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PROJECT PERFORMANCE ASSESSMENT REPORT

INDIA

MAHARASHTRA EMERGENCY EARTHQUAKE REHABILITATION PROJECT

(CREDIT 2594-IN)

April 21, 2005

Sector, Thematic, and Global Evaluation Group
Operations Evaluation Department

Currency Equivalents (annual averages)
Currency Unit = Currency Unit Indian Rupee (Rs.)

AppraisalYear (1994)	US$1.00 = Rs. 31.00
Intervening Years	US$1.00 = Rs. 34.70
Completion Year (1998)	US$1.00 = Rs. 41.22

Abbreviations and Acronyms

ADB	Asian Development Bank
CIG	Central Implementation Group
DE	Deputy Engineer
DFID	Department for International Development
DST	Department of Science and Technology
GOI	Government of India
GOM	Government of Maharashtra
ICR	Implementation Completion Report
IDA	International Development Association
IMD	India Meteorological Department
NGO	Non Governmental Organization
OED	Operations Evaluation Department
PPAR	Project Performance Assessment Report
PMU	Project Management Unit
R&S	Repair and Strengthening
SDR	Special Drawing Rights
SPARC	Society for Promotion of Area Resources Centers
TISS	Tata Institute of Social Sciences
UNCHS	United Nations Center for Human Settlements
UNDP	United Nations Development Program
VLC	Village Level Committee

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Government: April 1 - March 31

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OED Mission: Enhancing development effectiveness through excellence and independence in evaluation.

About this Report

The Operations Evaluation Department assesses the programs and activities of the World Bank for two purposes: first, to ensure the integrity of the Bank's self-evaluation process and to verify that the Bank's work is producing the expected results, and second, to help develop improved directions, policies, and procedures through the dissemination of lessons drawn from experience. As part of this work, OED annually assesses about 25 percent of the Bank's lending operations. In selecting operations for assessment, preference is given to those that are innovative, large, or complex; those that are relevant to upcoming studies or country evaluations; those for which Executive Directors or Bank management have requested assessments; and those that are likely to generate important lessons. The projects, topics, and analytical approaches selected for assessment support larger evaluation studies.

A Project Performance Assessment Report (PPAR) is based on a review of the Implementation Completion Report (a self-evaluation by the responsible Bank department) and fieldwork conducted by OED. To prepare PPARs, OED staff examine project files and other documents, interview operational staff, and in most cases visit the borrowing country for onsite discussions with project staff and beneficiaries. The PPAR thereby seeks to validate and augment the information provided in the ICR, as well as examine issues of special interest to broader OED studies.

Each PPAR is subject to a peer review process and OED management approval. Once cleared internally, the PPAR is reviewed by the responsible Bank department and amended as necessary. The completed PPAR is then sent to the borrower for review; the borrowers' comments are attached to the document that is sent to the Bank's Board of Executive Directors. After an assessment report has been sent to the Board, it is disclosed to the public.

About the OED Rating System

The time-tested evaluation methods used by OED are suited to the broad range of the World Bank's work. The methods offer both rigor and a necessary level of flexibility to adapt to lending instrument, project design, or sectoral approach. OED evaluators all apply the same basic method to arrive at their project ratings. Following is the definition and rating scale used for each evaluation criterion (more information is available on the OED website: http://worldbank.org/oed/eta-mainpage.html).

Relevance of Objectives: The extent to which the project's objectives are consistent with the country's current development priorities and with current Bank country and sectoral assistance strategies and corporate goals (expressed in Poverty Reduction Strategy Papers, Country Assistance Strategies, Sector Strategy Papers, Operational Policies). *Possible ratings:* High, Substantial, Modest, Negligible.

Efficacy: The extent to which the project's objectives were achieved, or expected to be achieved, taking into account their relative importance. *Possible ratings:* High, Substantial, Modest, Negligible.

Efficiency: The extent to which the project achieved, or is expected to achieve, a return higher than the opportunity cost of capital and benefits at least cost compared to alternatives. *Possible ratings:* High, Substantial, Modest, Negligible. This rating is not generally applied to adjustment operations.

Sustainability: The resilience to risk of net benefits flows over time. *Possible ratings:* Highly Likely, Likely, Unlikely, Highly Unlikely, Not Evaluable.

Institutional Development Impact: The extent to which a project improves the ability of a country or region to make more efficient, equitable and sustainable use of its human, financial, and natural resources through: (a) better definition, stability, transparency, enforceability, and predictability of institutional arrangements and/or (b) better alignment of the mission and capacity of an organization with its mandate, which derives from these institutional arrangements. Institutional Development Impact includes both intended and unintended effects of a project. *Possible ratings:* High, Substantial, Modest, Negligible.

Outcome: The extent to which the project's major relevant objectives were achieved, or are expected to be achieved, efficiently. *Possible ratings:* Highly Satisfactory, Satisfactory, Moderately Satisfactory, Moderately Unsatisfactory, Unsatisfactory, Highly Unsatisfactory.

Bank Performance: The extent to which services provided by the Bank ensured quality at entry and supported implementation through appropriate supervision (including ensuring adequate transition arrangements for regular operation of the project). *Possible ratings:* Highly Satisfactory, Satisfactory, Unsatisfactory, Highly Unsatisfactory.

Borrower Performance: The extent to which the borrower assumed ownership and responsibility to ensure quality of preparation and implementation, and complied with covenants and agreements, towards the achievement of development objectives and sustainability. Possible ratings: Highly Satisfactory, Satisfactory, Unsatisfactory, Highly Unsatisfactory.

Contents

This report was prepared Mr. Ronald Parker and Ms. Silke Heuser, consultant, who assessed the project in September 2004. The report was edited by Mr. William Hurlbut, and Ms. Helen Phillip provided administrative support.

Boxes

Principal Ratings

	*ICR**	*ICR Review**	*PPAR*
Outcome	Highly Satisfactory	Highly Satisfactory	Highly Satisfactory
Sustainability	Likely	Likely	Likely
Institutional Development Impact	Substantial	Substantial	Substantial
Bank Performance	Satisfactory	Satisfactory	Satisfactory
Borrower Performance	Satisfactory	Satisfactory	Highly Satisfactory

* The Implementation Completion Report (ICR) is a self-evaluation by the responsible operational division of the Bank. The ICR Review is an intermediate OED product that seeks to independently verify the findings of the ICR.

Key Staff Responsible

Project	*Task Manager/Leader*	*Division Chief/ Sector Director*	*Country Director*
Appraisal	Richard G. Scurfield	Robert N. Panfil	Heinz Vergin
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Preface

The Maharashtra Emergency Earthquake Rehabilitation Project (Credit 2594-IN) in the amount of SDR 177 million (US$246 million equivalent) was approved on March 31, 1994, and made effective on June 27, 1994. SDR 21.0 million (about US$30.24 equivalent) of projected savings from the credit was canceled on December 16, 1996. The British government provided cofinancing in the amount of UK£10 million. An additional UK£5 million was made available in parallel through the former British Overseas Development Administration, now Department for International Development (DFID) to assist project implementation. The Asian Development Bank (ADB) and the United Nations Development Program (UNDP) contributed parallel assistance of US$600,000 each to support project implementation. The credit closed on December 31, 1998, after two extensions totaling one and a half years. The credit was fully disbursed, and the final disbursement of US$78,921 was made on March 3, 1999.

The report is based upon reviews of the Implementation Completion Report, the Memorandum and Recommendation of the President, legal documents, project files, and discussions with Bank staff involved with the project. OED fielded a two-person mission to India in September 2004 to review the project results.

The mission visited central government departments in Delhi and project offices in Mumbai but spent most of its time in the field, visiting project sites, and speaking with project officials and stakeholders. The mission appreciates the courtesies and attention given by interlocutors and is particularly appreciative of the efforts made by Krishna S. Vatsa, Secretary, Relief and Rehabilitation, Revenue and Forest Department; Abhay Shah, District Project Officer, UNDP; and Kuljit S. Sidhu. It also gratefully acknowledges the logistical support provided by the Government of Maharashtra.

