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Improving post-disaster reconstruction in developing countries



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INFORMAL SETTLEMENT INTEGRATION, THE ENVIRONMENT AND SUSTAINABLE LIVELIHOODS IN SUB-SAHARAN AFRICA

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This paper forms one part of the CIB funded research on “Understanding the interface between the environment and sustainable livelihoods in the integration of informal settlements in Asia, Latin America and Africa: a review of current thinking and practice”.

The African continent is rich in its diversity of forms of informal settlement. This paper covers the sub-Saharan region. It is acknowledged from the outset that the diversity of settlement situations cannot be fairly treated in a paper of this kind, however a number of characteristic trends in experiences of informal settlement formation and upgrading emerge that differentiate the sub-Saharan region from others.

The aim of the paper is to present an overview of the continent from an African perspective, by providing base information about socio-economic conditions, the types and quantities of informal settlements occurring, and the types of disasters and other environmental hazards which predominate.

The method employed to give structure to this paper is the pressure-state response model commonly used in state of environment reporting.

Informal settlements; sub-Saharan Africa; sustainable livelihoods; environmental hazards.

CONSTRUCTION INDUSTRY DEVELOPMENT FOR DISASTER PREVENTION AND RESPONSE

George Ofori

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Disasters, both natural and human-caused, have been occurring with increasing frequency and effect in recent decades in many countries around the world. They have had a disproportionately heavy toll on developing countries both in terms of loss of lives and damage to property. The need to take action to effectively manage disasters has been highlighted at many major international conferences and measures are underway in many countries and at the international level.

The developing countries are less able to deal with the causes and impacts of disasters. It is important to develop the construction industries of the poorer nations in order to equip them to manage disasters. This paper considers how this can be done. It starts by providing examples of recent disasters and their impact on human settlements. It then considers the

role construction can play in disaster management. Following a review of current initiatives, some recommendations for further action are presented.

Construction industry; disaster management, reconstruction management; technical development

FROM MARATHWADA TO GUJARAT – EMERGING CHALLENGES IN POST-EARTHQUAKE REHABILITATION FOR SUSTAINABLE ECO-DEVELOPMENT IN SOUTH ASIA

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The link between disasters and development is very critical. Not only disasters are consequences of existing 'development' processes; they can also serve to provide new opportunities for development through post-disaster rehabilitation. However, development does not have a universal frame of reference. It is determined by different 'world-views' and 'perceptions' on what development implies for a particular community or group of people. Moreover it must take into account the implications in reducing disaster vulnerability in the long term. The paper will investigate, the consequences of post-disaster rehabilitation on development understood broadly for South Asia in general and India in particular through detailed investigation of the cases of Marathwada (Latur) and Gujarat in India. In the aftermath of devastating earthquakes in Marathwada (in 1993) and in Gujarat (in 2001), massive rehabilitation programmes have been undertaken in these regions, which are unprecedented in terms of their nature and scope. The approach followed in each of these cases has been quite different. Also in many ways, the latter has tried to build on the experiences of the former. It is interesting to review the way things have taken their course in both of these cases and analyse to what extent they have managed to reduce the existing vulnerability and to build on local knowledge, skills and resources.

The paper will bring forward the challenges common to both the cases, relating to long term sustainability, effective governance and creation of civic society, especially when the good intentions of those in charge of rehabilitation are tested against the grassroots social, economic and political realities.

Post earthquake rehabilitation; relocation; adoption; technology transfer; repairs and retrofitting; vulnerability; sustainability; local governance; community participation

DISPLACEMENT AND INFORMAL SETTLEMENTS IN THE PAKISTAN/AFGHANISTAN BORDERS AREAS

Sarwat Viguar

The mass displacement of the Afghan people as a result of the wars fought on their land has resulted in the influx of almost 3 million refugees in neighbouring Pakistan over the past 20 years. These Afghan refugees now reside in makeshift settlements all along the border

areas. The Afghan refugee settlements have received very little attention from international bodies which govern refugee and settlement issues, like the UNCHS (United Nation's Human Settlements Program) or the UNHCR (United Nation's High Commission on Refugees). The post September 11 situation, where Afghanistan was bombed by a US-led military campaign, has magnified the humanitarian crisis both within and on the borders of Afghanistan. This presentation will give a detailed overview of the shelter crisis affecting Afghan refugees in Pakistan and what measures need to be taken as a response.

