Designing for Post-Disaster Reconstruction

A Canadian Response

Credits

Project Development : Sustainable Buildings Canada (SBC)

Sponsor: Canadian Mortage & Housing Corporation (CMHC)

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Guiding Principles

The information exchange led the group to begin to develop a framework for a Canadian approach to Post-Disaster Reconstruction based on the following guiding principles:

1. Build Back Better.
2. Engage and train local communities.
3. Focus on permanent, not temporary solutions.
4. Respect local sustainability practices.
5. Address ecosystem and socio/cultural issues.
6. Use an integrated design process.
7. Aim to restore local economies quickly.
8. Integrate advanced technologies with locally available resources
9. Keep the implementation plan simple.
10. Communicate best practices and ensure access to information for all stakeholders.

What is Canada's Role?

Canada has produced numerous innovations that could inform the building of sustainable communities in disaster-affected areas. In break out sessions, members of the working group began to identify examples of relevant innovations in micro infrastructure, leapfrog technologies, advanced materials, energy efficient construction strategies, water purification and waste management systems.

The SBC Tool Kit

Making these innovations readily accessible to reconstruction programs represents a business opportunity as well as a social responsibility for Canada. To leverage this intellectual capital, SBC proposes to develop a Design for Post-Disaster Reconstruction Tool Kit. The Tool Kit will be a kit-of-parts: an evolving compendium highlighting examples of Canadian building technologies, products, services and other resources that can contribute towards a new international gold standard for sustainable reconstruction and revitalization. SBC will work with a team of expert information design researchers to develop the concept for the Tool Kit that will also showcase Canada's expertise in user-centred information design.

Next Steps

SBC is seeking collaborative research and funding partners to support future charrettes and the ongoing activities of the Design for Post-Disaster Reconstruction Working Group.

A full description of the Design for Post-Disaster Reconstruction Project can be found on the SBC web site, www.sbcanada.org, under: Design for Post-Disaster Reconstruction Charrette.

III Project Rationale

The Designing for Post-Disaster Reconstruction project vision is:

That Canadian expertise, resources and knowledge will be easily accessible to disaster-affected areas within its borders and around the world. This expertise will be used to help build sustainable communities, and to engage and prepare members of local communities to assume leadership and responsibility for revitalizing their own economies and improving the quality of life.

The project mission is:

> To mobilize Canadian skills, products, services and resources to support the development of sustainable community building in areas affected by natural disasters.
>
> The main objectives of the charrette held on March 7 & 8, 2006 were:
>
> - To leverage the expertise and experience of a cross-disciplinary professional working group to explore Canada's capabilities in post-disaster reconstruction and revitalization.
>
> - To identify the ecosystem, socio/cultural and infrastructure challenges in post-disaster reconstruction, as well as the opportunities to support and facilitate revitalization in the built environment.
>
> - To propose a concept for a Canadian Toolkit that will use state-of-the-art information design practices to collect and categorize skills, products and services that can help build sustainable communities in disaster-affected areas in Canada and around the world.

IV Profile of the Charrette Working Group

The charrette process was adopted for this project because it brings together stakeholders from a variety of disciplines to brainstorm around a particularly challenging problem or opportunity. The charrette provides an ideal forum for knowledge sharing and information exchange. It facilitates cross-disciplinary collaboration. It is also a process focused on modeling potential solutions in concrete terms. The process can be replicated under many different circumstances.

The Charrette Working Group involved members of key stakeholder groups active in post-disaster reconstruction. The group included architects, landscape architects, designers, civil engineers, urban planners, policy analysts, university researchers, and industry and government representatives. The expertise of participants spanned a range of capabilities from emergency management, water purification, civil engineering and anthropology to energy efficiency, urban planning and information design.

Charrette Organization Team

Mike Singleton, Executive Director, SBC
Project Director: Arlene Gould, SBC
Facilitator: Jillian Hovey
Researcher: Alina Racoviceanu
Sponsor: Canada Mortgage and Housing Corporation
CMHC liaison: Wojtek Kajowski, Senior Researcher

Charrette Participants and their Affiliations

NAME	OCCUPATION/ EXPERTISE	AFFILIATION
Ali Asgary	Professor, Emergency Management	York University
Phil Dick	Gov't Energy Efficiency	OMAFRA
Phil Fung	Certified Energy Manager	SRS
Priya Gopalen	Policy & International Development Professional	Rooftops Canada
Arlene Gould	Design Management Educator, SBC board member	York University
Lee Haust	Engineer	MCW Custom Energy Solutions
Anna Hercz	Strategic Planner/Urban Planner	City of Ottawa
Jillian Hovey	Facilitator/Designer	Sustainable Living Network
Richard Hunt	Graphic Designer, Graduate Student	York University
Wojtek Kujawski	Senior Researcher	CMHC
Rebeca Lamadrid	Graduate Student, Design	York University
Glenn McArthur	Graphic Designer, Graduate Student, Design	York University
Inez Mitchell	Sector Manager, Trade Department	Consulate General of the Netherlands
Carlos Moreno	Architect, Planner	Architects Alliance
Grant Morrison	Advisor, Aboriginal Housing	CMHC
Robert Munro	Director, Technical Services	LaFarge North America
Louis Musto	Program Manager	CMHC International
Angela Norwood	Assistant Professor, Design	York University
Steven Pedersen	Chief Design Engineer	Zenon Environmental Inc.
Tom Ponessa	Architect	SBC
Alina Racoviceanu	Electrical Designers	Smith & Andersen Electrical Engineering
Chris Ruhig	Emergency Management	City of Toronto
Teresa Sarkesian	Director, Business Development	Cement Association
Bill Semple	Senior Researcher	CMHC
Mike Singleton	Executive Director	SBC
Vera Straka	Professor, Architecture	Ryerson University
John Warren	Consultant	Waimata Associates