The PPAR was undertaken to support OED's major evaluation of Bank assistance in the context of natural disasters. This assessment of one project is unusual in that it occasionally compares the Maharashtra experience with what has happened during the Gujarat Emergency Earthquake Reconstruction project (approved May 2002). The PPAR mission provided an opportunity to visit Bank financed disaster-related work in Gujarat and Andhra Pradesh and to determine what lessons the Bank had learned over the years. Following standard procedures, copies of the draft PPAR will be sent to relevant government officials and agencies concerned for their review and comments. Any comment received will be attached as an annex to this report.

Summary

A series of large earthquakes struck the state of Maharashtra on September 30, 1993. The devastating quakes severely affected 67 villages, killing about 8,000 people and injuring about 16,000. Considerable damage to public buildings and infrastructure spread over 13 districts. IDA, in collaboration with ADB, DFID, and UNDP, supported a comprehensive rehabilitation program covering all aspects of the damage in affected villages. The project had three overarching objectives: (i) to assist with rehabilitation and reconstruction in the earthquake-affected areas (restoration of assets and basic services), (ii) to increase the earthquake resistance of buildings and infrastructure through the development of improved standards for design and construction, and (iii) to develop the ability of the Government of Maharashtra (GOM) to respond more effectively to natural disasters, including earthquakes.

The GOM staff in charge of the project, aware that many countries have faced civil unrest in the aftermath of poorly handled reconstruction activities, decided that the reconstruction effort would provide an opportunity to redress housing inequities and reduce social tensions. Renters and those incapable of providing themselves with a home (such as widows and the elderly) were to be granted the ownership of a first rate dwelling. Even more radical was the decision to provide nomads, scheduled tribes, and other marginalized groups with housing comparable to what was going to be provided to the middle class.

Early efforts to begin reconstruction were complicated by the seriously flawed criteria used to quantify the damage and identify beneficiaries. Although assessment was done in accordance with criteria developed by the International Association of Earthquake Engineering, the criteria were difficult to apply to most of the earthquake-damaged buildings which were made (using traditional designs) of mud and loose stone. It was nearly impossible to distinguish between slight nonstructural damage and moderate structural damage. In the areas where the damage levels were lower, it was also difficult to distinguish between earthquake damage, poor quality construction, and a prolonged lack of maintenance. The complexity of applying the categorization scheme stimulated controversy and led to numerous legal challenges. Project staff received about 17,000 complaints demanding additional compensation of varying sorts.

This project demonstrates the importance of borrower ownership. Because key officials in the GOM were convinced that the future of the state of Maharashtra would be influenced to a considerable degree by the approach taken during the reconstruction and economic rehabilitation, they were committed to a successful outcome, and resolved not to let the project fail. A series of modifications to the project approach were made for the purpose of overcoming obstacles and accommodating stakeholder preferences.

Critical "lifeline" facilities were given priority. A new water supply system was provided to the relocated villages. Since most families depended upon agriculture, irrigation dams were constructed and irrigation systems restored, and farm implements and agricultural equipment were provided to replace those that had been lost or damaged. Government imported farm animals (cattle, oxen, sheep, and goats) to Maharashtra for distribution. Financial assistance was extended to artisans and small businesses so that lost equipment, inventories, and implements could be repurchased. Land was acquired to relocate 52 villages (106 percent of appraisal estimates), to build 27,944 new houses (121 percent of target were erected), and new urban infrastructure was provided in these villages. In the villages that were not relocated, the housing repair component was rejected by beneficiaries, but about 200,000 additional houses were rebuilt.

All public and private buildings reconstructed or retrofitted passed engineering inspection certifying their earthquake resistance. The notable success in this area was due to the development of improved standards for design and construction that were simple to understand, information dissemination campaigns, training of artisans, and enforcement.

Overall the project outcome is rated **highly satisfactory**. The project fully achieved all three of its highly relevant objectives without significant shortcomings, at a scale which taxed the implementation capacity to the utmost. The institutional development impact is rated **substantial**. The project management unit was transformed into a permanent disaster management institution that will enhance human welfare over the long term. Statewide, skills have been upgraded, capable staff recruited and retained, information systems established, and hazard-related planning carried out. The result of the work begun under the Bank loan, and the added stimulus of repeated buffeting by disasters has been the creation of permanent public institutions to manage risks, monitor hazards, and predict disasters. These have served as an example to other Indian states and the national government.

Sustainability is rated **likely**. Hundreds of communities have had the disaster vulnerability of the built environment (public and private) significantly reduced. At the time of the evaluation the infrastructure constructed had already resisted the forces of another earthquake suffering almost no damage, and it can be predicted that it will continue to resist disaster risks thus adding to the substantial benefits delivered. Project-built public infrastructure is in use. Facilities are generally being well maintained under the budgets and oversight of different ministries. Technical and financial resilience is high, as is social support. Bank performance is rated **satisfactory**. The Bank responded quickly after the earthquake. Bank staff helped to design a project that addressed the problems caused by the earthquake in a comprehensive way. The government reports that the Bank supervision also supported the work quite effectively. The borrower's performance is rated **highly satisfactory**.

Among the lessons suggested by the project experience are the following:

- Careful poverty targeting and sensitive project design can lead to major poverty reduction impacts even under difficult post-disaster circumstances.
- Relocation of villages that consist mostly of one and two story buildings during post-earthquake reconstruction is usually a mistake in the long-term.
- Simplicity of message is essential to the adoption of disaster-resistant technologies.
- Grievance procedures need to be in place from the outset.
- Damage Assessments need criteria that are carefully tailored to each widely used construction type, and that lead to damage awards closely tied to the actual cost of what needs to be done.
- Owner-driven construction was more effective in providing culturally and environmentally appropriate housing given the limited range of options contractors were able to provide for the same cost.

Ajay Chhibber
Acting Director-General
Operations Evaluation

1. The Earthquake and Planned Response

1. A series of earthquakes of about 6.4 on the Richter scale struck the state of Maharashtra on September 30, 1993. The devastating quakes severely affected 67 villages, killing about 8,000 people and injuring about 16,000. It was the largest seismic event ever recorded in two districts (Latur and Osmanabad). Considerable damage to public buildings and infrastructure spread over a wider area, covering 11 additional districts. Traditional unframed housing, made of uneven stones held together with mud mortar and heavy timber/mud roofs, proved to have very little earthquake resistance. In total, approximately 225,000 houses were destroyed or damaged, and more than 58,000 families were left homeless.

2. The disaster-affected region was socially backward and quite poor, but it was located near Mumbai, an area that had been experiencing significant economic growth, modernization, and an elevated standard of living. The disaster provided an opportunity to rebuild the damaged communities to higher standards: public and private structures could be made much safer and a bit more comfortable than what had existed before. Yet it would not be easy: just the number of houses that needed rebuilding ensured that any effort that addressed housing would have to be one of the largest operations of its type ever conducted anywhere.[1] Social, economic, and physical reconstruction needed to go hand-in-hand, and no one in state government had ever managed a construction operation at the scale that would be required.[2]

IDA Involvement

3. The International Development Association made its willingness to assist known the day after the earthquake. A Memorandum of Understanding between the Government of India and IDA was signed five days after the earthquake, and IDA fielded a reconnaissance mission only five days later.

4. An important part of what IDA brought to the table was the World Bank's considerable experience with emergencies. Over the past two decades about 500 approved projects have had at least one component dealing with disaster. Local officials involved with the project commented that knowing that IDA would be involved in the reconstruction effort very early on made it significantly easier to design the project and the activities to be supported. IDA's support for the reconstruction effort also facilitated the participation of other international multilateral agencies, including DFID, UNDP, and the ADB, and numerous local organizations. However, the time lag between the initial actions and active World Bank involvement was criticized by many informants. Most high-level government staff interviewed felt that the Bank needed field a presence during the immediate post-disaster period so that a continued sharing of experience could take place and the reasons for the many minor modifications to the original plan could be understood by both parties.

