

## ANNEX 11 – WATER SUPPLY, SANITATION AND SOLID WASTE MANAGEMENT

### A. Introduction

1. The South Asia earthquake disaster significantly affected the water and sanitation sector in five districts of North West Frontier Province (NWFP) and four districts in Azad Jammu and Kashmir (AJK). Rural drinking water supply in these provinces is usually sourced from rivers and streams and, to a lesser extent through dug wells and tube-wells. Approximately 75% of rural water systems before the earthquake were gravity schemes, with the balance being met from well sources. Water supply networks and treatment plants in major towns were in poor condition, which has been further exacerbated by the disaster. In some cases existing infrastructure has been completely destroyed.<sup>1</sup>

2. Water shortages have been reported as a result of infrastructure failure. A survey of hospitals has also indicated a rise in typhoid, hepatitis, cholera and other gastrointestinal water related disease, resulting from unavailability of water and the use of untreated surface water. Quick repair works on the damaged distribution system, provision of temporary filtration facilities and water delivery through tankers has been initiated by the Government and donors to meet daily water requirements. However, the delivery of water has been hindered due to limited access to affected areas. In the short term, priority should be given to rehabilitation of the damaged water distribution network, which can be accompanied by sanitation improvement and hygiene education programs. The need to expedite adequate solid waste management practices and structuring the sector for efficient operation are also critical at this stage.

3. The needs assessment team, consisting of ADB, the World Bank, JBIC and UNICEF, held consultations with representatives of the Tehsil municipal administrations, local and provincial Governments in NWFP, and representatives of the Local Government and Rural Development Department and Public Works Department in AJK. The information provided by these agencies, NGOs working in concerned areas<sup>2</sup> and affected communities, existing baseline reports, and observations recorded during reconnaissance missions and surveys have served as a base in formulating the initial damage and needs assessment report. Field visits were undertaken in Muzaffarabad, Bagh, Poonch, Abbottabad, Mansehra and Batagram. A precise assessment of the damage is not possible at this stage due to the wide spatial spread of damage, time restrictions and data logistics.

### B. Damage Overview and Recovery Needs

4. ***Water Supply and Sanitation.*** The assessment is based on field data provided by the District and Tehsil departments dealing with water supply and sanitation, the District Coordination Officers, local NGOs involved with implementation of water supply and sanitation projects in the sector, and field staff of projects stationed in the affected areas, and through unstructured interviews of people coming from the affected areas. The baseline information on the large water and sanitation schemes is relatively accurate in both NWFP and AJK, however information on small community-managed schemes executed by the local government departments (TMAs) is not well documented in NWFP and has been estimated by extrapolating the data on community Water and Sanitation schemes undertaken through World Bank, ADB, DFID, and IFAD-financed projects. In AJK the data on the small rural water and sanitation schemes were compiled recently under World Bank-financed CISP, and is well reported.

---

<sup>1</sup> The Pakistan Integrated Household Survey (PHIS, 2002), indicates approximate 80% urban water coverage and 65% rural water coverage in AJK prior to the October, 8 earthquake. In NWFP, PHIS information indicates approximate 97% urban water coverage and 71% rural water coverage. Overall population in affected areas with latrines within the household has been computed to be 4 and 3%, respectively.

<sup>2</sup> These include Sungi and SRSP in NWFP.

5. **NWFP.** The overall estimated water supply coverage<sup>3</sup> is 50 % of the total population of 500,000 households in five Districts of NWFP damaged by the earthquake, covering about 250,000 households (including 180,000 households with house to house connections). As a result of the earthquake an estimated 77,500 households have only partial or no water supply. This does not include the 250,000 households that did not have a water source within a reasonable limit of their house (500 meters) before the earthquake. Overall damage to the 763 large schemes (average 300 households per scheme) operated by the Water and Sanitation Department, includes 220 that are partially damaged (minor to major repair). Out of the 3323 small community or TMA operated schemes (hand pumps and small gravity schemes – average 20 households per scheme) 1234 are partially damaged while 2,089 are operational. The overall estimated cost of these damages to both Public Health Engineering Department (PHED) and community schemes is Rs. 482 million.