Additional members of the Working Group who were unable to attend the March 7/8 charrette:
Allison Durand, Sales & Marketing, ReNew Magazine
Peter Howard, Project Manager, Zero Footprint Inc.
Colleen Lashuk, Architect, Group ECDH
Brad Peterson, Architect, EDC
Ed Oliver, Safety & Energy Conservation, Prolink North America Inc.
John Van Nostrand, Architect, Architects Alliance

V Framing the Opportunity

"With intelligent urban design and strategic planning it is possible to increase the pace of recovery after a disaster...the best possible response to the destruction would be to rebuild exemplary villages and towns whose architecture and urban design demonstrate an imaginative application of local wisdom and the finest science to available resources."
Sunand Prasad, CABE Commissioner and Chair
RIBA Policy Group

In the first morning of the charrette, the working group agreed that a sustainable reconstruction plan should outline guiding principles, processes, best practices, and potential partners. In setting the context for more detailed working sessions later in the day, the group raised a number of preliminary questions:

- Should Canada be concentrating on potential disaster areas at home or abroad?
- Can Canadian teams help to integrate advanced technologies with available local materials to facilitate a low cost, local response to reconstruction?
- Can we facilitate training programs and provide and provide tools and other resources needed restore and revitalize local economies?
- How can we export the charrette model and an integrated design process to engage local teams in the planning as well as the implementation phase of reconstruction?
- What are the best practices in sustainable reconstruction and environmental management that Canada has tested in local situations that can be exported?
- What skills does Canada bring to helping rebuild local infrastructure, community training and engagement?
- What are the opportunities for new research that could be applied to raising the bar on post-disaster reconstruction?
- Should the focus be on mitigation and emergency planning, or on reconstruction?
- Should we concentrate on disaster-affected areas in Canada first (particularly those in our northern communities)?
- What are the best practices in sustainable reconstruction and environmental management in disaster-affected areas that Canada can promote around the world?
- What skills does Canada bring to helping rebuild local infrastructure, community training and engagement?
- Could the Northern Healthy House that CMHC has developed with First Nations Communities become one model for low cost, high efficiency housing in reconstruction?
- Are the capabilities and best practices relating to emergency management in Canadian cities another area of focus?
- How can we identify, "package" and promote our capabilities in all aspects of post-disaster reconstruction?

Lessons Learned

The working group also exchanged stories and lessons learned from their broad-based experience in the field. Rooftops Canada shared its capacity-building approach to the development of low-cost housing in international settlements (see appendix b). Architects Alliance stressed the need for permanent (as opposed to temporary) solutions, and the importance of honouring local ideas on sustainability and resource conservation.

Guest Presentations

The group heard guest presentations from Louis Musto, Program Manager for CMHC International, and from Robert Munro, Director of Technical Services for LaFarge North America, documenting the activities undertaken by their organizations in Indonesia in the first few months following the Asian Tsunami of 2004.

Inez Mitchell, Sector Manager, Trade Department, Consulate-General of the Netherlands, attended the charrette with a view to exploring future collaboration on this project.

VI Ten Guiding Principles

"…Well-designed community based housing contributes to social and community development, stability, crime reduction, improved health and education, and local economic development. Women and children are usually the main beneficiaries of better living conditions."
Rooftops Canada

As the discussion continued, the group proceeded to identify a set of guiding principles for sustainable reconstruction.

These principles are:

1. Build Back Better.

Catastrophe can be a catalyst for positive change. History has demonstrated that catastrophes have given some cities a blank slate to rebuild according to a more sustainable plan: Chicago after the Great Fire, Halifax after the Explosion or Warsaw after the Second World War.

Natural disasters can offer this kind of opportunity. However, in the panic and desperation following a natural disaster, there is pressure to act rather than to reflect. Strategic planning often gives way to fragmented action. Reconstruction projects often manage only to restore the status quo, rather than to improve upon it.

This has happened not only in deprived areas in the third world, but even in post-Katrina Louisiana, where building projects have gone ahead of a strategic plan. On June 18th, 2006, the Sunday New York Times reported that in New Orleans "the money is ready, but a plan isn't…with the anniversary of Hurricane Katrina approaching, local officials have yet to come up with a redevelopment plan showing what kind of city will emerge from the storm's ruins."

Of course, following a major natural disaster, timing is a big issue. The affected communities may well feel they cannot take time for planning, because the pressure for housing and restarting local businesses is so great. In these situations, creating easy access to sustainable building strategies, concepts and tools can enable disaster-affected communities to "build back better" without serious delay.

2. Engage andTrain Local Communities.

This is probably the most important principle for reconstruction teams to keep in mind. Engaging the local community in the planning as well as the implementation phase of reconstruction is the best way to ensure that all restoration and revitalization activities are led by and embraced by members of the local population in the long-term. And using local technologies and employing the local labour force is the most practical and cost-effective strategy for rebuilding. It helps to restart the local economy and creates jobs, education and training opportunities for disaster victims (particularly women and children) seeking to restart their lives. The charrette team agreed that one of the important goals of international reconstruction teams focused on sustainable solutions is to "design themselves out of the process".

3. Focus on Permanent, not Temporary Solutions.

Unless a plan for transitional and permanent community restoration is developed at the outset, it can be difficult to mobilize resources for sustainable solutions later on. There are many recent examples of disaster survivors forced to live indefinitely in hastily erected relief camps, trailer parks and shantytowns. Such temporary shelters are a poor investment; and these sites are natural breeding grounds for crime and infectious diseases. Architects Alliance and other members of the working group provided specific examples of the dangers of temporary housing. Based on their own work, they suggested strategies for developing transitional or permanent housing and other sustainable facilities that respond practically and sensitively to the long-term needs of local communities.