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1. Source: OED Natural Disasters and Emergency Reconstruction evaluation database.

2. Worldwide, only 4 of the 40 Bank loans/credits that had attempted housing reconstruction did so at the 100,000 unit level – and none of those had been in India.

Project Objectives (Stated and Implied)

5. The credit documents do note that IDA supported a comprehensive rehabilitation program that dealt with *all* aspects of the damage in *all* the affected villages. The Memorandum of the President specifies three objectives for the project: (i) to assist with rehabilitation and reconstruction in the earthquake-affected areas (restoration of assets and basic services), (ii) to increase the earthquake resistance of buildings and infrastructure through the development of improved standards for design and construction, and (iii) to develop the ability of the Government of Maharashtra to respond more effectively to natural disasters, including earthquakes.

6. The earthquake came at a time when the local economy was booming and the GOM's coffers were relatively full. This permitted a more ambitious response than might otherwise have been the case. Also, Mumbai was increasingly attracting international investment, and preserving an image of stability was essential to regional economic development. The GOM staff in charge of the project, aware that many countries have faced civil unrest in the aftermath of poorly handled reconstruction activities, decided that the reconstruction effort would provide an opportunity to redress housing inequities and reduce social tensions. Renters and those incapable of providing themselves with a home (such as widows and the elderly) were to be granted the ownership of a first-class dwelling. Even more radical was the decision to provide nomads, scheduled tribes, and other marginalized groups with housing comparable to what was going to be provided to the middle class. The Government's social objectives are not reflected in the Bank's documentation.

Project Components

7. The project had components at the state and national level. The state of Maharashtra was responsible for: (i) reconstruction of 49 new villages on greenfield relocation sites including 23,000 new houses and associated infrastructure and civic amenities; (ii) the reconstruction on existing sites of 30,000 houses that were destroyed or substantially damaged; (iii) the repair of about 180,000 partially damaged houses; (iv) construction of 500 model houses to demonstrate construction with earthquake-resistant features; (v) a pilot retrofitting of 5,000 undamaged but vulnerable houses to demonstrate strengthening techniques; (vi) the repair, reconstruction, and strengthening of public buildings and infrastructure (including schools, health centers, social service facilities, roads, bridges, irrigation facilities, and historical monuments; (vii) economic rehabilitation focused on the replacement of business losses; (viii) social rehabilitation with a particular emphasis on the needs of women and children; and (ix) preparation of a disaster management program for the state of Maharashtra.

8. At the national level the Government of India (GOI) implemented a seismic monitoring and research program through the Department of Science and Technology (DST).

2. Implementation Experience: Learning to Reduce Disaster Vulnerability

Verified Vulnerability Reduction in 47 Villages

9. In order to come up with an independent view on the degree to which vulnerability has been reduced and to fully grasp the implications of the large number of complex issues raised by the reconstruction experience of this project, the OED PPAR mission visited a total of 47 villages, including in that number *relocated* villages and *reconstructed* villages (where whatever was done took place where buildings had been before). (The next chapter of this report enumerates project achievements in this respect and compares them with the relevant target). Project documents make an additional distinction between villages where *reconstruction* and *rehabilitation* took place, but, as will be discussed further below, that distinction was nearly meaningless to an outside observer.

10. The mission inspected 28 of the villages relocated to new sites (54 percent of all villages in that category) – including household visits and beneficiary interviews. The houses in the project-relocated settlements were built by construction firms or nongovernmental organizations, and the new settlements had been provided with a wide range of public amenities (schools, health centers, child feeding centers, access roads, storm water drainage, electricity, water supply, and, in some instances, irrigation). In most cases such things had not existed in the project villages before the earthquake.

11. Because the rubble clearance costs were low and some public infrastructure remained usable, families in relatively less-damaged villages stayed in place. They received new houses but stayed in their original communities and on their own parcels of land. The mission saw eight of the villages reconstructed in place. The project essentially restored whatever public buildings had been damaged in the villages of this category, and provided only the most essential urban services. Thus, at least in terms of the value of benefits received, the incentives strongly favored the relocated villages. This explains why villages litigated for relocation even when it might not have been technically justified or economically necessary.

The State Government Steadily Increased its Capacity to Manage Disasters

12. Between 1994 and 1998, the project was implemented by a project management unit (PMU) which was granted full powers to make administrative and financial decisions normally handled at the Cabinet level by the state bureaucracy. The PPAR mission found a very broad consensus regarding the performance of the unit – that it had done an outstanding job of managing the reconstruction process under difficult circumstances, thanks to careful analysis, sensitivity to local requirements, and speedy decision making. This opinion was shared by the GOM which, in 1999 after credit closing, decided to convert the PMU into a statewide disaster management unit. Four years passed before all the needed actions were taken. By September 2004, however, the PPAR mission found that the former PMU staff now enjoy permanent status. The unit is now a permanent agency responsible for relief and rehabilitation. Its responsibilities include: minimizing loss and damage from the full range of hazards to which the state is subject; monitoring emergency situations and providing

Box 1. Working Hard or Hardly Working: The Saga of the Junior Engineers

Oversight responsibility for the retrofitting and strengthening component was given to the District Collectors[3] assisted by about 800 junior engineers who were hired on a six-month renewable (consultant) contract to supervise repairs on site. In the beginning, the engineers were not highly motivated and they supervised work at an average of about 10 houses (each) in about a year and a half. First they used the rainy season as an excuse for slow repair work. In the dry season they complained that reconstruction was not happening because water was lacking and families could not build without it. Additional disruptions resulted from three strikes staged by the junior engineers, as part of their campaign to get permanent positions within the GOM system.

After about two years, social development and women's organizations were hired to help the engineers to motivate the beneficiaries and to speed up the repair process. While the social development consultants failed to jump start the rehabilitation effort, they were able to communicate to implementers that the beneficiaries were *determined* to invest any monies they received in new construction rather than repairs. The junior engineers, who were generally unenthusiastic about mud housing, were quite pleased to be building new structures out of cinder block and concrete: it was certainly easier to do (and more professionally appealing) than carefully placing odd bits of stone in crumbling mud walls on the verge of collapse.

To further speed the reconstruction process, an incentive program was created for the junior engineers. If the engineer-supervised buildings met target dates, then the engineer's salary was increased and the amount the beneficiary family was to receive increased as well. When the number of household visits had a clear connection to take-home pay, the number of supervisions and the speed of installment pay-outs increased remarkably. Work moved along rapidly: at the peak, 20,000 houses were built a month. Ultimately 250,000 were constructed in 13 districts. The new structures also increased usable interior space as damaged structures were often left standing for use as storerooms.

By credit closing the GOM gave in to the pressure of the junior engineers, and gave them all permanent positions in state government. The role of the District Collectors in the reconstruction process was generally positive, and highlights the importance of coordinating local and state-level governments during disaster response.

communication and, where appropriate, guidance to other public agencies; strengthening partnerships with the nongovernmental sector; conducting risk assessments, vulnerability analysis and hazard mapping; preparing action plans tailored to identified hazard levels; the elaboration of statewide mitigation strategies and actions; and the preparation of operational manuals. It currently has offices at the state and district level where it staffs an Emergency Operations Center and 33 District Control Rooms.

13. The project created videoconferencing rooms and a computerized email system which have improved communication between public officials in the districts, especially critical during emergencies. Just before the mission, rescue operations following a localized flood had managed to save numerous lives because several agencies coordinated their activities and equipment effectively – in a manner that would not have been possible earlier.

3. District Collectors head the government administration in a district. They are appointed by the national government to coordinate and monitor the development activities of government departments working in each district.