Refugees; refugee settlements; trans-border migration; UNHCR; wars

MONTserrat – A CASE STUDY IN THE APPLICATION OF MULTIPLE METHODS TO MEET A POST DISASTER HOUSING SHORTAGE

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Following the violent eruptions of the Soufriere Hills volcano in 1995 the Island of Montserrat suffered extensive damage and loss to its housing stock.

The post disaster reconstruction programme involved the provision of new housing to meet both the immediate emergency need and the longer term need for the resettlement of the population.

The re-housing programme drew heavily on both local and international resources and incorporated a range of solutions from low-cost prefabricated units, traditional timber framed units, masonry construction (upgraded to meet revised building code requirements) and high quality modular units.

This paper will set out the challenges faced in the implementation of this programme, which included the logistical complications presented by an Island with very few natural resources, a need to maximise local employment and a desire to conform with accepted notions of best practice.

The paper will also compare and contrast the effectiveness of the alternative methods in meeting both the above mentioned challenges and, more importantly, the needs of the Island population.

In conclusion this paper will suggest ways in which lessons learned can lead to improvements of best practice.

Merging local and imported technologies, imported prefabrication, self-help programmes, inadequate prevention, hazard prone area development, natural catastrophes, improved strategies

WHAT'S THE BIG DEAL ABOUT TEMPORARY HOUSING? PLANNING CONSIDERATIONS FOR TEMPORARY ACCOMMODATIONS AFTER DISASTERS: EXAMPLE OF THE 1999 TURKISH EARTHQUAKES

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This paper is Part 2 of a 2-part series on temporary accommodation after disasters. Both papers are based on a case study of the 1999 earthquakes in the Marmara and Bolu regions of Turkey. Part 1 examines the different types of temporary accommodation possible after a disaster. This paper, Part 2, looks at the necessary planning considerations for temporary accommodation.

Preparedness planning before disaster is necessary to find the 'best-fit' solution for temporary accommodation. Preparedness planning includes understanding: pre-disaster vulnerabilities; regional and local issues; climate; long-term effects of temporary accommodation; project procurement, planning and construction time; permanent reconstruction strategy and timing; and location. Matching these planning considerations with a type or combination of types of temporary accommodation will produce the 'best-fit' solution.

Immediately after the disaster, it is necessary to reassess the temporary accommodation strategy to see if it fits the particular disaster situation. If it fits, the organization may proceed with the plan. If it does not fit, they must reassess until a good solution is found.

Temporary housing; temporary accommodation; planning; recovery; disasters; Turkey

THE CRISIS AND MODERNITY OF HOUSING DISASTERS IN DEVELOPING COUNTRIES: PARTICIPATORY HOUSING AND TECHNOLOGY AFTER THE MARATHWADA (1993) EARTHQUAKE

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This paper examines the social, spatial and technological impact of post-disaster housing projects on rural communities in Marathwada, India. Based on field research in 1994 and 2001, as well as academic work, this case study will shed light on an area of design that is poorly understood by architecture and planning professionals. *Section I* briefly examines how post-colonial land reforms and market competition in India have marginalized artisan castes and vernacular building technologies--leading to a deterioration of local building trades and the vulnerability of both people and housing to disasters. *Section II* contrasts this "vulnerability" perspective with formal architecture and planning practices that assume restructuring space and social life around urban environments is the only way to mitigate

future disasters--despite two decades of research to the contrary. And *section III* examines how this norm is also embedded in international development self-help housing policies--a fact that has a negative impact on the development of appropriate housing technologies by non-government organizations who work with rural communities. In short, this paper is both a critique of the post-disaster housing field, as well as a call for professionals to rethink their housing practices in developing countries.

India; relocation; World Bank; earthquake; participation; housing; non-government organizations; Maharashtra; Marathwada.

DESIGN OF REFUGEE SETTLEMENTS: DEVELOPING ECOLOGY-DRIVEN APPROACH

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Fast developing refugee crises can cause a massive environmental impact. It is often a consequence of rapidly increasing displaced population compounded by poor camp planning and logistical decisions. Environmental deterioration of surrounding environment in turn generates impacts on the refugees and local populations. In absence of mitigating measures, the economic, social, and public health impacts on these populations can be devastating. International humanitarian relief system has been slow to find effective measures to balance relief and environmental action in refugee crises. This is a result of the lack of a systemic approach that combines local and outside resources to facilitate long-term environmental sustainability.