4. Respect Local Sustainability Practices.

In developing countries, local communities have developed their own, very basic energy and resource conservation practices because they have no choice. Such practices as building "healthy houses" out of yellow soil or keeping food cool in a hole in the ground are part of the culture and collective knowledge of specific regions. Local sustainability practices should be respected in reconstruction planning. As one experienced member of the charrette group cautioned: "We can't export a western idea of sustainability" to these regions.

5. Address Ecosystem, Socio/cultural and Infrastructure Needs.

A sustainable approach to post-disaster reconstruction must address not only the needs of the built environment, but also ecosystem, socio/cultural and infrastructure requirements. Adopting this holistic framework ensures that the restoration along one dimension does not have a negative impact on other aspects of the long-term health and well being of the region. Maintaining the delicate balance between natural and socio/economic goals will also ensure that communities co-ordinate available resources and maintain fair and equitable opportunities for all stakeholders in the reconstruction

process. A full exploration of these issues and an outline of a methodology for assessing various dimensions at risk in the reconstruction process is presented in Appendix A.

6. Use an Integrated Design Process.

Many different kinds of expertise are required to develop and implement a sustainable reconstruction plan. The Integrated Design Process (IDP) brings together experts in a variety of disciplines (including engineering, design, construction and finance) with future users. These stakeholders form a collaborative team to identify issues and objectives for the process. It is essential that all members of the team are involved throughout the process to agree on goals, provide input into concept design and development, oversee implementation and evaluate results. This closed loop process examines every stage in the life of the facility or community environment to be developed – in other words, the complete lifecycle of the project. Key steps in this cycle are:

i) Assess the damage,
ii) Determine the scope and scale of work to be done
iii) Prioritize the needs
iv) Identify key players
v) Develop opportunities for local community involvement
vi) Assess and enumerating available resources
vii) Conduct a feasibility study on what can be done
viii) Decide on the best plan
ix) Conceptualize the plan
x) Implement the plan
xi) Monitor the process and evaluate results

Adopting an Integrated Design Process is particularly critical to post-disaster reconstruction because the challenges are monumental, the interests of the stakeholders are extremely varied and the resources are very limited. The primary goals of the process are to:

a) Build a sustainable community that improves upon the infrastructure and built environment that were destroyed and mitigates the impact of future disasters.

b) Engage the local community in the process, so that they assume ownership and leadership for all phases of the reconstruction initiative and can replicate the Integrated Design Process for themselves on subsequent reconstruction projects.

7. Aim to Restore Local Economies Quickly.

A top priority for international reconstruction teams is get disaster survivors back to work and to restore the normal rhythm of daily life. “Get the local hospital and the local bakery up and running as quickly as possible…seek to regenerate local craft industries”. To do this, it is critical to understand the basic infrastructure and economics of food and shelter in the disaster-stricken area. Often, the local population has lost their tools or means of production, so supplies of simple tools and equipment could help people to retrain and to restart their lives.

8. Facilitate a Local Response to the Disaster.

It is important to facilitate a local response to a natural disaster, rather than importing sophisticated solutions that are not sustainable by the local population in the long-term. "Local technology usually evolves to deal with local issues". The best way to support local reconstruction initiatives is to:

a) Study the architecture and materials used historically in the region
b) Propose solutions that integrate advanced technology, or micro infrastructure with local materials
c) Train local teams to implement the plan, to take ownership for local reconstruction projects and to maintain systems and equipment in the long-term.

9. Keep the Implementation Plan Simple.

"Think local and low cost". A simple plan involving the local community and local resources, and a design concept that honours culture and sustainability practices of the region has a better chance of success. Establishing micro-infrastructure, contributing "deskilled", high-performance equipment and training local community members to maintain that equipment are ways of ensuring that the solutions can be maintained without continuous involvement of the international post-disaster team. This principle also creates jobs and supports the reestablishment of local economies.

10. Communicate best practices and ensure access to clear information for all stakeholders.

Clear and open communications enable all stakeholders to become engaged with the reconstruction process in a fair and equitable way. Making sure that disaster-affected communities have timely access to sustainable reconstruction principles and best practices will increase their chances of building sustainable communities and contribute to community engagement and the quality of life for the local population as it works towards restoration and revitalization.

VII What is Canada's Role?

"Design can be used to identify which communities are at risk and to develop strategies for minimizing the impact of potential crises. Measures could include restricting development, relocation; building more robust housing; developing early warning systems and abandoning decentralized communications channels. But perhaps the most important role design can play is to enable communities at risk to create their own potential solutions, encouraging ownership of the issue and its action plan."
Richard Eisermann,
Director of Design and Innovation
Design Council, UK

Why Should Canada Play a Leading Role in Sustainable Reconstruction?

As a nation, Canada has broad-based expertise to contribute to sustainable reconstruction projects in disaster-affected areas. This expertise includes sustainable construction practices, micro infrastructure for water and waste management, new products and advanced materials, technical training and community engagement strategies.

However, unlike The Netherlands, which has branded, marketed and efficiently exported its high-level expertise in water management and energy efficiency, Canada has not yet clearly positioned or leveraged the multi-disciplinary capabilities it can contribute to post-disaster reconstruction. It is critical to do so now because:

1. The need is intensifying. In the developing world, natural disasters already wreak havoc on fragile economies. But, if predictions of the impact of global warming come true, Louisiana's post-Katrina floods could be a bellwether for what's to come for low-lying urban areas in the developed as well as the developing world.

2. Once our capability has been clearly identified, there is a better opportunity to partner with other countries and local governments to develop a new Gold Standard for sustainable reconstruction in disaster-affected areas.

3. A comprehensive identification of our expertise would help Canada to respond more effectively to the threat and impact of natural disasters within our own borders.