14. Although it was intended that seismic data gathered with project-funded equipment at the National Seismological Data Center be made publicly available, especially to the officials charged with disaster management, seismic risk data (especially for cities) is considered politically sensitive, reportedly on the grounds that it could have an impact on property values in several major urban centers, and distribution is carefully restricted to an undersized group that does not include staff with disaster management responsibilities.[4] Under the project, about 7,000 builders and masons were provided vocational education, focusing especially on earthquake-resistant building techniques. This has been an important contribution to the safety of the thousands of houses reconstructed, a process described further below.

Successive Disaster Assessments Missed the Mark

15. Early efforts to begin the reconstruction of private housing were complicated by botched attempts to quantify the damage and definitively identify beneficiaries. Although damage assessment was done in accordance with criteria developed by the International Association of Earthquake Engineering (IAEE), their criteria fit the prevailing construction types very poorly. Damage classification was based on assignment of each damaged building to one of five categories.

1. Slight non-structural damage
2. Slight structural damage
3. Moderate structural damage
4. Severe structural damage
5. Collapse

16. One problem was that the criteria were relatively simple to apply to modern buildings, but difficult to apply to most of the earthquake-damaged buildings which were made (using traditional designs) of mud and loose stone. It was nearly impossible to tell the difference between slight non-structural damage and moderate structural damage by looking. And it was impossible in many cases to distinguish between earthquake damage, poor quality construction, and a prolonged lack of maintenance. Worse, the first assessment team was composed entirely of revenue officers who had little knowledge of construction. In 1995, about a year and a half after the earthquakes, as a result of misguided generosity, the newly elected state government expanded the number of beneficiary families by about 150,000. Subsequently, when the cost implications of what was essentially a political decision were better understood, the decree was revoked. The GOM's granting and taking away of reconstruction entitlements complicated the task faced by project staff. It took three successive attempts at damage assessment (each requiring tens of thousands of house inspections) to finalize lists of beneficiary families in the villages and to determine which houses were to be repaired and which ones demolished and reconstructed.

4. The PPAR mission requested a meeting with Department of Science and Technology (DST) to discuss the achievements and impacts of the seismic monitoring component and the GIS system. The latter currently prioritizes natural resource data and not disaster management, as originally intended. Staff attrition (reportedly) has left no one still familiar with what had been done. It was not possible to arrange a meeting.

Protests and Litigation

17. The complexity of applying the categorization scheme, the disparity of early awards for similar damages (which varied between about US$479 and $1,315) and, to a lesser degree, the lack of transparency of the assessment process, stimulated controversy and led to legal challenges. Litigation by (over 70) excluded families resulted in lower court rulings in their favor, and court orders for the inclusion and/or reassessment of 63 entire villages. Thankfully, the Supreme Court finally lost patience with the growth of its docket and suspended all beneficiary litigation against the project in lower courts. In its ruling, however, the Supreme Court instructed the project to return to the reconstructed villages and to install bathrooms in each new house.[5]

18. While the court cases and bathroom retrofits were going on, project staff received about 17,000 complaints demanding additional compensation of varying sorts, and, following further review, about 4,000 of these cases were resolved in the claimants' favor.

19. Notwithstanding the unremitting damage assessment controversy, most of the severely damaged villages in Latur and Osmanabad were relocated to more congenial sites under the project. Families in these villages generally wound up with more land and built area than they had owned before the disaster. In the end, to put a stop to the disputes that were taking way too much of PMU staff time, families classified in the first three damage categories (*para.* 15) received the same amount of compensation.

A Clever Strategy for Achieving a Safer Built Environment

20. A key decision made early in the project by India's leading earthquake engineer (a consultant to the PMU) was to promote simple technical solutions that were easy to implement. The consultant – who in recognition of his service to the country was subsequently made the National Seismic Adviser – was convinced that reducing the vulnerability of the settlements to be rebuilt required the distillation of a vast body of technical knowledge into a uncomplicated message that could be easily communicated to thousands of construction workers and 225,000 homeowners. It is a testament to his stature that the engineering community, often a source of conflicting opinions and excessively complex technical requirements in other disaster responses, followed his lead. His simple message: earthquake-resistant masonry construction has steel reinforcements at the corners, and columns that ring the structure at the ground (foundation) and lintel levels. People with little education found this advice to be totally comprehensible. They understood the concepts, and, as will be discussed further below, almost without exception (and including families that did not participate in/benefit from the project) these features have been incorporated in rebuilt houses and public facilities. Given the general acceptance of the simple technical concepts, the construction of 475 model houses (which was intended to help with the housing education process) was superfluous, and it took place too late. Also, early completion of higher cost donor-built housing raised community expectations, and as a result the models did little to help the dissemination of safer but more-economical housing technology.

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5. Before the earthquake very few houses had bathrooms. No space in the new houses was allotted for a granary, which, in almost all the houses visited, resulted in the new bathrooms being used for grain storage rather than for sanitary purposes.

Strong Borrower Ownership, Beneficiary Preferences, and Flexibility

21. Borrower commitment and flexibility made the project a success. Because the top people in the PMU (as well as other key officials in the GOM) were convinced that the future of the state of Maharashtra would be influenced to a considerable degree by approach taken during reconstruction and economic rehabilitation, they were committed to a successful outcome, and resolved not to let the project fail. This resolution was decisive when, because of beneficiary preferences, several aspects of the original design of the project proved unworkable.

22. Adopting beneficiary preferences guarantees beneficiary ownership and enhances sustainability. For the GOM it was important to take beneficiaries into account, even though the expressed preferences might mean that implementation took a little extra time. For example, when work started on the relocated villages, it turned out that for cultural reasons the beneficiaries wanted to enter their houses from either the east or the west, but definitely not from the south. Villagers were insistent that cobblers should be located at the west end of the villages so that the prevailing winds would blow the smell of tanning away from the houses. Beneficiaries wanted strong pegs and hooks installed high on their walls because they store their grains by hanging them in sacks. They have little furniture, and strategically placed hooks give an important additional dimension to a room.

23. Actually, there were a succession of modifications to the project approach that were made for the purpose of overcoming obstacles and accommodating stakeholder preferences. If the inhabitants of less damaged village wanted to relocate, they often received permission to do so under the project. In some cases stakeholder insistence was due to their awareness that new

Box 2. Relocated Villages Had Unforeseen Benefits And Problems: The Case of Killari.

The epicenter of the earthquake was near the village of Killari located in the Latur district, about 300 miles southeast of Mumbai. What happened to Killari is representative of several notable reconstruction trends. First, as happened with 52 out of the 67 heavily damaged villages, the village was relocated to a new site. Only a few badly damaged buildings remained standing in the original site after the disaster, and, as of September 2004, only the sacred temple buildings had been repaired in Old Killari. Second, the original village, which was quite large before the disaster, was bifurcated. That is, two new villages were built and the population divided. While some critics argue that this and other village bifucations (informants estimated variously the number of villages bifurcated at 25-30) were done to separate castes, project staff argue that this is not the case. The criteria for placement in one of the new sites were proximity to each family's agricultural land and a reduction in commuting time. Third, the type of lodging provided is too small to permit the preservation of the nuclear family. The typical family received 4 to 5 units. Fourth, the footprint of many villages has grown about tenfold. The two New Killaris occupy 15 times more land than the original village (project-wide the average is eight times more land). Generally houses are well built. The distance between houses is greatly increased. New houses have separate kitchens. The reconstruction was carried out by several NGOs and agencies under government contract. This approach led to high expectations; competition for superior relocation sites and house design; and a sense of entitlement reflected in the general refusal to pay tax, water, and electricity bills once the new houses had been handed over to their new owners. Negotiations over contentious issues were not always peaceful. Aggression against construction workers and willful destruction of rebuilt houses in Killari led to work stoppage for over eight months. An earthquake in 2000 caused minor plaster cracks in some houses. Villagers are demanding public funds for cosmetic repairs.

villages received more public amenities. In about half of the relocated villages the distribution of houses did not place family members in close proximity. In the later stages of the project beneficiaries requested that social and family ties be respected in the distribution and this was done. When villages slated for relocation were peopled with opposing factions that could not agree on where the new village should be located or the design of the reconstruction plan, the PMU divided the groups and built two villages. If the project engineers were progressing too slowly doing the housing inspections, the PMU created piecework incentives to make them deliver the volume of work needed. Initially, IDA did not want to finance stone flooring. Beneficiaries wanted flagstone flooring because other donors working in the area were providing it. Ultimately the Bank and GOM decided to provide stone flooring too.