In the midst of humanitarian crises, ecological issues are often disregarded due to the lack of information and resources available to the aid workers in the field. Use of renewable energy and materials in construction and operation of the camps is seldom considered. Local inhabitants and refugees are rarely included as partners in relief action, in decisions affecting their livelihood and local ecosystems. Left dependent on outside aid, refugees often cannot sustain themselves when the aid is withdrawn. There is an urgent need for designing and applying sustainable strategies to both emerging and existing refugee populations.

The following discussion addresses the current camp planning strategy applicable across geographic and political domains. It examines a proposed model for the integration of existing aid work experience and expertise in the fields of environmental sciences as well as information technology, engineering, and architecture to resolve current impasse facing many refugee communities and their hosts.

Carrying capacity; ecology; eco-cycles approach; environmental action; internally displaced persons; man-made load; participatory design; optimization; refugees; renewable energy; sustainable development.

ORGANISATIONAL DESIGN, PERFORMANCE AND EVALUATION OF POST-DISASTER RECONSTRUCTION PROJECTS

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This paper is based on a study that hypothesizes that the performance of low-cost post-disaster housing reconstruction projects in developing countries is improved by increasing one, two or all of the following variables: (i) multiplicity of choice offered to residents; (ii) users' responsibility in decision making; (iii) the articulation of local and external resources through an intermediate organization. Drawing from the lessons learned from the reconstruction project developed by the Coffee Growers' Organisations (CGOs) after the 1999 earthquake in Colombia, this study evaluates each of the aforementioned variables. This paper deals in particular with the third of these variables. In the form of a "first-part article" a complementary paper (Lizarralde, 2002) examines the first two aspects.

In order to articulate all the so called 'soft' and 'hard' aspects of reconstruction, an appropriate -usually complex- organisational design is required. This study examines the relation between organisational design and performance of reconstruction projects. Looking for the cause-effect relationship between organisational design and performance, this research confronts the underdeveloped field of the evaluation of post-disaster housing projects. This paper, then, proposes a method that has been specially adapted for the evaluation of reconstruction. This method attempts to solve the difficulties usually found in the evaluation of projects by bridging the gaps between: (i) evaluation of the system vs. evaluation of results and (ii) evaluation through qualitative methods vs. evaluation through quantitative methods.

In order to respond to the extreme damages caused by the 1999 earthquake, the CGOs articulated local and external resources by working as an intermediary between the local community, external organizations and the government. This approach permitted the delivery of various outputs that took into account the needs of local residents, including housing, infrastructure, education, technical assistance, public services, and others. An examination of this project serves to illustrate the method of evaluation proposed here and draws important lessons for the improvement of reconstruction projects.

Reconstruction; post-disaster housing; project evaluation; organizational design; building performance; developing countries; disaster management.

RECONSTRUCTION AFTER THE GUJURAT EARTHQUAKE

Jean-Lou Hamelin et al.

This study was conducted by five Canadian graduates who participated in a six-month internship at the Vastu-Shilpa Foundation, a non-profit organization for research in Environmental Design in Ahmedabad, India. The study examines the effects of the disaster and the reconstruction activities of the region affected by the 2001 earthquake in India; particularly the city of Bhuj, some rural villages and the Hamlet of Ludiya. The presentation is accompanied by an exhibition of posters that examine, among others, the traditional

architecture, rural patterns, community building, culture, and social aspects of the region. The reconstruction activities are discussed and relevant conclusions are drawn from this experience.

Disasters, reconstruction, long-term development, India, vernacular architecture

SITE EFFECT ASSESSMENT AT SMALL SCALES IN URBAN AREAS: A TOOL FOR PREPAREDNESS AND MITIGATION

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Recent destructive earthquakes have clearly shown that near-surface geological and topographical conditions play a major role in the level of ground shaking. In post-disaster reconstruction as in mitigation, information on soft soil response to large earthquakes becomes of prime importance. The mapping of predominant frequency of resonance and amplification of soil permits identification of zones at risk in seismic-prone areas. It can be used as a tool for prevention planning and retrofitting measures and also to define safety zones for reconstruction after a destructive earthquake. In the framework of a seismic risk study of the island of Montreal (Canada), a methodology for seismic zoning in urban areas is validated. It is based on field investigations coupled with numerical modelling.

