ANNEX 4 – HAZARD RISK MANAGEMENT

A. Introduction

1. Pakistan is subject to a number of natural hazards, of which flooding, earthquakes, cyclones and drought/heat waves are the most significant. Floods, droughts and landslides in Pakistan tend to be frequent, seasonal, and localized. The snowmelt from the high mountains coinciding with the monsoon season leads to very large discharges of the Indus River and its tributaries, resulting in annual floods. In February and March 2005, large areas of Pakistan were battered by rain, snowfall and flooding. The worst affected areas were NWFP, the Northern Areas, and Balochistan. Water supply and sanitation systems, electricity, communication and road links were severely affected. In Balochistan, nearly half a million people were affected, with more than 4,000 families left homeless. In NWFP more than 80,000 houses were destroyed and over 108,000 were damaged. A number of dams collapsed due to excessive flooding, causing severe destruction to crops and livestock.

2. The earthquake hazard in Pakistan is high and derives from Pakistan's position on the eastern margin of the collision of the Indian plate with the Eurasian plate. The result is the potential for major earthquakes in the north, where the Indian plate thrusts under the Himalayas, and along the western edge of the country, where transform motion of the Indian plate relative to the Iranian and Afghan micro-plates is expressed with the Chaman fault. The 1935 Quetta earthquake (60,000 killed) occurred on the Chaman fault. The Arabian plate subducts beneath the Iranian plate along Makran coast, where the 1945 magnitude 7.9 earthquake resulted in a tsunami with 12 meter waves. Karachi, east of the Makran coast, has significant seismic risk due to several nearby faults, including the Allah Bund fault (1819 earthquake), and the Pubb fault.

Institutional Structure and Legal Framework for Hazard Risk Management

3. Although it is prone to a variety of natural hazards, Pakistan has an ad hoc approach to dealing with hazard risk management. Interventions are primarily focused on relief and response as opposed to ex ante mitigation measures.

4. At the national level, there are systems in place for providing relief following a disaster through the Emergency Relief Cell (ERC) that lies within the Cabinet Division. The ERC is tasked with coordinating federal response to disasters; to provide resources to provincial and district governments in the event of a disaster; administer federal relief funds, and maintain stockpiles of relief goods for distribution following a disaster. Each Province and District has individual relief units responsible for liaising with affected communities and the central ERC to coordinate emergency response and relief distribution.

5. The Federal Flood Commission (FFC) and the Pakistan Meteorology Department also assemble and disseminate data on weather-based, geophysical and seismic hazards at the national level. Pakistan's military forces are an important player in organizing logistics for response to larger-scale disasters; following the devastating 2005 earthquake, the military was a main focal point for relief and emergency response. Other Government agencies and line ministries, such as the Dams Safety Council, and the Space and Upper Atmosphere Research Commission (SUPARCO), the Geological Survey of Pakistan, the Department of Environment, and the Civil Defense Department, are involved to varying degrees in post-disaster planning and recovery efforts, with limited mitigation interventions.

6. In terms of a legal mechanism for disaster management, the National Calamities (Prevention and Relief) Act of 1958 gives a framework for government response to, and to some extent, preparation for disasters nationwide. The recent Local Government Ordinance (2001) includes provisions for local

governments at the District, Tehsil, and Union level to develop and enact disaster management and risk mitigation measures, but the Provincial Government still has authority and influence over ordinance applications, and few strategic hazard risk management activities have been implemented to date.

B. Reconstruction and Recovery Strategy

7. In light of the devastation caused by the 2005 earthquake, it is important to take into account some of the factors that may have exacerbated the damage in affected areas. These critical issues should be reflected in the design and implementation of the recovery strategy, as existing vulnerabilities should be mitigated as much as possible rather than repeated. The following areas comprise five pillars that elaborate a comprehensive hazard risk management approach: (i) risk identification; (ii) emergency preparedness; (iii) risk reduction; (iv) capacity building; and (v) risk transfer mechanisms. Improvement across these areas can significantly contribute to protecting communities from future disaster impacts.

Pillar I: Risk Identification

8. ***Seismic hazard analysis.*** An event similar to the magnitude of the 2005 earthquake in this region was inevitable and had been generally foretold by scientists as well as by the Pakistan Geological Survey. More significantly, seismotectonic considerations indicate that similar or larger events in the same or neighboring regions are possible. Although the Pakistan Meteorological Department maintains six seismological observatories (Quetta, Peshawar, Islamabad, Lahore, Karachi and Khuzdar), the network is in need of modernization. Efforts to undertake a new seismic risk analysis of Pakistan should also be intensified.

9. ***Multihazard risk assessment.*** Risks from individual natural hazards, particularly floods and droughts, are known; limited progress has also been made to map seismic and landslide hazards. For example, following the earthquake and its aftershocks, the ground movement triggered a series of landslides in steep mountain areas and valleys of AJK and NWFP. These landslides ranged from small rockfalls to large slides that blocked roads, further isolated communities, and caused additional damage. A nationwide, multihazard risk mapping from existing data and further localized assessments should be undertaken to inform reconstruction decisions as well as underpin future development plans and risk transfer mechanisms, such as insurance.