6. Most damage is concentrated in rural areas. The small urban pockets that have been affected include Balakot, Batagram, Besham and outer fringes of Mansehra and Abbottabad city.

7. In NWFP, about 85% of the water supply schemes are gravity based, and the remaining 15% consist of tube-wells, dug-wells and hand-pumps. Major damage has been reported at the intake of gravity schemes. Other significant damage is to water supply due to landslides and to distribution system due to structural collapses. The damage to water reservoirs, hand pumps and tube-well schemes (ground water sources) has been minimal.

8. As many as 25,000 households may have lost their sanitation facilities in NWFP. Based on 2005 projections, Government and on-site reports, damage to drainage systems has been correlated to household damage and computed in urban areas for Balakot and Batagram (90% damage) and Besham (40% damage), and rural areas. The total replacement cost for sanitation systems is estimated to be Rs 88 million.

9. **AJK.** In AJK, three large urban water-supply schemes operated by PHED are providing water to the district headquarters of the three affected districts. Out of the total estimated 23,000 households living in these urban centers 16,500 households (about 80%) are provided with direct connections. After the earthquake the supply of water from the treatment plants in these cities has been reduced to about 62% of system capacity. All three large urban water-supply schemes<sup>4</sup> are partially damaged. The estimated cost of urban water damage, including the six other small urban centers in the affected area is Rs. 83 million.

10. Overall estimated rural water supply coverage is 65% of the population in the three Districts of AJK damaged by the earthquake, covering about 152,000 households. An estimated 11,400 households are now without access to water and another 64,600 households are getting only partial water service. It is estimated that 234 rural systems are completely destroyed, 1,334 are partly damaged (minor to major repair), and 462 are operational, out of the 3,147 medium to small schemes operated by the communities (hand-pumps and gravity) or Government (usually 1,000 households and above). The overall estimated cost is Rs. 509 million.

11. Most of the water supply schemes in AJK rural areas are gravity based, and in the urban areas source are either perennial streams or rivers, using pumping systems. In the rural areas the damage is

---

<sup>3</sup> Averages computed from PHIS district data for PHED schemes and community coverage (based on NGO and donor reports).

<sup>4</sup> The cost of damage to six other minor towns is worked out on the same assumption as used for rural damage, which is based on approximate damage estimates provided by the PHED department, further adjusted based on mission field visit observations.

mainly to the source, intake structures and water mains, and to a much lesser extent to the tertiary networks. In the urban areas the damage has been mostly to the intake facilities (treatment plants) and tertiary networks due to building and structure collapse in both cases.

12. In AJK, sanitation coverage in the form of street drains is approximately 65% in urban settlements (specific Statistics coverage, 2005, for Muzaffarabad, Poonch and Bagh has been utilized in the computations), and the damage has been correlated to damage in the housing sector (to be confirmed after rubble clearing). In rural areas, the Government has reported 30% damage to drainage systems. The combined urban and rural cost estimate for damage to drainage is Rs. 86 million.

13. **Solid Waste Management.** Provincial statistics (2004) indicate the existence of very limited garbage collection services in affected areas, largely restricted to municipal centers (approximately 45% of households), where the balance is disposed of randomly. Where such services were in place, such as in the towns of Muzaffarabad and Mansehra, dumpsites and collection trucks have no reported damage.

**Table 1: Summary of Damage to Water & Sanitation Sector (Rs. million)**

| Territory    | District        | Urban     |            | Rural      |            | Total Damage Cost |
|--------------|-----------------|-----------|------------|------------|------------|-------------------|
|              |                 | Water     | Sanitation | Water      | Sanitation |                   |
| AJK          | Muzaffarabad    | 33        | 13         | 172        | 31         | 249               |
|              | Bagh            | 27        | 4          | 97         | 15         | 143               |
|              | Poonch          | 23        | 7          | 157        | 16         | 203               |
|              | <b>Subtotal</b> | <b>83</b> | <b>24</b>  | <b>426</b> | <b>62</b>  | <b>595</b>        |
| NWFP         | Abbottabad      | -         | -          | 35         | 15         | 50                |
|              | Batagram        | -         | -          | 130        | 29         | 159               |
|              | Kohistan        | -         | -          | 38         | 19         | 57                |
|              | Mansehra        | -         | -          | 213        | 12         | 225               |
|              | Shangala        | -         | -          | 76         | 13         | 89                |
|              | <b>Subtotal</b> | <b>-</b>  | <b>-</b>   | <b>482</b> | <b>88</b>  | <b>570</b>        |
| <b>TOTAL</b> |                 | <b>83</b> | <b>24</b>  | <b>908</b> | <b>150</b> | <b>1165</b>       |