The field approach is emphasized as a fast and low cost method well adapted for urban areas through pre- and post-disaster surveys. It is based on the well-known "Nakamura's method" (or H/V method) and uses records of ambient noise produced by wind-structure interaction, traffic and other man-made vibrations. It has been demonstrated that the spectral ratio between the horizontal and vertical components of such records gives a good estimate of the fundamental frequency of soft deposits. Extensive use of this method allows the fast and detailed mapping of these frequencies within urban areas. By combining information on ground response and vulnerability, potential damage to buildings and lifelines can be identified.

In the case study of Montreal, different zones with soil profiles typically associated with large amplification factors have been identified and surveyed using the field approach. Preliminary results show a good correlation between thickness and/or the type of soft soil and the fundamental frequency obtained with the H/V method. By identifying the relationship between key soil-profile parameters and estimated fundamental frequencies, it becomes possible to extrapolate the results to parts of the island that are not covered by the field study.

In conclusion, this method is a fast, economical and useful means of defining the microzonation in urban areas, which is essential for the deployment of seismic instrumentation, land-use planning and seismic mitigation.

Site effects, seismic microzonation, H/V method, urban areas, mitigation

IMPROVING POST DISASTER RECONSTRUCTION IN DEVELOPING COUNTRIES THROUGH MUNICIPALLY BASED DISASTER CENTRES

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Disasters require immediate remediation in the form of food, social/medical services and shelter. Food and social/medical aid can be supplied in measured quantities thereby limiting any surplus that may accumulate. Providing shelter is a different circumstance because shelter is usually delivered in manufactured or prefabricated packages. Because there are no alternatives available the same design and the same building materials will be used in permanent reconstruction. If disasters occur in a cyclical fashion then reconstruction must be expected to be repeated after each disaster

To break the "circle of pain" a performance specification could help to develop a strategy and design for disaster initiated temporary and permanent housing. Building technologies that can meet these specifications are available in the international building market and could be used to provide shelter in disasters. The Thailand Institute for Technological and Scientific Research {TISTR} consulting with the Asian Institute of Technology, Bangkok, Thailand, has developed a network of centres throughout the Kingdom that carry out many of the proposals mentioned in this paper. While Thailand does not offer emergency plans similar to those proposed in this paper, the work of TISTR strongly argues the feasibility of establishing national networks of municipally based disaster centres capable of mounting the type of disaster shelter program proposed in this paper.

Design strategies; performance specifications; provision of shelter; repetitive disasters

RESILIENCE AND SUSTAINABLE COMMUNITY DESIGN: THE CASES OF PUKAPUKA, IOWA, AND LA BAHIA DE JIQUILISCO

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Our awareness of the value of resilience in architecture and community design emerged through the application of criteria for sustainability to emergency management efforts as carried out in three diverse sites: a South Pacific atoll, the plains of middle America, and a shoreline in Central America. In each case, the author, an architect, academic, and community designer, and his associates conducted on-site research and prepared agency reports that quickly refocused on the larger scale environmental design and planning issues rather than on the often costly but futile local mitigation efforts.

The three criteria for sustainability include: *equity* in the present and future, *economy*, and *ecology*. These criteria were used to assess weather-related emergency management

activities typically conducted as a *contingency* before an emergency, the *reaction* during an emergency, and *recovery* activities conducted after the event.

Considerations included social equity, economic costs, and ecological balance in prevention and mitigation efforts; agility in response to weather related events; and sensitivity to environmental threats in reconstruction efforts. The results of these analyses are instructive in developing sustainable architecture, community design, and planning. The quality of resilience rather than resistance to events prevailed in all of these efforts. With this change in perspective, architecture and community design efforts become both more local in nature and regional in scope, less intrusive, and of a scale and magnitude more appropriate for community-based cultures.

Sustainability; resilience; community design; disaster management

OPTIONS FOR CYCLONE PROTECTION: BANGLADESH CONTEXT

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Bangladesh is one of the most natural disaster prone countries, over the last 30 years and specially after 1991 cyclone, the methodology has developed considerable experiences and expertise in managing a wide range of disaster relief operations primarily concerned with cyclones and other natural disasters. The unprecedented floods of 1987, 1988 and 1998, the 'super' cyclone of 1991 and also 1996; all these events had stimulated fresh management measures to reduce vulnerability to natural disasters. In this regard the main theme of this paper is to review the options on structural and non-structural measures for reduction of vulnerability.