The Rehabilitation of Damaged Housing Proved Unacceptable to Survivors

24. In 749 villages that were located further away from the epicenter, in which there had been few deaths, and in which dwellings had suffered less than 70 percent damage, it was intended that houses would either be retrofitted or repaired by the owners themselves. Once the decision had been made to allow the beneficiaries themselves to decide whether they wanted a repair or new construction (see Box 1), cash and materials were given out to them in installments. Each payment took place at an easily definable stage, determined by the height of the new construction and the observable presence of a key steel reinforcement set in concrete. In order to receive the next installment, the homeowner had to pass an inspection by a junior engineer that certified that earthquake-resistant techniques had been used. Beneficiaries received support in cash or building materials (up to the equivalent of US$479 in government funding) for the repairs. Originally the government had planned to engage villagers in strengthening damaged structures by sealing fractured walls, bonding stones in the corners of rooms and at other critical points, inserting concrete layers at various wall heights, anchoring timber beams, and building mud roofs with less weight.

25. The mission visited 11 of these villages and learned from project staff that the repair component had not taken place as anticipated. Beneficiaries in the repair program were very reluctant to reconstruct stone housing because they perceived (the widely available and free) stone as a major cause of housing collapse and the resulting deaths. About 14,000 families defaulted (refused to construct as agreed) after receiving the first installment. In the entire disaster region, not a dozen families were willing to use the compensation they received to rehabilitate their houses using the project-recommended techniques. The mission asked to see rehabilitated housing in many of the villages visited without finding a single example, and several project staff admitted that they believed there had only been eight rehabilitations in the entire disaster-affected zone. Recycling did take place, however: many new houses used stone from the destroyed houses in foundations.

26. While field observations make it clear that motivating the villages (scheduled for rehabilitation and strengthening) to repair their houses had proved to be a challenge too great for project managers, is this a deficiency of the project? Arguably it was not. Each damaged house was damaged in a different way. It was extremely difficult to estimate how much a repair would cost, or even to tell what type of repair would be necessary without dismantling most of what remained (because the degree to which stones were bonded to the mud masonry inside the walls and the integrity of wood roofing beams covered by compressed earth could

not be seen). Since the traditional structure was never designed or supervised by an engineer or architect, there is no possible way to know how safe any rehabilitated house actually was. From the outset, beneficiaries in villages slated for "just repairs" sought to have new houses constructed for them. With the support provided, the beneficiaries refused to make a significant further investment in a damaged house made of stones held together with earthquake-pulverized mud.

27. Once it became permissible (see Box 1) they opted instead to construct one or more new rooms in a new free-standing structure located near or adjacent to their still-standing but damaged house. In other words, they built *new houses*. Most commonly, a totally new house constructed of steel-reinforced concrete masonry. With the low local cost of labor (and often with just self-help construction) the amount allotted for repair was sufficient to erect a 200-square-foot house of steel-reinforced concrete. Many families built larger structures supplementing the project allotment with their own funds.

3. Achievement of Objectives

28. The three overarching project objectives identified by the Memorandum of the President were fully achieved as follows.

Objective 1: Assist with rehabilitation and reconstruction in the earthquake-affected areas (fully achieved)

29. Critical "lifeline" facilities were given priority. This included the repair of some roads and the construction of both dirt and blacktopped new roads. The project provided access roads for relocated villages (157 kilometers), repair of existing right of ways to permit access to relocated villages (116 kilometers), inter-village roads (59 kilometers), blacktop (37 kilometers), urban road repair (297 kilometers). Bridge repair received considerable attention (8 major bridges strengthened, over 200 lesser bridges repaired, and 156 [minor] new bridges constructed). In communities where water systems were damaged, repairs to the supply infrastructure were made. In some cases temporary facilities had to be installed while permanent repairs were underway (51 interim systems, system repairs in 53 villages). A new water supply system was provided to all the relocated villages and several others (57 new systems, 22 in Osmanabad, and 35 in Latur).[6] This entailed the construction of aqueducts, two treatment plants, and, for each community, a new piped system. During the PPAR mission it could be seen that water service is intermittent. Under normal conditions the families receive about 40 liters per capita a day. The mission took place during a drought (actually, 2004 is the fourth consecutive year of drought). The system was consistently delivering about 30 liters a day per family. Repair and reconstruction of dug wells (337) was undertaken throughout the project area.

6. The water systems were not adequately designed for local soil conditions. The highly expansive "black cotton soil" was so dynamic that the pipes, which were made out of inexpensive but brittle asbestos cement, fractured and burst as the earth was moistened by rain and then dried out. In many areas the problem was only overcome when the original pipes were replaced with iron and/or PVC.

30. To the degree possible, the PMU attempted to reinvigorate the local economy. Since most families depended upon agriculture, restoring local productivity was a priority. Farm implements (24,363) and agricultural equipment (12,639 units) were provided to replace lost and damaged items. Farm animals (1,534 cows, 829 bullocks, 1,812 buffaloes, 1,342 sheep, and 8,269 goats) were purchased in other parts of the country and brought to Maharashtra for distribution. There was also financial assistance for artisans and small businesses (555 grants) so that lost equipment, inventories, and implements could be repurchased.

31. The earthquake damaged irrigation infrastructure over a wide area. Some of the damage to embankments was handled by contracting local laborers. Among the repairs to larger facilities conducted under the credit were: reconstruction of offices for government officials managing the irrigation system, repairs to storehouses and machinery repair facilities, rebuilding the Talni aqueduct and 125 percolation tank embankments, 92 major earthworks, and strengthening of 218 weirs.

32. Of the 67 severely-damaged villages, land was acquired to relocate 52 villages and the same number were ultimately relocated (49 villages estimated, actual results are 106 percent of appraisal estimates[7]). It was estimated that 23,000 new houses would be built in those villages and 27,944 new houses were erected (121 percent of target). New urban infrastructure was provided to all these houses. Moving to a new village provided young married couples with the opportunity to own their own home and move out from under parental roofs and oversight. And more housing units per family also meant more land is now owned by each family.

33. In the villages that were not relocated, 10,622 houses were reconstructed in situ (35 percent of appraisal estimates). In terms of the housing repairs that were to take place, 189,113 houses were totally rebuilt (101 percent of estimated) and 8 were repaired.

34. Pilot strengthening of 3,876 undamaged but vulnerable houses took place (5,000 appraised) to demonstrate strengthening techniques: The actual cost of retrofitting was higher than anticipated. There were also 475 (500 appraised) model houses constructed for educational purposes to demonstrate construction with earthquake resistant features. These were later given over to community purposes or handed out to widows and handicapped families. Trauma centers were built in Osmanabad and Latur. An orphanage for 150 orphans was built in Pune. A school was built on the same on same site. One old-age home and one handicapped care facility were constructed.

35. *Women's Groups and Issues*. About 500 community-based women's organizations were formed with the help of project staff. Self-help savings groups were formed in the relocated villages to provide small loans.[8] Fifty-two community centers and two district

7. Estimates are according to the Memorandum of the President (MOP). Appraisal reports are not prepared for disaster projects.

8. The mission met with the officers and members of two savings groups and found that they were still meeting once a month to manage loans and oversee savings deposits. In both groups the amount of money circulating was a little under US$300. The women said that the most common use of loans is for family emergencies (sickness, school fees and uniforms, ceremonies, and responsibilities to the extended family). Instances of loans being used for money-making schemes were infrequent.

resource centers were constructed that are available for use by women. In most relocated villages, women were given title to property jointly with their spouses, and widows were sole owners. About 1,140 childcare/feeding facilities were built.