Pillar II: Emergency Preparedness and Response

10. ***National level.*** The Government responded quickly to the disaster and rushed to provide relief and restore basic services to affected communities. Even with its rapid response, the terrain and sheer scale of the disaster required unprecedented logistics and resources to sustain the emergency relief operations. A more clear-cut strategy for emergency preparedness and response at the national level, which builds upon existing entities and mechanisms already in place, should be devised and implemented following the relief phase.

11. ***Local level.*** Following the disaster, communities themselves were the first responders and helped rescue people, address immediate shelter and relief needs, and locate displaced family members. For quick response operations immediately after a disaster, communities should be encouraged to be prepared for emergencies by mutual cooperation before the arrival of external assistance. Local government and NGOs working in affected areas, such as the Pakistan Red Crescent, could help inform and organize community preparedness activities. Emergency drills should also be carried out periodically for better preparedness and public awareness.

Pillar III: Investment in Risk Reduction

12. ***Reducing risks in post-earthquake reconstruction.*** Post-earthquake reconstruction is a major investment in rebuilding the country. Another earthquake in this region is likely, and floods and landslides are also common occurrences in the affected areas. Therefore the Government should take this opportunity to protect the reconstruction of public and private buildings and infrastructure from various types of hazards. Reconstruction of buildings and infrastructure systems should be conducted in such a manner that they will not be again destroyed when (not if) future earthquakes occur. Building construction in damaged areas needs to occur in conformance with modern seismic codes and good construction practices, so as to not to rebuild the pre-existing vulnerabilities exacerbated by the recent earthquake. Particular attention needs to be paid to the quality of construction, via education of builders, artisans and homeowners, and assured compliance with the current building code. Lessons learned from the current earthquake damage should be fed into reconstruction planning and future risks reduced through improved building standards and design considerations.

13. ***Protection of public infrastructure.*** A significant amount of public infrastructure was severely damaged by the earthquake. Safety of public buildings such as schools and hospitals is particularly important as they house large numbers of the people, and their survival is critical in emergencies. Medical and educational facilities built in high risk areas should incorporate improved building standards to reduce their risks to hazard impacts. Educational and other public buildings rebuilt should be built safer and should incorporate design specifications in buildings used to double as evacuation centers. It is recommended that the Government create an entity with the requisite technical capacity and mandate to review and approve the designs for public buildings in order to ensure that seismic–resistant standards are applied.

14. ***Land use.*** Site conditions appear to have played a role in the level of damage sustained in earthquake-affected areas, such as in Muzaffarabad and Balakot. Specific effects need to be analyzed and incorporated into land use planning guidelines for the region. Land use policy is a vital tool in disaster reduction. Land use decisions both in reconstruction of the affected areas, but also in urban development plans, need to integrate identification of high-risk areas into planning decisions. Site investigations for critical facilities should be undertaken as a routine part of construction preparation.

15. ***Legislations and standards for future safety.*** The large number of deaths attributed to the recent earthquake was the result of the collapse of approximately 200,000 buildings, which left millions of people homeless in difficult to access terrain at the onset of a harsh winter. These buildings collapsed en masse due to their very poor quality and lack of any seismic consideration in their design. As previously mentioned in paragraph 13, the primary lesson to be learned is that new buildings need to be seismically designed and built of a reasonable quality.

16. Building regulation in Pakistan, at least in larger cities, is the responsibility of the municipal government. Building seismic design is stipulated to be per the US Uniform Building Code (1997 edition, or UBC-97). In practice, based on discussions with a number of design professionals, building design for major investments is performed in accordance with UBC-97 using state-of-the-art techniques by qualified professional engineers. These engineers monitor construction in order to assure quality. For small investments, building code compliance would appear to be optional. Building supervision outside of major urban areas was reported to be severely lacking. More attention should be paid to the monitoring and enforcement of current building codes in the design and construction of new structures in seismically active areas throughout the country.

17. ***Retrofitting.*** During the reconstruction phase, repair of damaged buildings should include seismic strengthening. A financing and technical package should be developed to serve this purpose. Outside the affected areas, buildings in Pakistan are generally very vulnerable to earthquakes, and similar or larger disasters could occur in the future. Therefore, the feasibility of developing and implementing a national seismic retrofitting program should be examined, beginning on a priority basis with public

buildings, such as schools and hospitals. However, it is not feasible that all buildings be immediately rebuilt; moreover, attrition of older buildings over the next several decades will remove many of the most vulnerable structures. A national earthquake risk reduction program for Pakistan is recommended to undertake seismic retrofitting of selected public facilities (schools, hospitals, etc), upgrading of construction quality, research and development of seismic engineering capacity, and risk-based investment planning.

Pillar IV: Capacity Building

18. Current capacities in disaster management are largely focused on emergency response, relief, and post-disaster recovery. A comprehensive risk reduction strategy and an institutional framework to address long term disaster risk reduction issues should be systemized.