4. Canadian NGO's and companies in the construction, engineering, design and other sectors would be better positioned to find strategic partners and suppliers and to respond quickly to local community needs in disaster-affected areas.

5. The "packaging" of Canadian expertise as intellectual capital would provide the base case on which to build new cross-disciplinary research initiatives, and to leverage research collaborations at institutions across the country.

VIII Mapping Canadian Expertise

The Charrette Working Group began to identify areas of expertise, and provided specific examples of advanced technologies, micro infrastructure, new products and services that could be adapted for use in sustainable reconstruction projects. These examples include:

1. Micro-infrastructure

EcoNomad – a self-contained, off grid utility system developed by Architectural and Community Planning Inc. Kenora, Ontario. The EcoNomad system has been integrated into the CMHC Eagle Lake Healthy House. www.economad.com

Compressed Air/Foam (CAF) Sprinkler System – An NRC research project is adapting a commercial sprinkler system for use in residential communities. This is a low-cost solution with potential for use in rural communities with limited fire-fighting capacity.

2. Sustainable Housing

Eagle Lake, First Nation, Healthy House, (2000) –
A prototype for energy efficient, environmentally responsible, affordable housing developed by CMHC with the Eagle Lake First Nation, near Dryden, Ontario. The concept uses the EcoNomad portal utility system to provide heat, power, drinking and wastewater.
www.cmhc-schl.gc.ca

3. Advanced Materials

Insulated Concrete Forms (ICF) – a Canadian innovation, Insulated Concrete Forms facilitate the building of energy efficient and disaster-resistant concrete houses. ICF materials are manufactured by a number of Canadian companies including Nudura Corp, in Barrie, Phil-Insul Corp. in Kingston and Arxx Building Products Inc. in Coburg, Ontario and Fastfoot Industries in Surrey, British Columbia.

4. Water Purification

Membrane Filtration System – Zenon Environmental Inc., based in Oakville, Ontario uses a proprietary membrane filtration process to produce safe drinking, wastewater and water recycling systems. Zenon has developed generations of water treatment products from infrastructure systems to (most recently) a simple, low cost, personal unit that can be quickly distributed to thousands of survivors in the early days following a natural disaster. www.zenon.com

5. Environmental Auditing

Green Globes – Green Globes is a cost-effective online environmental auditing tool that enables designers, property owners and managers to integrate the principles of green architecture and design into new construction and retrofits. The system includes a specific tool for Building Emergency Management Assessment (BEMA). www.greenglobes.com

6. Community Engagement Strategies

Rooftops Canada – Rooftops Canada/ Abri International has provided technical expertise and leadership in urban low-cost housing and human settlements development around the world since 1984. The organization has more than 20 years experience in international settlements development and has provided expertise to the Canadian Red Cross, CIDA and authorities in Turkey, Rwanda and more recently Indonesia, in various emergency and reconstruction situations. Its use of community engagement strategies in resettlement and rebuilding can provide a model for other disaster management situations and reconstruction projects in various regions. (See Appendix B). www.rooftops.ca

7. Mapping the Visual Vernacular of Regions

MacKay-Lyons Sweetapple – When entire regions are destroyed by natural disaster, it is important that the design and aesthetic of reconstructed communities maintain continuity with the past. Links and associations with the physical and man-made landscape of regions can be made not only through the grand plan but also through small details in building design. For a number of years, Nova Scotia architect, Brian Mackay Lyons, in his firm MacKay-Lyons Sweetapple, has been evolving a software tool that records and breaks down the details of local visual vernacular into key components that can then be reassembled, adapted, and referenced. His residential work uses these references in innovative ways. He is currently working on a project in Louisiana with New Orleans architect Allen Eskew. www.mlsarchitects.ca

The Tool Kit will include the following sections:

Section A Sustainable Design – Theory and Best Practices
A summary of best practices in sustainable design that is compatible with the use of local materials and resources in disaster-affected areas.

B. Building Sustainable Communities
Guidelines and recommendations for community engagement, economic revitalization and the building of prototype community sites, to demonstrate a values-driven model for sustainable reconstruction.

C. Training
Design and illustration of a process for training local community teams to work on the reconstruction implementation plan and maintenance of related services, technology and equipment.

D. Guide to Canadian Services and Resources
Many Canadian companies and research institutions have leading-edge capability in manufacturing, construction, waste management, water purification, transportation, engineering, design, information technology, medical devices and other services vital to the international reconstruction effort. The Tool Kit will include a guide to these products, services, and other related resources. An online version of the resource guide will be regularly updated.

Design of the Tool Kit

The Tool Kit will be developed on the principles of universal design, accessibility and clear communications in information design. The goal is to make high quality information accessible to members of local communities to facilitate their active engagement and to ensure that the reconstruction plan contributes to an improved quality of life for the region. The Tool Kit will be organized as a kit-of-parts or modules that can be adapted for use by disaster relief teams in varied post-disaster situations. The plan is for the Tool Kit to be translated into various languages and published in both print and electronic form. One option is to print the Tool Kit in Asia, to reduce transportation and printing costs and to provide economic benefit to the local region.

Tangible Symbol of Change

Apart from its critical function in aiding sustainable reconstruction planning and implementation, the Tool Kit would serve as an icon or tangible symbol of change management. It will serve as a documentation of Canadian expertise and a Canadian approach to the enormous challenges involved in post-disaster reconstruction around the world. The Tool Kit could also establish a model for other information guides to support the export of Canadian cross-disciplinary capability (teams, products and services) to development projects around the world.