Objective 2: Increase the earthquake resistance of buildings and infrastructure (fully achieved)

36. Each private house that received and passed engineering inspection and all public buildings reconstructed or retrofitted were earthquake resistant. There were 3,722 school buildings constructed, as well as 1,856 public buildings of various types, and 9 historic monuments.[9] Success in this area was due to several measures: the development of improved standards for design and construction that were simple and understandable to the average villager, the information dissemination campaigns to propagate technology, training of artisans, and inspection of reconstruction designs. Another contributing factor was the training given to about 7,000 builders and masons in earthquake-resistant techniques.

Objective 3: Develop the ability of the Government of Maharashtra to respond more effectively to natural disasters (fully achieved)

37. Modern disaster management equipment was provided to the GOM. There is now a state Secretariat of Relief and Rehabilitation. A statewide disaster management plan was developed that includes land use regulations, a mitigation strategy that covers risk assessment and vulnerability analysis, public awareness, disaster management legislation as well as a public policy on relief and rehabilitation, and a research agenda. An emergency operations center has been built in Mumbai and there are 33 others in the districts. A communications network for wireless (VHF) is in operation, as are the satellite (V-SAT) networks, a GIS-based disaster management information system, community disaster preparedness programs, and training and support to regularly update the plans. The project has had an influence far beyond Maharashtra's borders. A National Institute for Disaster Management was established in the Ministry of Home Affairs. Today, the GOI is setting up state-level emergency management agencies for each state, with crisis control rooms all over the country connected by communication systems that provide critical information in real time to the District Collectors. The national government has strengthened its capability to undertake more effective seismic monitoring and research, although it has yet to share data with relevant disaster managers.

38. The disaster management capacity created in Maharashtra has also been beneficial to neighboring states and the conversion of the PMU into an emergency management secretariat served as a model for national disaster management efforts. While there is almost no precedent for states helping each other in India, the state of Maharashtra supported neighboring Gujarat with US$30 million of its own resources – they were used to construct 5,000 houses in two villages plus access roads, electricity, and water supply. Furthermore, masons trained under this project helped in the rebuilding of Bhuj. Additionally, more than

9. Problems with the Department of Culture resulted in less achievement than anticipated in the monument sub-component.

400 cyclone shelters and schools were built in Orissa by GOM following a devastating cyclone.

39. At the national level, modern seismic equipment (costing US$8 million) was procured; monitoring stations were set up, as was a National Seismological Data Center. Ten new and 10 upgraded digital seismological observatories are able to monitor earthquakes down to magnitude 3 on the Richter scale. Data are automatically fed into the National Seismological Data System. The India Meteorological Department never purchased accelerographs (meters specially equipped to measure and record ground motion during an earthquake) which would have added depth to the data collected.

4. Conclusions and Lessons

40. The Maharashtra Emergency Earthquake Reconstruction project received international recognition: it won a Sasakawa Award for Disaster Prevention, and it was selected to a list of the 100 best projects by the United Nations Center for Human Settlements. The Maharashtra demonstrates that Bank and its development partners can help borrowers facing a complex reconstruction situation to be very successful, even when the scale of the damage is large. Staff in the PMU were able to supervise the construction of large numbers of houses and public buildings in a short time under difficult conditions in the field. And they were able to catalyze the social and economic aspects of the recovery as well, achieving a poverty impact that is largely unprecedented. Class and ethnic differences are no longer visible in many villages. Furthermore, the vulnerability of an area likely to confront earthquake disaster again at some point has been significantly reduced. There are seasoned institutions staffed with staff knowledgeable about disasters and functional new communications networks. Nearly all of the rebuilt dwellings are earthquake-resistant.

41. The GOM-contracted junior engineers personally supervised the construction of each of thousands of constructions. This was only possible because the essence of disaster-resistance was distilled down to three simple messages. It also highlights the importance of close government monitoring in reducing disaster vulnerability.

42. Now that it is clear that the Bank and its borrowers can function effectively at a scale larger than ever before, thought needs to be given to improvements that might be tried the next time. The strategic approach to the reconstruction process adopted by Maharashtra should be modified before receiving wider adoption. By providing beneficiaries (especially those who were relocated) with a comprehensive solution to their personal and community problems it encouraged more demands, disputes, and ultimately litigation. The MEERP was largely government-driven. It involved large construction firms but only a limited number of NGOs – some of the latter being large construction firms reconstituted as NGOs so as to qualify for additional contracts under the project. By comparing the Maharashtra experience with that of the Bank-financed Gujarat Emergency Earthquake Reconstruction project, the way forward is somewhat clearer (see Box 3).

Most Project Problems Were Not Serious Shortcomings

43. OED is currently undertaking a major review of the Bank's emergency reconstruction

Box 3. Comparison with the Reconstruction Process after the Gujarat Earthquake

The Gujarat project was a Bank-financed response to a subsequent earthquake that was visited by the PPAR mission for the OED evaluation of Natural Disasters and Emergency Reconstruction. While its experience is covered in a background paper, several distinctions between the approaches taken by the two projects are worth noting here. Reconstruction of private houses was owner-managed construction (about 85 percent) and a much larger number of NGOs was involved (over 100).

An owner-driven approach can result in housing layouts that take the needs, occupations, and family size of the beneficiaries more into account. Such an approach should be followed in the future in large countries where there is a well developed construction industry and a large geographic area untouched by disaster.

While Maharashtra adopted a *compensation* approach, which opened the door to lawsuits, Gujarat adopted an *assistance* approach with no legally binding grievance redressing mechanism in place. The *compensation*-centered approach seems to have been a mistake.

- Accordingly, Maharashtra had to cope with a large number of lawsuits that were finally decided by the high court in the beneficiaries' favor, while Gujarat's ombudsman, who had no power to redress grievances, processed 40,000 complaint letters, but probably did little to resolve the problems brought to his attention. In the end, however, beneficiary satisfaction was high in both projects (according to survey results in the former and mission observations in the latter).
- Damage assessment was problematic in both projects and had to be redone. Instead of using a complicated scale with five criteria and a wide range of cash awards, a simpler two-point scale would have been sufficient to determine if a house could be repaired or if it had to be reconstructed.
- The size of the project area needs to be taken into account in the design of the institutional structure. For Gujarat, the implementing agency, GSDMA, had to cover an area much larger than the one under Maharashtra (five instead of two districts), manage five times as much money, and provide implementation as well as supervision services. Its institutional capacity was overstretched.

The World Bank learned from Maharashtra not to promote the relocation of entire villages; instead it made support conditional on in situ building. Still, in the emotionally charged atmosphere after a major disaster, some groups wound up relocating. The Government of Gujarat ultimately let village councils decide whether to relocate. Most of the beneficiaries decided against relocation, a decision that proved to be wise. After millions of tons of rubble were cleared, damage to some neighborhoods appeared to be less dramatic than originally thought, and houses were repaired and reconstructed.

lending. While that review is still ongoing, it is advanced enough to shed light on some of the things that happened under this project. One of the biggest problems during implementation of the MEERP was the contentious disaster assessment. This turns out to be a fairly common problem, with controversies around beneficiary selection being an ongoing headache faced by staff in many projects.

44. Another problematic aspect of the project was the abandonment of the appraisal commitment to locally available materials and least-cost construction. It turns out that aspirations often shift following disaster, with victims desiring to adopt more modern (though not necessarily safer or more environmentally appropriate) housing types. Efforts to convince disaster victims to rebuild using mud and stone (to use an appropriate metaphor) ran into a brick wall.

