OVERALL RECONSTRUCTION: DESIGN, IMPLEMENTATION, AND MANAGEMENT

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INTRODUCTION

This paper addresses key challenges that have been experienced in several countries during the post-disaster recovery and reconstruction process, in particular relating to the organization and management of the reconstruction planning, design, and implementation process.

KEY LESSONS LEARNED FROM INTERNATIONAL EXPERIENCE

Management of reconstruction

Institutional arrangements: At the outset, it needs to be recognized that the capacity at the local level will have been severely affected as a result of the disaster. The national government will need to strengthen the affected local and regional governments in order to ensure efficient management of the reconstruction process and to rebuild capacity. The implementation of reconstruction could be managed by existing institutions either at the national or local level. The management structure and the scope of authority and responsibility should be clearly defined and communicated to all parties involved in the reconstruction process.

In some country cases, an independent agency was set up to manage multisectoral disaster reconstruction. In these instances, the new agency coordinated closely with the existing institutions/commissions, community leaders, and the nongovernment sector and paid specific attention to programs for retrofitting and strengthening existing structures and facilities. A specific policy, plan and implementation strategy should be developed for retrofitting in the recovery program area and possible adjacent areas at risk. Should a stand-alone reconstruction authority or agency be formed for China, a finite timeframe and an exit strategy would be required, as ultimately disaster management and risk mitigation need to be mainstreamed.
In other cases (e.g., Yogyakarta–Central Java and Los Angeles) earthquakes have been handled through the regular implementation channels of ministries and local governments.

The overall plan needs to identify possible financing sources, promote sustainable urban and infrastructure planning, and show the links to the various sectors and the subsequent sector reconstruction plans. Ultimately, the need for transparency and cohesion between the overall plan and sector plans is critical. Parties need to be able to track who is doing what. This is essential to coordinate an effective response. As examples of previous mechanisms of transparency and coordination, Indonesia had a regular newspaper and Pakistan maintained a Web site: http://www.era.gov.pk.

**Timing:** Planning and financing the reconstruction of destroyed and endangered infrastructure should make realistic estimates of timing for delivery and completion. In large disasters, completion times of 7–10 years are realistic (Aceh, Los Angeles, and Kobe). Managing the expectations of homeowners and political leaders is an important responsibility of the reconstruction management team. In addition, this long time horizon needs to be incorporated into the financing and budgetary management strategy. To realistically assess timing, classic project development steps would need to be followed: (i) decision to proceed; (ii) data collection; (iii) analysis; (iv) strategy; (v) design; (vi) procurement; (vii) implementation; (viii) commission; and, (ix) delivery. The difference in this case is that the data collection and analysis steps would be more complicated, and the social pressures and need to conclude a strategy and start the procurement process would be more intense.

**Assess and decide:** The government should assess the damage and losses caused by the earthquake and based on this assessment, make a decision as soon as possible as to whether the current construction standard should be retained or reinforced. Without this decision, the government and private sector cannot start reconstruction on housing and infrastructure. The decision on a construction standard is a critical point for the implementation of the reconstruction plan. In Kobe, the government decided not to change the construction standard because the buildings that observed the latest construction standards withstood the earthquake.

**Logistics:** Reconstruction logistics (i.e., putting in place the people, plans, and equipment to commence work) is a critical factor. Logistics during the reconstruction process and for materials delivery present a major challenge. In addition, logistics for handling post-disaster debris retrieval, processing, and recycling/removal can be complex. This is a highly specialized field of expertise, and the proposed reconstruction program should include specific expertise throughout implementation. It will save time and reduce costs.

**Management costs:** Post-disaster reconstruction pro-
gram management and administrative costs could be as much as 100 percent higher than for normal infrastructure and construction management costs. In China, management costs are currently estimated at 10–12 percent of the costs of the works; for the Wenchuan Earthquake reconstruction program, much higher costs are likely to be incurred.

**Quality assurance:** For the full duration of the reconstruction process, quality assurance should be a core activity of all stakeholders. Reconstruction of structures with low quality materials and lack of adherence to seismic standards poses a significant future risk.

**Reconstruction funding:** Generally this is derived from multiple sources. The reconstruction plan should include a clear financing plan. This approach would significantly improve delivery efficacy, facilitate quality control, and be cost-effective by avoiding the duplication of efforts and management that occurs in large-scale programs.

Besides the conventional budgetary funding sources, it is recommended that a special reconstruction fund be established in order to provide flexible subsidies for housing construction and livelihood rehabilitation, which cannot be financed within the existing budgetary framework and regulations.

**DESIGN PARAMETERS**

**Build back better:** Program design should recognize that long-term outcomes are being created by all strategic and policy decisions. The opportunity to build back better should be incorporated into planning. Short-term, quick-results solutions should be avoided to allow for long-term socioeconomic gains. Many damaged buildings may be found to be uneconomical to reconstruct or repair. In addition, experience indicates that properly engineered structures should be rebuilt at a significantly higher standard than those replaced, adding 5–30 percent to the cost. The additional cost will help mitigate the costs of future disasters. Specific attention should be given to ensure updated seismic design codes and design practices, are adopted, and guidance provided for retrofitting key infrastructure facilities and public buildings. Dissemination of state-of-art best practice design, construction and quality assurance methods should be one of the key responsibilities of the reconstruction authority.

At the outset, the vision of the recovery program for the Wenchuan Earthquake should be clarified (as was done in Aceh, Honduras, Kobe, and Maldives). The question to be considered is, “what do we want when we are finished?” Through defining and communicating the recovery vision, all of the stakeholders would be focused on the goals and objectives.