X Appendices

Appendix A:

A HOLISTIC PERSPECTIVE ON DISASTER RECONSTRUCTION: REBUILDING WITH SUSTAINABILITY IN MIND
by Alina Racoviceanu

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Appendix B:

Rooftops Canada/ Abri International: Approach To Post-Disaster Resettlement And Rehabilitation

Introduction

Rooftops Canada/ Abri International has provided technical expertise and leadership in urban low-cost housing and human settlements development around the world since 1984. Initially, the international development program of the Co-operative Housing Federation of Canada, Rooftops Canada now also works on behalf of the Canadian Housing and Renewal Association, the Ontario, New Brunswick and British Columbia Non-Profit Housing Associations, and la Confédération québécoise des cooperatives d'habitation. Rooftops Canada is a non-profit NGO. All together our Canadian partners own and manage most of the 650,000 non-profit housing units in Canada, housing some 2,000,000 people.

Rooftops Canada works with community-based housing groups, NGOs, local and senior levels of government, and the private sector. Our programs help thousands of families to secure affordable housing in sustainable communities. This helps develop inclusive cities where basic human rights, including the right to housing, are fulfilled. Effective housing processes enable people to work together and strengthen democratic governance by encouraging dialogue among all stakeholders. Affordable housing development also creates local jobs, which with related improvements in health and education are critical to poverty reduction.

Rooftops Canada has more than 20 years experience in international settlements development and has provided expertise to the Canadian Red Cross, CIDA and authorities in Turkey, Rwanda and more recently Indonesia, in various emergency and reconstruction situations. The Rooftops Canada team and network also has significant direct experience in the relief and reconstruction environment specifically in assessment, monitoring and evaluation and more recently program management.

In this document, we list our perspective and approach to shelter development, key strategies and lessons learnt from our experiences.

The Community Development Based Approach To Shelter Development

Rooftops Canada sees sustainable shelter development as a process, which is much more than just building houses. It is premised on a strong sense of ownership of the process and community decision making at all times and in securing full ownership rights and building sustainable economic activities. Our experience has shown that; "well-designed community based housing contributes to social and community development, stability, crime reduction, improved health and education, and local economic development. Women and children are usually the main beneficiaries of better living conditions."

We adopt a community development based approach to shelter development as opposed to a housing development approach and prioritize building people's organizations and institutions for shelter and livelihood enhancement. Depending on the context and the nature and scale of the disaster, specific projects are identified.

The objective is rooted in looking at the development approach as holistic rehabilitation, – social, economic, political and environment – of communities and is characterized by the following principles:

- **Linking of reconstruction and development** – referring to comprehensive and integrated recovery of sectors (e.g., consonance of provisions for shelter, livelihood and environmental management).
- **Empowering / participatory processes** – designing development activities that seek out and build up internal capacities of "beneficiary" communities
- **Preservation of social fabric** – maintaining the cohesiveness of community structures so as to uphold the viability of local decision-making and conflict resolution
- **Reducing vulnerability and improving quality of life** – focusing on social and environmental factors and actions that communities cannot achieve themselves: secure access to land, water, sanitation, technical assistance and building materials, access to housing credit. Prioritizing and identifying the needs of the most vulnerable in the community and using the community process to address these needs.
- **Cooperation among stakeholders** – bringing together diverse groups to complement each others' strengths toward common objectives
- **Transparency** – promoting practices that give clarity to responsibility for tasks and resources. This5 is particularly relevant when identifying and selecting the most vulnerable beneficiaries by communities.

The focus is on ensuring the following outcomes (within each context)

- Construction of secure shelter that is technologically and culturally appropriate and conditioned to resist prevalent environmental threats such as earthquakes, floods or storms.
- Systems for ensuring participatory governance, particularly the role of women
- Ensuring access to systems such as health and education and establishing linkages where none exist.
- Engendering the process of community development

Key Elements of Rooftops Canada's strategy

- **Understanding and analyzing stakeholders**: As a first step, we scope the extent of disaster and stakeholders involved in the rehabilitation and recon-

and organizations from one another justifying different approaches. It is important to understand the previous and current social dynamics and structure of the community and get their involvement in the housing project. Otherwise the project could easily be boycotted. Competition with other NGOs is a reality and communities are greatly solicited by one and other. It will be important to offer a shelter package that will provide more then houses but also job opportunities.

- Looking for best partners: assessment of local NGOs in regards to capacity building in community-based approach for shelter delivery. If local NGOs either are not available, or unlikely to be able to scale up in the short-term, then we might consider a medium or long-term objective of developing local NGO capacity to support the community based development organizations (CBDOs) in the long term. Also we can look towards building leadership amongst potential youth, women in the communities incase there is any local NGO

- Cultural Adequacy: Incorporate activities geared towards improved and more resilient housing while ensuring the cultural dimensions of housing are not sacrificed while still recognizing particular needs of women, children and other groups that may have special needs.

- Social mobilization: The process of the shelter development program should be an opportunity for social mobilization and sustained livelihoods development. - Women, youth and children do not have a voice in the decision making in the community. It is therefore necessary to introduce spaces and forums for women, youth and children to vocalize their thoughts and views.

- Security of tenure: Recovery of Property Rights - based both on the prior status of tenure as well as new opportunities for establishing secure tenure - is a very important matter. Some disasters wipe out ownership and land records, but while it can take very long for land records to be sorted, it is critical to ensure some degree of secure tenure initially so that international resources as well as people's investments are not lost. Part of our role is to strengthen institutional relationships to facilitate such security. For example, the local government could provide a letter confirming use of particular parcels of land and then move on to more formal legal forms of tenure when this becomes feasible.