Cyclone; great danger; high risk areas; killas; refuge

COMMUNITY PREPAREDNESS – AN UNIQUE EXPERIENCE IN POST DISASTER SCENARIO

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In the coastal region of Andhra Pradesh, recurring disasters caused by cyclones result in loss of life, of productive agricultural resources and of human settlements. Community preparedness is seen as a suitable mitigation strategy, leading to the development of task forces, able to intervene both before and after disasters. Training members of the task forces – drawn from the villages in the exposed areas – includes emergency medical care, rescue and evacuation, and the organization of relief camps. Preparing contingency plans is important, together with 'disaster drill'. The task forces are also able to contribute to other aspects of community development.

Reconstruction; disaster mitigation; emergency housing; India

POST DISASTER RECONSTRUCTION EXPERIENCES IN ANDHRA PRADESH, IN INDIA

Annie Jayaraj

Post Disaster reconstruction work may be executed with a paternalistic, philanthropic approach as a project with an end in itself or with an approach, which is based on communities and as a means towards sustainable long-term development. The choice between these two depends on the intentions, motivation, commitment, concepts, perceptions, capacities and character of the concerned NGO. ATMA consultancy services, rendering services to NGOs in South India for about 20 years wishes to share its experiences in this regard. It is hoped that these experiences provide an insight for the people who are genuinely interested in addressing the issues relating to post disaster reconstruction activities with special reference to housing.

Community development; gender issues; non-governmental organizations; strategic planning; sustainable development

CHINESE EXPERIENCE WITH POST-NATURAL-DISASTER RECONSTRUCTION

Ye Yaoxian

China Architecture Design and Research Group

At the beginning of a millennium, it is appropriate but also necessary to look back upon the events that happened in China and to see what lessons and prognoses concerning post-natural-disaster reconstruction can be derived from them for the future.

The Government of the People's Republic of China (after its founding in 1949), in response to various natural disasters that occurred in the country noted the importance of improved reconstruction strategies. This was particularly 1976 when the Tangshan Earthquake caused 242,000 deaths and again in 1991 when the Anhui and Jiangsu floods caused 5,000 deaths and 77.9 billion RMB of direct economic losses.

Reconstruction following natural disasters is a complicated problem concerning social, economical, environmental, psychological, and technological aspects. However, for developing countries or regions, it is a good opportunity to change its original economy development model, and to push urban and rural renewal forward. Therefore, an improved strategy is the key to accelerate the reconstruction process and to improve the environment of human settlements.

The paper begins with a discussion of the facts of floods and earthquakes disasters in China, and then shifts the focus to draw lessons from the reconstruction process per se so that there can be an improvement of reconstruction strategies following a natural disaster. This includes policy development, decision making, technology, and evaluation models etc. The paper concludes with a summary of reconstruction experiences learned from the practices in the past decades in China.

TECHNOLOGIES FOR POST-DISASTER RECONSTRUCTION

Roger Bruno Richard

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As buildings are site-related and as technology is normally factory-related, building systems are classified according to the strategy adopted to distribute the work between those two poles: from the Site-intensive Kits of parts to the Factory-made Modules. Somewhere in between, the Hybrids rely upon the factory for the complex parts of the building and assign the production of heavy and/or basic operations to the site. In the case of post-disaster reconstruction, various well documented case studies have demonstrated the importance of adopting a “combined” or “pluralist” strategy, close to the Hybrids, in order to benefit both from the energy, resources and motivation of local community-based participation as well as from the rapidity, precision and productivity of industrialisation: with this strategy in mind, we will see that there are relevant technologies all around the *palette* of presently available or prospective building systems.

Naturally, the selection of relevant technologies has to be governed by relevant criteria, notably: immediate availability; modular increments; input of local labour and materials; compact + lightweight transportation and handling configurations; simple and fast site-assembly processes; sensitivity to the cultural heritage; adaptability to the ever changing needs of each person – family – community.

- I- Within the *SITE-INTENSIVE KITS OF PARTS* (“Meccano”) family: pre-packaged or off-the-shelf wood/steel/concrete Post & Beams; lightweight panels; monolithic 3D integrated joints locating the connections outside the geometrical meeting points.
- II- Within the *FACTORY-MADE MODULES* family: telescoping modules; steel or wood framed boxes;
- III- Within the *HYBRIDS* family: factory-made service cores where the service area is built at the plant within a 3D module strong enough to support locally or even traditionally built floors and walls; mobile factory or various types of permanent formworks to cast concrete or concrete substitutes (vg. stabilised soil, etc.).

Construction management; prefabrication; local resources; construction systems