19. ***Institutional capacity building and coordination***. The recent disaster once again revealed the importance of coordination among government agencies from the Federal to village level. The lessons and experiences of relief and recovery coordination should be distilled in developing an appropriate disaster management mechanism and authority that reflects the hazard risks faced by Pakistan. A National Disaster Management Plan would clarify roles, responsibilities and streamline coordination across administrative levels and various stakeholders. Significant coordination among GoP line ministries and agencies should be encouraged in order to improve coordination of response and sharing of data and information for sound actions. A review of different systems from other countries and stakeholder consultations could assist in determining the most effective model for Pakistan.

20. ***Education and training.*** Training and exercising of disaster management plans help to maintain a well functioning system to respond. Systematic training for emergency management should be undertaken in Pakistan. A facility to train relevant officers and authorities in disaster management at all levels should be established. National and local authorities should be routinely trained both on emergency preparedness and principles of risk reduction. At the local level, primary and secondary school textbooks should also raise awareness of risks as part of the education curriculum.

21. With regard to construction and design professionals (i.e., architects and engineers), several levels of licensing exist, but there is no mechanism to update their knowledge in safety standards. A good deal of housing construction happens outside this professional system by small contractors, and in rural areas, by local builders who do not benefit from any such training. Professional education and short training courses could improve compliance with risk reduction measures. Basic training of contractors and builders on safety measures for construction should also be considered as part of the post-earthquake reconstruction plan, as well as transferred to other high risk parts of the country.

22. ***Public awareness-raising***. Immediately after a disaster, public awareness of disaster risks tends to increase. But in general, this does not translate into sound actions to be taken to reduce their impact. This is evident in Pakistan in the continued encroachment of settlements onto flood plains and landslide-prone areas, despite repeated loss of property and lives. This attitude is partly a consequence of economic pressures, population increases, and urbanization. Particularly for less frequent events like earthquakes, it is also due to limited understanding of risks involved and simple ways of reducing their impact. A major public awareness campaign on reducing vulnerability to various hazards should start while the memory of the earthquake is fresh.

Pillar V: Mechanisms for Risk Transfer and Financing

23. In Pakistan insurance penetration is limited, and individual housing and livelihood insurance against natural disaster losses is not widely practiced. Not only what exists today, but private, Government, and development partner inputs into post-earthquake recovery could be at risk from future

disasters. Risk transfer through insurance allows for the burden of reconstruction to be shared among public and private actors and protects valuable resources.

24. A micro-insurance package to the poor that addresses their main post-disaster risks can indemnify against the loss of life, property, livelihood, and help pay for the cost of living for a few months. At the macro level, national governments should consider investing in ex ante risk reduction measures, such as insurance pools and reserve funds that can be mobilized rapidly. Capital injection by donors and creation of a regional insurance facility could also be considered. The feasibility of these options should be further investigated to fit the context of Pakistan.

25. ***Mitigating the social and economic impacts of future disasters.*** While the recent earthquake was a tragic event and the immediate focus should be on response and recovery, it should be borne in mind that Pakistan will suffer from future earthquakes. In fact, Pakistan has very substantial seismic hazard, so that parts of the response and recovery program should be developed bearing in mind future earthquakes and how the current response and recovery experience can be usefully employed in other parts of Pakistan.

26. In many parts of the world, major earthquakes tend to occur in cycles in which stress builds up in tectonic plates over decades to centuries, which results in increasing seismicity culminating in a large earthquake. Available evidence indicates the Himalayas follow this pattern. The October 8, 2005 earthquake occurred in a region "where a great plate-boundary earthquake has long been considered overdue"[20], resulting in only about 25 percent of the energy of the potential great plate-boundary earthquake being released. Release of the remainder of the energy would require a magnitude 7.9 event. The potential exists for the same area affected by the October 8 event, to be affected by a larger earthquake. Beyond the Kashmir seismicity, Quetta and Karachi also have serious seismic risk.

27. Consequently, building and reconstruction in the area damaged by the recent earthquake should occur in conformance with modern seismic codes and good construction practices. Beyond the affected region, older buildings will be removed by attrition over the next several decades, but seismic retrofitting of selected facilities (schools, hospitals, etc), upgrading of construction quality, research and development of earthquake engineering capacity, risk based planning of investments and other actions is required which, combined, form an integrated national earthquake risk reduction program. This earthquake risk reduction program would be a key component of a broader multihazard risk reduction strategy, as previously discussed.

[20] Bilham R and K Wallace, (2005), Future Mw>8 earthquakes in the Himalaya: implications from the 26 Dec 2004 Mw=9.0 earthquake on India's eastern plate margin, Geol. Surv. India Spl. Pub. 85, 1-14.

C. Recommendations

28. This section provides cross-cutting recommendations for reducing Pakistan's overall vulnerability to natural hazards.

- Integrate training and capacity building in seismic safety measures for technical staff, builders and homeowners into reconstruction programs and introduce public awareness raising and community preparedness at schools and communities.
- Review and strengthen the national disaster management system to identify gaps and areas that need improvement, based on lessons learned from the recent earthquake experience.
- Strengthen capacity for seismic engineering and improve systems and incentives for achieving compliance with the current building code.
- Undertake an integrated, multi-hazard vulnerability and risk mapping exercise to provide rational measures for the reconstruction process and for informed land use planning.