**Note:** Damage costs have been calculated as the repair cost of partially damaged water supply and sewerage systems and replacement cost for totally damaged assets. Data sources include Government estimates and community schemes constructed under various programs and mission estimates. The damage cost of public buildings has not been included (please refer to paras.15 and 17). Sanitation damage is based on reported housing damage.

14. **Institutional issues.** The NWFP water and sanitation administrative and institutional infrastructure has generally suffered only minor damages. The only Tehsil Municipal Administration office with substantial damage is Balakot, which included loss of records and staff. The cost of damage to administrative set-ups related to water supply in NWFP is approximately Rs. 35 million.

15. The AJK PWD administrative infrastructure has suffered major damage, including losses to life, property and records. Most of the buildings housing the Local Government and PHED staff in urban areas of Muzaffarabad, Bagh and Rawalakot have either collapsed or are damaged beyond repair. The estimated cost is Rs. 320 million.

## C. Reconstruction and Recovery Strategy

### *Approach*

16. The reconstruction and recovery strategy for the water supply, sanitation and solid waste management sectors will be guided by the following principles:

- Rebuilding and rehabilitation should be premised on locally adapted and accepted practices.
- Actively promote safe water, sanitation and solid waste management programs.
- Introduction of appropriate technical upgrades, including improved design and construction materials (e.g., use of HPD piping material).
- Local Government-led and Community-implemented tertiary infrastructure rehabilitation in accordance with the principle of subsidiarity, existing mandates, and recorded ownership of damaged schemes.
- Damage verification. A detailed damage assessment should be carried out prior to initiating the rehabilitation and reconstruction process.

### *Critical Issues*

17. ***Water and sanitation policy*** for rehabilitation and reconstruction should be developed by the Provincial authorities in consultation with TMAs, district governments, civil society and communities. The water and sanitation policy for rehabilitation and reconstruction, in coordination with the housing sector strategy, should consider delivery of services based on reviewed urban boundaries.

18. ***Capacity assistance***. In both AJK and NWFP the number of schemes to be rehabilitated and/or reconstructed in the short and medium term represents a significant increase in implementation. Whilst rehabilitation may require fewer resources than construction of new schemes, the following are expected to be required for timely rehabilitation: (i) planning and technical support to communities for reconstruction and enhancement of damaged community schemes; (ii) technical support to local government agencies for project planning, design, implementation, contracting, supervision and monitoring; and (iii) strategic packaging of rehabilitation works based on sound geographical grouping and outsourcing. Different options to be considered include deputation from professional institutions and/or departments in other Provinces in the country, recruitment of incremental staff and active engagement of NGOs.

19. ***Inter-sectoral coordination*** is essential to adequately address the needs of the affected population and minimize implementation delays in the reconstruction process. Consistency with the housing sector strategy and overall approach is of particular relevance and shall consider the following principles:

- Water and sanitation services will complement predominantly in-situ rebuilding and rehabilitation of housing.
- In areas where population is highly dispersed or damage is extensive and cannot accommodate pre-earthquake populations, design of replacement water and sanitation schemes will be considered with land readjustment schemes.

20. **Financial sustainability.** In addition to geographical location, the quality of engineering design and the quality of construction, quality of facility operation and maintenance can reduce vulnerability and positively contribute to disaster mitigation and preparedness. Improved scheme sustainability should be considered in the medium to long term, as well as in the selection of repair and improvement measures.