Lessons learnt from previous experiences of Rooftops Canada as well as our partner network

Among lessons learned from previous experiences, Rooftops underlines the following:

- Where possible, temporary housing solutions should be deployed such that beneficiaries are established in their future settlements as soon as possible can participate in the works and supervision and reuse the temporary materials in their final housing solution.
- Settlement planning should include the target families and groups.
- Selection of beneficiaries should take into account:
  - Transparency of process
  - Avoid creating losers
  - Avoid creating "ghettos" of vulnerable populations.
- Settlement development should concentrate on components that families cannot provide themselves (in the following order):
  - Secure access to land
  - Reliable access to water

in countries where pre-disaster infrastructure was inadequate or inappropriate. Short term reconstruction requires immediate shelter, access to temporary sources of potable water, and a host of other stop-gap measures. Many international organisations are experienced in providing tent cities. Of more concern, however, is the long term process of rebuilding houses, neighbourhoods and towns.

The architecture of reconstruction should be based on local culture, local economy and new technologies. Technical changes are often made when buildings are rebuilt after disasters, particularly structural improvements. Infrastructure improvements are also carried out in many circumstances, although these rarely include any redesign of waste and energy systems based on environmental considerations.

The process of rebuilding also provides an opportunity for design and economic improvements. Reconstruction involves the definition of shelters for communities to carry out personal and collective activities, and as such should reflect local culture and use. Reconstruction is also an economic activity, and the process of reconstruction should be designed to maximize the economic benefit to the community.

Towards this end, this paper proposes a framework for reconstruction based on nodes of development. While the long-term goal of the process is local self-sufficiency, in the early stages, a multidisciplinary team of resource people is needed to create a node, a motor for reconstruction, laying critical organisational groundwork for a community-based reconstruction process. A rebuilding node will gather information, analysis and people. It will produce ideas, small industries, community organisations, urban layouts and demonstration houses.

External resource team

Throughout this paper, I make reference to external resource people; however this does not necessarily mean external to the region or the country. The degree of "externality"of the resource team will depend on many factors, including budget, availability of personnel, expertise required and, in some cases, distance from local structures of authority and social hierarchy.

The makeup of the team of outside resource people best suited to lay the groundwork for community-based reconstruction will vary depending on the context. At a minimum, however, such a team should include an architect, a structural engineer, an environ-mental engineer (or a mechanical engineer with a strong base of knowledge about low-maintenance and environmentally sustainable systems), a community economic devel-opment expert, a community development worker and an archivist. Within this team,or in addition to it, should be people with skills in group facilitation and sociological/anthropological analysis. Depending on the context and scope of the project, it may be possible for one person to fill more than one role.

This team should be prepared to spend several weeks on site. A sustained presence over a period of time in the initial period of the reconstruction process is necessary in order to understand the situation properly, to develop a rapport with the community, and to create momentum for the reconstruction itself.

community (age, gender, ethnicity, class). An overall schedule of tasks, meetings and goals will also be defined. Periodic updates to the community as a whole must be scheduled to ensure clearly defined follow-up.

Phase 3: Inventories of local resources including building traditions, materials, skills and key community members.

The third phase will consist of a series of inventories of local resources. Local building traditions will be investigated, including technology, vernacular architecture and rituals. External team members can contribute to this process with measured drawings (recording).

Skilled crafts people, key community members, and keepers of local history will be identified. Locally available materials will be catalogued, along with traditional means of dealing with waste. Existing social infrastructure in the community will be identified. Traditional spaces within the house and the community will also be studied.

After these people and building traditions have been catalogued, traditional building forms can then be analysed to determine building details and techniques as well as space use, building orientation, procession into and through indoor and outdoor spaces, and the definition of public and private areas. Both the cataloguing and the analysis should then be taken back to the community at large for discussion.

Phase 4: Introduction of relevant new technologies and ideas, including construction technologies and planning principles, particularly those relating to disaster resistance and environmental sustainability.

The fourth phase will introduce technologies and ideas from outside the community (and even outside the continent) to community members. There can be a certain overlap between this phase and the cataloguing of existing local resources, particularly once gaps in local knowledge or where the integration between traditional and modern requirements are identified. Outside inputs may include certain building technologies and planning principles, particularly those relating to disaster resistance. Environmentally sustainable waste and water management systems will also be presented, with an emphasis on low-tech and small-scale technologies. Approaches to financing should be explored, including state and international funding, and locally-sustainable methods such as micro credit and community-based revolving funds. External team members should arrive with a body of information which they anticipate might be relevant, although further research may become necessary to respond to conditions on the ground. Means of accessing further information must be foreseen.

New technologies and approaches must be introduced with consideration for potential impacts on local traditions and on local economic development.

Phase 5: Participatory design process, defining community layout and prototype dwelling designs with community members.

The fifth phase will consist of a participatory design process, incorporating representatives

Building node – physical presence

The organisational infrastructure laid out in the above phases is the basis of a building node; the ongoing reconstruction of a community after a disaster relies on clearly defined and structured process and a team to implement it. It is critical that the building node be given a physical embodiment at the earliest possible opportunity through the construction of a demonstration building.

The demonstration building should serve as a home base for reconstruction activities,in the spirit of the building yards used by Christopher Alexander in Mexicali. It should serve as a space for sharing information and experiences, a workshop, a materials depot and an office for local economic activities linked to reconstruction.

A demonstration building can house the activities of the reconstruction node and its various committees. It can also store building materials and samples. Most importantly,however, it serves as proof of the potential of teamwork in the community to achieve concrete goals. A demonstration building is a promise of things to come.

The timing of this first construction depends on the situation in which the community finds itself, and on available resources, both human and material. It may also depend on community dynamics and the management of local conflicts of interest. Ultimately,the decision about when it is appropriate to build the first building may fall to the external team to gauge. Obviously, the demonstration building should incorporate elements of the discussion and research which is underway at that point in the process, and so the degree of demonstrationness will vary depending on where it fits into the phases outlined above.

Conclusions

In contrast to the problem-solving and somewhat technocratic approach of much current reconstruction practice, the proposed framework takes the process of reconstruction as a potential generator of better and more engaged communities. Through a comprehensive integration of the knowledge of a multidisciplinary team of outside experts with that of local community members, sustainable reconstruction practice can be made possible.