**PROCUREMENT**

**Accountability:** Clear accountability and delegated powers of decision making and authority are essential for effective reconstruction management. It may be necessary to designate this through a ministerial decree.

**Procurement methods:** Adopting emergency procurement procedures for reconstruction provides significant time benefits, while presenting accountability and economic efficiency challenges. Economic efficiency problems can be dealt with through limited bidding procedures. Accountability challenges can be managed through improved financial management systems. The duration for validity of these procedures should be defined, recognizing that comprehensive infrastructure reconstruction takes time.

**Materials selection and sourcing:** This presents a major challenge in terms of availability, logistics, environmental impact, suitability for use in high-hazard areas, artisan skill level and workmanship, quality assurance,
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and costs. These factors are especially relevant for reconstruction programs in remote areas. Environmental and sustainability considerations with respect to deforestation (timber), landscape degradation (sand and gravel for concrete), and farmland reduction (needed for settlement relocation and housing) all have an impact on reconstruction strategies. Options for off-site manufacture, large-scale procurement of key materials, and the logistics of construction materials purchase and distribution need to be optimized as part of program design. The choice concerning materials and design would also be based on a realistic assessment of the likely available local equipment, artisan skill level, and sustainability factors.

PRIORITIZED DATA SETS AND ANALYSES
Planning should be based on setting clear objectives: The objectives need to be premised on verified data and rigorous analysis. Data sets would be processed through a series of digital data overlays to enable rapid and least risk decision making, taking sociocultural preferences as important parameters. The principal data sets, parameters, and analyses are:

- Land availability and “ownership” or land-use rights, ensuring proposals are realistic, trading the benefits between rural and urban land rights and responsibility.

- Topographical mapping and weathering analyses, including base mapping, combining satellite imagery, orthophotos/maps, ground truthing, and efficient contour intervals. Detailed mapping would be required of the principal reconstruction areas, once selected through the hazard and risk mapping.

- Hazard and risk mapping should follow from the above, also drawing on topographical mapping data, eliminating ultra-high-risk areas, and dictating design parameters for all retrofitting and new construction.

- Environment and ecosystems: Delineating and addressing these features is vital at this point in time for scoping, exploring options, and planning. The aim is to minimize reconstruction impact and maximize ecosystem protection.

INVESTMENTS IN MAPPING AND DATABASE
Strategic investments by the government in current mapping and databases have been found to be a vital input for the reconstruction process. It is important that unified base mapping be created or updated, including topographical, cadastral, and thematic information. All agencies should work using the same base mapping. Satellite imagery is needed for initial assessments and is useful for concept review and initial decision making. Digital orthophoto mapping (scale 1:1000 with 25 centimeter contours intervals) should be arranged immediately.

Geological, soils, hazard mapping, and environmental and ecosystem data should be overlaid on this base mapping. (The scale will vary depending on typology requirements.) All mapping should be quickly published in hard
and electronic copy to enhance public awareness and ensure availability of these tools. The cost of adequate mapping is often seen as too expensive, whereas the future costs of planning and constructing infrastructure without adequate information is often overlooked.

**QUALITY ASSURANCE**

Achieving quality assurance (QA) is one of the main reconstruction challenges, and the methodology selected will have an impact on the QA outcomes. Hence care is also needed during the design phase to reflect the practicality of on-the-ground/site conditions.

Specific challenges to manage and meet acceptable levels of QA during the construction phase occur due to the dispersed nature of reconstruction activities, variation in the quality of materials, and unpredictable skill sets. Meeting construction safety standards and acceptable practices also presents unpredictable challenges.

Incorporation of quality assurance and awareness training: Disaster awareness parameters are generally not incorporated into general training of professionals (e.g., engineers, architects, and administrators), the business methods of contractor, or the hiring practices of local construction artisans and laborers. Non-engineered buildings (e.g., rural housing) will likely be built back to original quality unless owners are educated and designers, builders, and artisans are trained. Providing and ensuring this outreach and support is a key responsibility of the respective reconstruction authority which is often overlooked.

The training of planners, designers, construction managers, and especially local-level artisans and construction workers should be incorporated into all phases of reconstruction. Moreover, training should also be incorporated in the reconstruction program for the asset and building owners, financiers, and local communities, since they are all beneficiaries of and dependant on the infrastructure. Budget provision for these inputs should be realistic, taking into consideration the post-disaster conditions and capacity and the potential impact of substandard quality. Indicative estimates, for example, of site supervision costs should be double normal provisions.

**EXIT STRATEGY**

Specific plans should be made for long-term ownership and management of the newly created assets to ensure that adequate financing will be available for their completion, legal ownership, operation, and maintenance. This capacity should be created as part of the reconstruction plan. Moreover, strengthening China’s national strategy and future disaster risk management arrangements—focusing on mitigation and preparation—should be part of the exit strategy.

**End Note**

1 Following the end of the emergency response phase to the tsunami, the Indonesian government through the National Development Planning Agency (BAPPENAS) coordinated and drew up a rehabilitation and reconstruction plan for Aceh and Nias. Several institutions in cooperation with international bodies participated in the process of developing the master plan. The master plan outlined the need to establish an agency responsible for the coordination and implementation of the rehabilitation and reconstruction plan for Aceh and Nias. The agency for the Rehabilitation and Reconstruction of Aceh and Nias (BRR) was created for this purpose.
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