**Short Term Priority (up to 18 months)**

21. **Infrastructure needs.** Water and solid waste services to relief camps over the short term have not been costed in this assessment. Immediate and short term efforts<sup>5</sup> in this sector should focus on: (i) rehabilitation of partially damaged Government and community spring/gravity water schemes, dug-wells and hand-pump infrastructure; (ii) rehabilitation of partially damaged surface water (river) schemes and associated treatment plants, such in the case of Muzaffarabad town;<sup>6</sup> (iii) rehabilitation of partially damaged water distribution networks; (iv) rehabilitation of communal latrines; (v) initiating a solid waste management program for clearing and recovery of debris;<sup>7</sup> (vi) provision of basic buildings for AJK Government staff supporting water and sanitation related agencies; and (vii) development of water quality and source monitoring, and leakage detection programs.

22. **Institutional and governance requirements.**<sup>8</sup> Short term needs in this sector must consider: (i) formulation of a water and sanitation rehabilitation policy and strategy for NWFP and for AJK; (ii) recruitment/deputation of incremental staff to local government for planning, implementation, contracting, supervision and monitoring; (iii) provision of community awareness and technical training to undertake repairs and rehabilitation; (iv) facilitating community consultation and participation programs for reconstruction of large schemes, and water and sanitation options for selected localized land readjustment schemes and small-scale relocation schemes;<sup>9</sup> (v) local government capacity development; and (vi) formulation and delivery of sanitation and hygiene training and education programs, adapted to local conditions and practices.

23. **Cost estimates for immediate and short term assistance (up to 18 months).** Safe drinking water is a basic necessity, and restoration of pre-earthquake coverage must be prioritized. As such, the reconstruction and recovery strategy for this sector considers that the rehabilitation of all partially damaged schemes should be completed within 18 months. The total estimated cost for the short term assistance is Rs. 1,147 million for replacement of assets and implementation.

---

<sup>5</sup> Prioritization of works should consider overall effectiveness with regards to population coverage.

<sup>6</sup> Restoration of water treatment systems, and in particular filtration and chlorination facilities, should be expedited as highlighted in water quality reports (Pakistan Council of Research in Water Resource, October 2005), which indicate microbiological contamination of water sources, particularly in AJK.

<sup>7</sup> Recovery and reuse of material should be promoted. Based on the nature of the materials utilized, this is foreseen to be particularly viable in rural areas. In urban areas, centrally managed (TMA, NWFP or municipal corporation, AJK) sites should be designated and adequate machinery provided for crushing, cutting and safe final disposal in designated controlled dump-site. Transportation of debris to selected site locations outside highly populated areas will have to be considered. The cost of this component is presented under the “environment” sector assessment of this report.

<sup>8</sup> Rehabilitation and reconstruction programs should consider (i) maximizing the opportunity for local income generation, (ii) maximizing opportunities for community-based approaches, (iii) maximizing the opportunities for better household sanitation and waste management practices, (vi) using the community’s potential for operation and maintenance.

<sup>9</sup> These activities will be combined with those undertaken by the housing sector and therefore have not be costed.

**Table 2: Short Term Needs for Water Supply and Sanitation Sector (AJK+NWFP)**

| <b>Component</b> | <b>Cost Estimation Base</b>                                   | <b>Replacement Cost*<br/>(Rs. million)</b> | <b>Partial Upgrade Cost<br/>(Rs. million)</b> |
|------------------|---|--|---|
| Water Supply     | Rehabilitation of full rural schemes and urban source intakes | 338+590 = 928                              | 478+889 = 1367**                              |
| Sanitation       | Re-construction of public latrines                            | 35   | 125+35=160***                                 |
| Institutional    | Staff recruitment, community support and hygiene education    | 85   | 85  |
|                  | Basic buildings   | 100  | 100   |
| <b>Total</b>     |   | <b>1147</b>                                | <b>1712</b>                                   |

\* Since most systems are reported to be partially damaged, retrofitting of the undamaged portion has been costed through applying a flat 20% cost increase multiplier.

\*\*Calculations assume partial upgrading through a 3% annual population increase for 2 years in rural water to accommodate rise in population.

\*\*\* The cost includes provision of public toilets for partial and fully affected households in urban areas, urgently required in the short term leading to the reconstruction process.