The framework proposed is purposefully broad, as it is intended to be applicable in a variety of contexts. I have attempted to identify a series of steps and goals which, when applied in a clear and structured manner, will lead to reconstruction which recognises both the advantages of the tabula raza following disasters and the importance of local traditions and cultures in structuring the rebuilding. The intended result is a self-sufficient ongoing reconstruction process which reflects local visions and needs, and benefits the local economy.

A HOLISTIC PERSPECTIVE ON DISASTER RECONSTRUCTION: REBUILDING WITH SUSTAINABILITY IN MIND

by Alina Racoviceanu and Arlene Gould

Getting Ready: Preparedness Planning Considerations

The confusion and tension surrounding the emergency period following a disaster could easily lead to short-term decisions adversely affecting community's ability to achieve sustainable, long-term reconstruction goals. To minimize these unintended consequences, it is vital to plan in advance for post-disaster restoration in order to provide general guidance for decision-makers and a framework for the "Reconstruction Design Team". A different team, the "Recovery Management Team", will be empowered to implement the developed reconstruction strategy and monitor its results and progress.

Preparing an extensive reconstruction plan ensures that communities will engage in a holistic recovery after a disaster. In the light of increased frequency of extreme weather events leading to disasters, heightened attention has been given worldwide to preparedness or emergency management planning. An example in this sense is the Ontario Emergency Management Act[1] reinforcing local jurisdictions to prepare comprehensive emergency management plans that both meet immediate disaster-relief needs and long-term reconstruction and mitigation goals. Amongst the benefits of pre-disaster planning are reduced human and property/infrastructure damages and/or losses and associated economic losses, and lower social dislocation and stress.

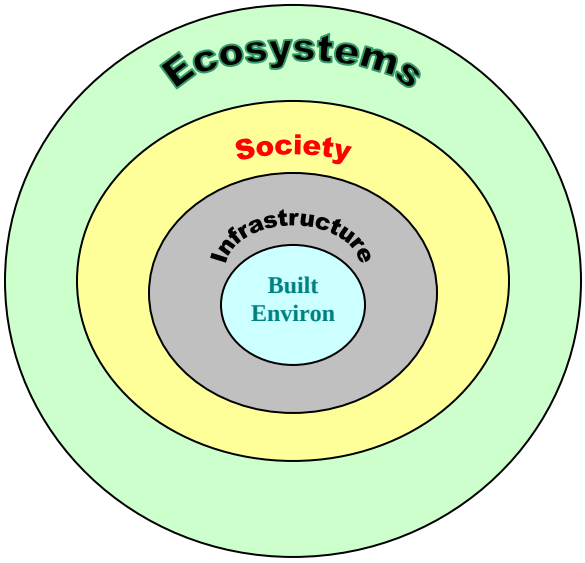

Figure 1

The charrette organized by the "Design for Disaster Reconstruction Working Group" will focus on the work undertaken by the 'design team'. The matrix given in Table 1 is proposed to be used by the charrette participants to map the preparedness planning process, an extensive exercise whose primary goal is to create a comprehensive picture of the disaster restoration. This "triple-bottom-line" framework advances the use of sustainability principles in addressing rebuilding efforts, a holistic approach that provides an ideal towards which to strive and against which to weigh different potential mitigation/revitalization measures. In so doing, society's disaster-related concerns are examined within a broad spatial and temporal context, an analysis envisioning the

built environment with its infrastructure, the society and the environment as interrelated wholes, constantly interacting and impacting one another. Figure 1 illustrates this interconnectedness, representing the four key elements to be revitalized as part of the post-disaster reconstruction process.

The major sub-steps intended for this workshop are the identification/assessment of disaster-inflicted situations requiring remediation and identification of opportunities arising out of this adversity for a sustainable long-term reconstruction. A wide array of issues, such as expert analysis of economic trends, rebuilding costs and opportunities for economic growth prior and after a disaster, present and future hazard/vulnerability assessment, are expected to be touched upon during the charrette. The anticipated outcome is a "package" encompassing Canadian expertise and intellectual capital as well as innovative reconstruction design practices used internationally, a set of guidelines to be used by communities in their planning and rebuilding efforts. This "tool kit" will be further tailored to consolidate local economic, social and environmental sustainability objectives. To this end, further steps, involving the development of implementation strategies, will to be carried out by the design team in collaboration with community representatives.

Preparedness planning facilitates a better understanding of pre-disaster vulnerabilities and long-term effects of temporary disaster relief actions, and thus it is important in finding the 'best-fit' recovery solution. The success of a permanent reconstruction programs depends on its effective phasing, which ensures adequate funding resources for all restorable assets. Disasters should be viewed as stimuli for redevelopment, reconstruction initiatives correcting the problems that were impeding the sustainable revitalization prior to the disaster. Issues to be addressed by recovery include the relocation of disaster-ravaged developments and the use of less environmentally taxing technologies. Attesting to the benefits of employing sustainable reconstruction techniques are a number of successful projects used to rebuild several communities in the U.S.[2].

Enhancing social/cultural values and protecting the ecosystems as part of the rebuilding efforts ensures an integrated approach to disaster restoration. In the same vein, the reconstruction solution should foster local business growth, boosting employment while preventing communities' economic decline. A top priority of a long-term reconstruction plan is the economic revitalization. To identify the appropriate strategies and resources (i.e., contingency plans for post-disaster economic recovery), an inventory of potential disaster-inflicted damages has to be developed. This will enable the estimation of direct losses, such as losses to building stock and public/private infrastructure, and indirect losses, i.e., loss of economic activity resulting from temporary closure of municipal services (e.g., water treatment plant, power station, etc.), transportation-related economic losses due to traffic disruption, loss of tourism, job loss due to business closure or employee dislocation. When planning for post-disaster reconstruction, opportunities to rebuild a disaster-resistant economy have to be seized by creating environmentally and economically sustainable local business and built habitat. Furthermore, promoting a more diversified economy also enhances communities' ability to withstand the impact of disasters. Not only will communities become less vulnerable when facing disasters, but their economies will also be more resilient due to lower recovery costs and diminished disruption of economic activity.