45. Although this project was classed as Emergency Recovery Lending, which is expected to be completed in three years, it required two extensions covering an additional year and a half before closing. How much of a shortcoming is this delay? This project significantly reduced the long-term vulnerability of Maharashtra to earthquakes, drought, and disease. Bank assistance for emergency recovery and restoration projects are to be commended when they include long-term hazard mitigation and loss-reduction measures. A three-year project period is not adequate to prepare and implement the things that need to be done, and postponing important tasks until a follow-on project (which might never happen) is not an appropriate alternative. Given what was accomplished, and the scale of the devastation at the outset, beyond drawing the lessons contained in this and the next section to guide future disaster lending, it is hard to criticize Bank or borrower staff for the problems encountered and the solutions derived.

Ratings

46. *Outcome*. The devastating earthquake caused a rapid reassessment of borrower and Bank development priorities, focusing them on the current situation in Maharashtra. In that context, the project fully achieved all of its highly relevant physical and social objectives without significant shortcomings, at a scale which taxed the implementation capacity to the utmost. Efficiency cannot be evaluated with an ERR (which emergency reconstruction projects do not calculate). However, the per capita and per unit costs of the infrastructure constructed and services provided were in line with local industry standards. And with the housing component, costs and poverty targeting represent industry best practice. Overall the project outcome is rated **highly satisfactory**.

47. *Institutional Development Impact*. The PMU was transformed into a permanent disaster management institution that will enhance human welfare over the long term. Statewide, skills have been upgraded, capable staff recruited and retained, information systems established, and hazard-related planning processes carried out in an unprecedented manner. The partnership between the GOM and NGOs that commenced under the project has established enduring relationships. Although not all the project's scientific objectives were attained (for example, the poor experience with the national seismic data), the project had an impact far beyond the borders of Maharashtra. The result of the work begun under the Bank loan, and the added stimulus of repeated buffeting by disasters has been the creation of

permanent public institutions to manage risks, monitor hazards, and predict disasters. These have been an example to other Indian states and the national government. In India there had been a major change in strategic thinking on disasters in the past decade: disaster risk management and efficacious response to emergency situations are now central in the government planning process for the first time. The institutional development impact rating is **substantial**. The project experience also changed the rules governing disaster-response and led to significantly simplified procedures.

48. *Sustainability.* Hundreds of communities have either been relocated to areas believed to be safer from earthquakes or had the disaster vulnerability of the built environment (public and private) significantly reduced. Zoning that takes into account disaster vulnerability has been introduced. This will increase the sustainability of public and private investments for years to come. At the time of the evaluation the infrastructure constructed had already resisted the forces of another earthquake suffering almost no damage, and it can be predicted that it will continue to resist disaster risks adding to the substantial benefits delivered. Project-built public infrastructure (buildings, water systems, irrigation, warehouses, and workshops) are in use. They are generally being well maintained under the budgets and oversight of different ministries. Technical and financial resilience is high, as is social support. Sustainability is rated **likely**.

49. *Bank Performance.* The Bank responded quickly after the earthquake. Bank staff helped to design a project that addressed the problems caused by the earthquake in a comprehensive way. The government ICR notes that its consultations with the Bank team during supervision "could be cited as an example of the best professional relationship." Bank involvement mobilized funding from other sources that complemented project activities in important ways. And Bank influence moderated the frequent and disruptive transfers of key public officials. The disputes between Bank and borrower (that led to the third assessment of housing) contributed to project delays but the Bank position had merit. On balance, Bank performance is rated **satisfactory**.

50. *Borrower Performance.* The MEERP is widely considered to be a major government achievement, and key staff members that participated in the effort are among (or have become) the foremost disaster experts in the country. The rescue and relief operations managed by the Borrower without Bank support set new standards for India. Technical audits and quality control were handled by international consultants. Project implementers' flexibility and determination to succeed helped overcome a challenging series of obstacles. There were no procurement-related delays. Project-built infrastructure that remained in public hands has been well maintained and government commitment to social stability in the housing component is noteworthy. The project exceeded appraisal estimates in many components, and benefits were provided to a large number of poor families, who were painstakingly identified according to criteria agreed with the Bank. Highly relevant studies were completed and used effectively. The project experience has been extensively documented, with an enormous amount of data available to the public on CD-ROMs. Assistance to the OED team and willingness to learn from the project experience were exemplary. Covenants were complied with in full. Supreme Court monitoring of project progress was unusual but constructive. The borrower's performance is rated **highly satisfactory** overall.

Lessons Learned

51. The mission's field visits to disaster projects in Gujarat and Andhra Pradesh were extremely useful for highlighting good practice in Maharashtra. Among the lessons suggested by the project experience are the following:

52. *Careful poverty targeting and sensitive project design can lead to major poverty reduction impacts even under difficult post-disaster circumstances.* The project provided better than adequate housing for beneficiaries at the bottom of the social ladder, which shows the potential of using the reconstruction period to promote policies to effectively reduce the gap between rich and poor. In this sense, the project achievements are a lasting monument to the convictions of the supervising officials.

53. *Simplicity of message is essential to the adoption of disaster-resistant technologies.* The project promoted simple earthquake-resistant features for non-engineered masonry construction that could be understood, adopted, and applied by the villagers. Their wide dissemination and use will benefit a much larger population than originally targeted, as these techniques would be used in future house construction. Training 7,000 local artisans in earthquake-resistant techniques (facilitated greatly by the simplicity of the message) was a major contributor to changing the construction practices in the disaster-affected region.

54. *Damage assessments need to be simple, carefully tailored to local construction types, and they should lead to damage awards closely tied to the actual cost of what needs to be done.* Although the damage assessment was undertaken in a professional manner, the original compensation system was too complicated. The experience of using the criteria of the International Association of Earthquake Engineering for damage assessment was painful for all concerned. The assessment criteria may work well for modern, engineered housing where what can be observed on the surface indicates what is going on within the wall. But they were abysmal for classifying damage to mud-bonded stone structures. Many of the people interviewed attributed the bulk of implementation problems to early difficulties distinguishing between damage categories 1-3 in the first two damage assessments. Specifically, informants noted that because the distinctions between categories were not intuitive, this led to a non-standardized assessment because of observer error.

55. Future damage assessments that use the IAEE criteria in areas where owner-built earthen houses are common need to carefully modify them so that they suit local conditions and building practices. Post-earthquake safety evaluations should determine if buildings are habitable and include some sort of solution for the owners of those that are not.

56. The OED study of Natural Disaster lending should explore the ways used in other Bank-financed disaster projects have arrived at definitive beneficiary lists in a less contentious manner than the one used here. Pressures to include additional beneficiaries are inevitable and usually prove impossible to resist. Throughout the project period, the pressure to classify additional families as eligible beneficiaries continued unabated, and after project closing (even as late as the date of the OED mission in September 2004) the GOM was still negotiating with families denied benefits. There must be a better way.

57. *Beneficiaries entitled to new housing need to make a significant contribution.* Bank emergency reconstruction lending used to expect cost recovery at levels that could not feasibly take place, given all the disaster victims had lost and needed to replace. A recent PPAR[10] of an earthquake project that targeted low-income families and expected full cost recovery found that over half the original beneficiaries had been unable to pay and consequently had given up their homes. So the fact that MEERP provided finished houses for free is a reaction to earlier lessons learned.[11] But there is probably a midpoint between full cost recovery and no cost recovery that does not create quite so much dependency and perpetually escalating expectations among beneficiaries. Because they are used to receiving everything for free, and then having the government come back again and again (bathrooms, stone floors see para 25 and Box 2), the PPAR mission found that many beneficiaries in new villages are currently unwilling to pay user charges for urban services, and it even found one group that expected the government to paint and maintain their new houses in perpetuity. In contrast, families in the villages that stayed in place are continually improving their homes and compounds using their own funds.

58. In the aftermath of natural disasters an element of grant funding is probably unavoidable, but official largesse should be limited so that beneficiaries contribute their own savings, or labor, or materials, or time for rehabilitation. Even where people have no insurance and low incomes, full grant-based rehabilitation is socially pernicious. It is also not economically sustainable. Expectations in India have risen. Following the Gujarat earthquake, there was full awareness of what had been provided in Maharashtra, and that awareness constrained project design.

