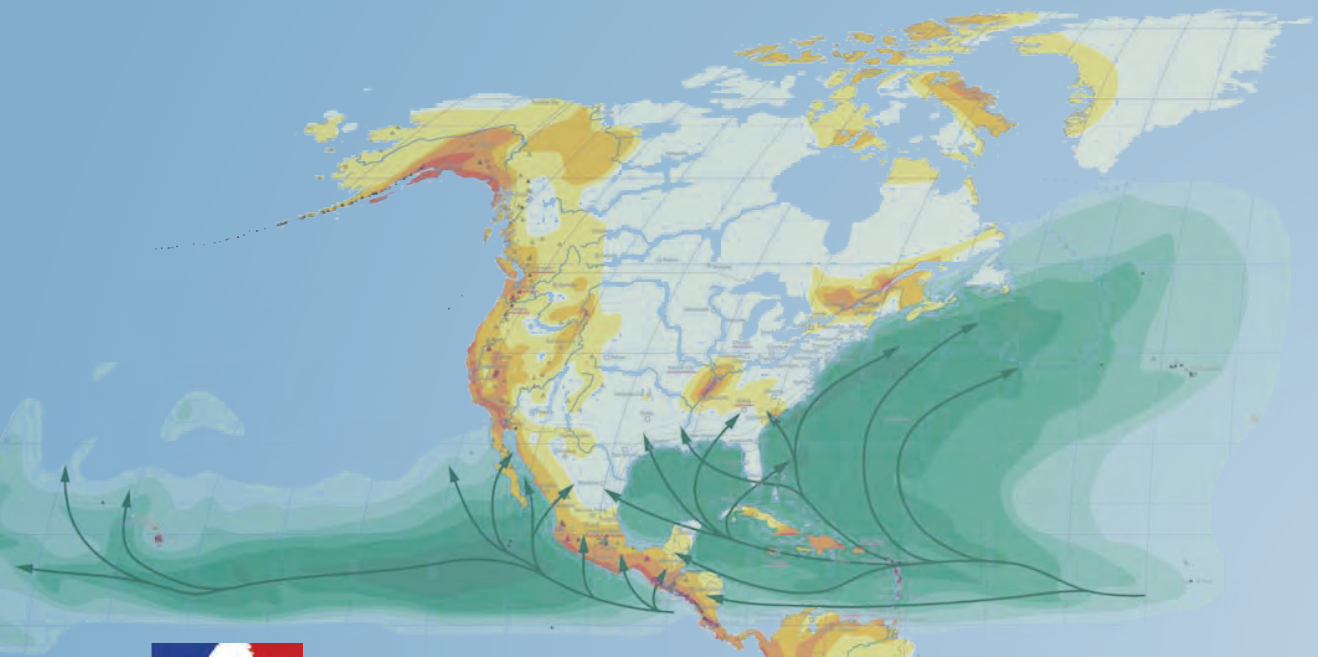

BUILDING CULTURES and SUSTAINABLE DEVELOPMENT

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

Ministère de l'Écologie, de l'Énergie, du Développement durable et de la Mer

Ministère Culture Communication

CRAterre ENSAG

UNESCO

UNITWIN

Fondation Abbé Pierre pour le logement des défavorisés

MISEREOR
IHR HILFSWERK

This publication addresses the role of the international community and of local representatives regarding the responses to be brought in the face of natural disasters. It is aimed in particular at individuals and institutions aware of the need to integrate reconstruction programs as part of a strategy for sustainable development. The objective of this document is to show the interest, relevance and potential of local materials in at-risk situations but also to demonstrate that ignoring or banning the use of local materials and their associated know-how, as part of reconstruction, risk prevention and management or development projects, inevitably leads to even more vulnerable and dependent affected (or likely to be affected) populations. Beyond housing reconstruction, the idea is to implement sustainable conditions for better prevention and risk preparedness, for and by local populations, by taking into account and valorizing their knowledge and know-how: their own building culture. The theoretical and methodological elements proposed are illustrated by case studies of several recent initiatives, reflecting the different approaches developed and their results. This document does not provide instructions to be followed, but is intended as a basis for reflection. It opens new doors into more effective programs of reconstruction and prevention in high-risk areas.

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