Table 1. Mapping disaster reconstruction: Preparedness Planning Considerations

Pre-disaster planning phase / Restorable Assets	Needs Assessment[4]		Risk & Vulnerability Assessment	Sustainable Reconstruction Strategies	
Built Environment[1] **Infrastructure[2]**	1. Examine current resource (energy, water, natural gas, construction materials) consumption. 2. Identify/assess potential relocation sites.	Identify barriers to sustainable development	1. Analyze buildings/ infrastructure sustainability 2. Identify risk factors (land planning, environ. degradation & pollution) increasing vulnerability of water/energy systems.	1. Institutionalize natural resources efficiency[5]. 2. Relocate residential sector & vital businesses[6]. 3. Build disaster-resistant structures; use structural mitigation strategies[7]. 4. Use reconstruction as opportunity for SD[8]. 5. Remove damaged infrastructure hindering SD[9]. 6. Develop risk mgmt plans for residential developments & vital municipal services[10]. 7. Re-orient financial resources towards increasing settlements/services sustainability[11]. 8. Include disaster prevention/mitigation criteria in design/construction, O&M standards. 9. Include risk reduction aspects in feasibility studies[12].	Develop multi-sectoral partnerships for risk reduction[15].
Social/Cultural Values[3]	1. Identify/assess social inequity and its associated impacts. 2. Assess quantity/quality of existing social services.	Identify barriers to sustainable development	Assess authorities' awareness, knowledge of vulnerability reduction measures.	1. Promote social/intergenerational equity[13]. 2. Improve/encourage public-private partnership enhancing qty./quality of social/cultural services[14]. 3. Preserve/restore cultural/historical resources. 4. Raise personnel/community awareness on integrated risk mgmt importance. 5. Engage communities to implement vulnerability reduction measures.	Develop multi-sectoral partnerships for risk reduction[15].
Ecosystems	1. Assess environ. impact associated w/ construction technologies. 2. Map environmentally sensitive areas.	Identify barriers to sustainable development	Examine the impact of environ. degradation on disaster frequency/ intensity & their relation w/ increased vulnerability of built habitat/infrastructure.	1. Develop recovery programs that preserve/conserve/restore natural resources[16]. 2. Manage stormwater. 3. Preserve greenfields. 4. Prevent/remediate pollution. 5. Raise public awareness on ecosystem deterioration & its adverse consequences on society & economy.	

Table 1 (cont'd)

[1] Housing stock, shelters, commercial/institutional buildings, industrial property, built landscape.

[2] Physical infrastructure systems: power, transportation, water, sewer, solid waste, telecommunications.

[3] Equity, personal safety, quality of life, environmental justice issues.

[4] Analysis of current and post-disaster safety and sustainability of each asset.

[5] Revise Building Code requirements to mandate use of renewable energy, energy efficiency (passive solar technology), water conservation (water reuse, rainwater harvesting, minimize use of natural resources, increase use of recycled materials.

[6] Select less vulnerable areas: new design sites should provide solar access & appropriate landscaping w/ summer shading & winter wind protection.

[7] Flood proofing, elevation.

[8] Replace aging, damaged buildings w/ new sustainable structures (w/ lower resource use, improved air quality, reduced waste generation).

[9] Highways impeding waterfront redevelopment or affecting community's social values.

[10] Land use management plans accounting for disaster-prone areas, avoid vital services (water & sewage system, energy system, health care infrastructure) exposure to risk.

[11] Ensure that financial resources are used for prevention/mitigation rather than increased coverage.

[12] In this way preventive design/decision-making becomes economically feasible.

[13] Build affordable houses, promote employment opportunities.

[14] Provide education opportunities, health care services, protect/instate freedom, maintain health/safe neighborhoods, promote crime reduction.

[15] Sign agreements b/w regional/national entities (e.g., hospitals, fire dept., shelters, energy utilities) for providing mutual support in emergency situations.

[16] Energy efficient techniques, use of recyclable, non-toxic materials.

Benefiting From a Holistic Approach to Disaster Recovery:

Using the foregoing matrix to map the pre-disaster planning process enables the integration of isolated revitalization projects, creating a common vision for a sustainable reconstruction development. Adopting this holistic framework ensures that: (1) the restoration of one asset/sector does not have detrimental impacts on the sustainability of other sectors; (2) disaster reconstruction acts as a catalyst, contributing to the revitalization of other assets by fostering positive synergies amongst the different restorable elements or functions, and (3) helps communities coordinate available resources (e.g., funds, assistance).

The integrated approach accounts for the interconnectedness between society, economy and the environment, avoiding the damage that could be inflicted by disaster-relief solutions, not suited to local conditions. Often, post-disaster reconstruction programs are coordinated by teams of international experts, cases in which it is vital to customize solutions to suit communities' needs, while encouraging their involvement. In this way rebuilding efforts are tailored to the economy and socio-cultural milieu of disaster-ravaged settlements, making use of local resources.

While employing this mapping tool seems a complex exercise, it is feasible given the breadth of expertise brought in by the 'design team' professionals, i.e., Design for Disaster Reconstruction Working Group, including urban planners, architects and landscape designers, civil engineers and industry representatives, business and policy analysts.

References

[1] http://www.e-laws.gov.on.ca/DBLaws/Regs/English/040380_e.htm

[2] Operation Fresh Start website http://www.freshstart.ncat.org/