59. Problems were created by uneven rehabilitation/reconstruction incentives. Villages litigated for the right to relocate even when it was technically contraindicated and likely to cause individual families great inconvenience because the benefits given to villages that only rehabilitated compared so unfavorably with what other groups obtained.

60. *Owner-driven construction was more effective than the use of contractors.* During project design it was believed that the only way to produce the huge number of new dwellings needed was to bring in large contractors. The results were as desired. However, in the villages that were not relocated (where people were expected to repair their units but they actually built new ones) a much larger number of (quite comparable) houses were built, and contractors were generally not involved. In those villages it was possible to use local people in construction, so employment was created for people from the disaster-affected region. (Contractors generally used imported labor because workers from outside the area were willing to work 12-14 hours a day in response to piecework incentives). Also, when homeowners were put in charge of the process, houses are more adapted to each family's requirements – there was no one-size-fits-all approach necessary. What works in India, a large country with ample production of building materials and a highly mobile work force

10. Report No. 28389 on the El Salvador Emergency Earthquake Reconstruction project (Loan 2873).

11. In the villages that were not relocated, the beneficiaries made contributions averaging 10 to 20 percent of the construction cost.

may not work everywhere. But the reliance on owner-managed construction was even more widely used following the earthquake in Gujarat, and the results were equally positive.

61. *Supervisory personnel do not always need higher education.* The junior engineers that worked on the project were over-qualified for what they were expected to do, and this can be seen in their concentration on their personal agenda of furthering their careers by landing government posts. A number of people interviewed in the project area suggested that future projects working with post-disaster housing could more effectively and economically be supervised by builders and masons rather than engineers, at least as regards owner-built structures.

62. *Grievance procedures need to be in place from the outset.* The strikes, protests, and litigation that plagued this project were partly the result of not having efficient and effective processes to redress grievance in place. An ability to make decisions and communicate them speedily to the involved parties is important. A dissemination capacity is helpful, especially if decisions have implications for other beneficiaries.

63. *Participation should only be encouraged when expressed preferences will be taken into account.* Community participation is not a panacea, and more participation is not always better than less participation. In this project, participation was extremely useful in the design of houses and their layout. In some of the villages visited, however, it created problems that were difficult to resolve during the construction process. This was partly a result of not deciding beforehand what aspects of contracted work homeowners should supervise and what the observers should do in the event of a grievance. Women's groups cited local supervision of construction as being a triumph of women's empowerment. On the other hand, the mission met with representatives of several construction firms that had been involved in activities supervised by community groups during the project. The interviewed contractors (and several public officials) were critical of what they classed as "excessive" community participation leading to blackmail in the housing component. In some cases, homeowners tried to extract bribes from contractors before approving the work. Construction companies attributed work stoppages in Killari (see Box 2) to frictions and misunderstandings between builders and villagers unfamiliar with the proper use of steel reinforcements and concrete. In their opinion beneficiaries should be involved in the planning phase and in housing unit allocation. It seems clear that in the villages visited having individual owners supervise the construction of just their own house was counterproductive, although the use of construction committees for the same purpose worked better, in part because the committees were able to benefit from training.

64. Participation may have been even less useful where there were stark social divisions, and a majority may have been inclined to call for things that are unfair to the minority. Some villagers held up construction starts, demanded bifurcation of villages or new relocation sites, tried to dictate building material preferences, delayed house allocation decisions, and interfered with the contractors' work. Reportedly community participation was more problematic in larger villages and those where the political leadership had a clear agenda. Pressuring Village Level Committees to accept women members was a short-lived triumph, as once the project closed women's participation was discontinued.

65. *Relocation of villages that consist mostly of one and two story buildings during post-earthquake reconstruction is usually a mistake in the long-term.* Although the GOM considers the relocated villages to be the project's greatest success, and a survey conducted at the end of the project showed that 77 percent of respondents thought that the new villages were better than they had had before, there were no strong technical reasons to support the decision to relocate, and many good reasons not to do so. The social interaction patterns that have built up in settlements that have been occupied for a long time are rarely if ever preserved in a new site. In most villages the modern style houses provided forgo the courtyards which were popular in traditional architecture. Many ethnic groups restrict women to the home compound. Since the new villages do not have walled courtyards, in some cases this results in the day-to-day restriction of women to a small room. Although most relocated families now own more land than formerly, in many cases they are farther from their fields, family graves, and places of worship than they were before. The design of new villages, though similar to what prevails in the newer neighborhoods in the periphery of Mumbai, did not fully consider the social, economic, and cultural needs of the villagers. Longer distances between houses (and a lack of courtyards) made it difficult for villagers to socialize.

Annex A. Basic Data Sheet

MAHARASHTRA EMERGENCY EARTHQUAKE REHABILITATION PROJECT (CREDIT 2594-IN)

Key Project Data *(amounts in US$ million)*

	Appraisal estimate	Actual or current estimate	Actual as % of appraisal estimate
Original commitment	246.0		
Total cancellation		30.2	
Total project cost	327.8	348.26*	
Cancellation			

Average Dollar/Rupee rate: $1=Rs.36.18

*Indicates actual project cost at December 31, 1998. Estimated project cost to completion by June 1999 is US$363.62 Million.

Project Dates

	Original	Actual
Departure of Appraisal Mission	November 8, 1993	January 4-29, 1994
Board approval	January 5, 1994	March 31, 1994
Signing		April 6, 1994
Effectiveness	March 5, 1994	June 27, 1994
Closing date	June 30, 1997	April 30, 1999

Staff Inputs *(staff weeks)*

	Actual/Latest Estimate	
	N° Staff weeks	US$ (000s)
Pre-appraisal	68.1	198.0
Appraisal	10.4	26.4
Negotiations	10.2	33.2
Supervision	205.2	511.4
Other	9.0	30.6
Total	303.9	799.6

Mission Data

	Date (month/ year)	No. of persons	Staff days in field	Specializations represented	Perfor -mance rating	Rating trend	Types of problems
Identification/ Preparation	10/93	3	2	EC, ME, RE	----	----	----
	11/93	7	24				
Appraisal	01/94	8	25	ME, RE, AC, SP, HS, ES, PC	----	----	----
Supervision	04/94	10	17	ME, SB, CP, UP, HS, SE, RS	1	----	----
	09/94	7	10	ME, SB, UP, HS, GE, EG	HS	----	P
	10/94	2	12	ME, UP	HS	----	----
	02/95	2	10	ME, UP	S	----	P
	05/95	4	10	ME, UP, DM, SE	S	1	P
	09/95	4	6	ME, SO, HE, CD	S		P
	10/95	4	6	ME, SO, UP, DM S P	S	1	P
	11/95	4	4	CD, SO, ME, UP	S		P
	03/96	2	5	ME, PO			----
	06/96	2	4	ME, PO	U		2
	07/96	2	4	ME, PO	S		2
	10/96	2	6	ME, PO	S		2
	01/97	4	6	ME, UP, SO, PO	S		----
	08/97	4	11	RC,PC,SO,PO	HS		----
	11/97	3	5	RC, PC, PO	HS		----
	03/98	3	6	RC, PC, PO	HS		----
	06/98	4	19	RC, PC, IN	HS		----
Completion	01/98	4	11	RC, IN, AN, FA	HS	HS	----

Specialization: AN=Anthropology; CD=Community Development Specialist; CP=Community Planner; DM=Disaster Management Specialist; FA=Financial Analyst; GE=Geologist; HS=Housing Specialist; IN=Institutional; ME=Municipal Engineer; PC=Procurement; PO=Project Coordinator; RC=Reconstruction; RS=Rehabilitation Specialist; SE=Seismic Engineer; SB=Small Business Specialist; SO=Sociologist; UP=Urban Planner

Ratings: S=Satisfactory; H=Highly Satisfactory; 1=Minor Problem; 2=Moderate Problem

Problems: P=Project Management