### **Medium Term Priorities (18 months-3 years)**

24. **Infrastructure needs.** This phase should focus on providing water and sanitation to towns where major reconstruction activities are required, namely Muzaffarabad and Bagh, in AJK, and Balakot, Battagram and, to a lesser extent, Besham, in NWFP. Medium term priorities will focus on (i) providing water distribution networks for reconstructed settlements; (ii) providing water systems for selected new settlements resulting from land readjustment and small-scale relocation schemes;<sup>10</sup> (iii) drainage and/or sewerage for reconstructed settlements; (v) formalization of solid waste management schemes in large towns; (vi) reconstruction of full AJK Government PWS and LGRDD offices; and (vii) upgrading sector facilities for disaster preparedness.<sup>11</sup> Although the computations presented do not incorporate infrastructure elements that were not present prior to the earthquake disaster, it is recommended that, as part of the reconstruction planning and development strategy of fully destroyed settlements, development needs, and in particular the construction of upgraded water and wastewater treatment systems in densely populated urban areas, be considered.

25. Institutional and governance requirements for the medium term should consider (i) improved planning and preparedness for disaster management in the water and sanitation sector; (ii) institutionalization and streamlining of successful and effective planning, implementation, supervision and monitoring practices; and (iii) independent evaluation of sector reconstruction process and financial, technical and social auditing. The total estimated cost for the medium term assistance is about Rs. 753 million (exclusively for replacement of assets and implementation).

<sup>10</sup> In the absence of specific relocation schemes data on magnitude and scope, the cost of providing water and sanitation services cannot be costed.

<sup>11</sup> This should include measures such as the provision of emergency generators for water pumping in the event of power failure and retrofitting towards improved disaster resistance.

**Table 3: Medium Term Needs for Needs for Water Supply and Sanitation Sector (AJK+NWFP)**

| <b>Component</b>       | <b>Cost Estimation Base</b>   | <b>Replacement Cost<br/>(Rs. million) *</b> | <b>Partial Upgrade Cost<br/>(Rs. million)</b> |
|------------------------|---|---|---|
| Water Supply           | Water distribution networks for reconstructed settlements                                       | 103+ 23= 126                                | 134+33 = 157**                                |
| Sanitation             | Reconstruction of drainage systems in urban areas   | 136+151 = 287                               | 170+189=358***                                |
| Solid Waste Management | Formalization of solid waste disposal centers in selected participating urban centers (Phase I) |   | 53  |
| Institutional          | Staff recruitment   | 85  | 85  |
|                        | Basic buildings   | 255   | 255   |
| <b>Total</b>           |   | <b>753</b>                                  | <b>908</b>                                    |

\* Since most systems are largely reported to be partially damaged, retrofitting of the undamaged portion has been costed through applying a flat 20% cost increase multiplier.

\*\*Calculations assume 100% water distribution networks coverage for urban centers in need of reconstruction (including Muzaffarabad, Balakot, and Bagh).

\*\*\*Calculations assume 100% drainage coverage for urban centers in need of reconstruction (including Muzaffarabad, Balakot, Bagh and Batagram).

#### **D. Environmental and Social Aspects**

26. **Debris disposal.** Geographical conditions and the absence of adequate waste management practices pose a severe environmental problem. Safe and controlled disposal practices and designation of waste disposal zones should be immediately identified and communicated to the communities, particularly in densely populated areas.

27. **Lack of hygiene practices.** In view of the loss of a large number of household latrines, appropriate communal sanitation facilities must be provided in the short term. In addition, hygiene education programs should be formulated to ensure use of toilets, washing hands and cleaning of the living environment.

28. **Gender and social issues.** Provision of short and medium term accommodation arrangements should take into consideration gender differences. Separate arrangements and facilities should be provided for men and women. Moreover, social issues to be considered while formulating a reconstruction strategy (including water and sanitation infrastructure) comprise fair asset distribution, resettlement and livelihood options, and preserving community fabric for successful implementation and operation of new and rehabilitated schemes.

29. **Community participation** in the reconstruction process, especially for small schemes, networks of smaller settlements within towns should be promoted. In addition, findings derived from the implementation of projects related to natural disasters have highlighted the need for integrating recovery and long-term development planning as well as population targeting that should be identified on a needs basis.