

## SECTOR ASSESSMENT (SUMMARY): WATERSHED MANAGEMENT<sup>1</sup>

### A. Sector Road Map

#### 1. Sector Performance, Problems, and Opportunities

1. Watershed management brings a holistic approach to managing watershed resources. It integrates the management of water, forestry, agriculture, and pasture. The approach aims to minimize damage to natural resources and to coordinate social institutions in the use of land and water resources for the benefit of the national economy. Its objective is to ensure proper land use and to promote interaction of the multiple stakeholders throughout a watershed. The interest and involvement of those living in an area are necessary for successful natural resource management. To gain the interest of communities, watershed management is often linked with community development, poverty reduction, and action to increase local incomes.

2. Studies indicate that watershed management in Nepal has produced benefits in the areas of conservation farming, community forestry, agro-forestry, and conservation engineering (upstream measures).<sup>2</sup> The government's Bagmati Integrated Watershed Management Project reported a 40% increase in the annual yield of maize from terrace improvement, a 25% increase in the use of previously unproductive land, a 40% rise in female membership in groups, an 80% drop in offseason migration, and an increase in user group participation by disadvantaged groups.<sup>3</sup> These results may not be transferrable to the far west region of the country where the project will be implemented.

3. Climate change study findings in Nepal have identified patterns that may result in critical shortages of water used for drinking, irrigation, and other uses.<sup>4</sup> Global models forecast that by 2060 stream flows may become less reliable and monsoon rainfall more intense and potentially more erratic. Increased impacts from flooding are also expected. The projected weather changes include more cloudy days and shifts in the form of precipitation from snow to hailstones. To respond to climate change, Nepal's National Adaptation Program of Action recommends urgent action on effective, multipurpose use of water resources, conservation of watershed areas, and upgrading and expansion of hydrometeorological stations. The program's plan for management of watersheds and aquatic ecosystems and priorities for forests and biodiversity include activities to (i) map climatically sensitive watersheds; (ii) implement programs for climate change-related adaptation, water conservation, education, and awareness; (iii) implement climatically sensitive watershed management programs; (iv) promote community participation in watershed management to enhance climate change adaptation; (v) protect water sources from landslides, erosion, and other disturbances; and (vi) develop watershed management policy. The action program also calls for institutional capacity building in government agencies and better coordination between them in watershed management, as well as establishment of an institutional framework for coordinated and integrated development at the basin level.

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<sup>1</sup> This summary is based on the project preparatory technical assistance consultant's final report (TA7883). Available on request.

<sup>2</sup> M.P. Wagley and R. Bogati. 2000. *State of Art and Status of Watershed Management in Nepal*. In: K.S. Bendtan and K. Stapit (Eds.), Danida Watershed Development. Proceeding of Danida Third International Workshop on Watershed Development. Kathmandu Nepal: Sewa Printing Press (available on request)

<sup>3</sup> K.R. Tiwari, R.M. Bajracharya, and B.K. Sitaula. 2008. *Natural Resource and Watershed Management in South Asia: A Comparative Evaluation with Special References to Nepal*.  
<http://www.nepjol.info/index.php/AEJ/article/viewFile/2120/1953>

<sup>4</sup> Government of Nepal. 2010. *National Adaptation Program of Action to Climate Change*.  
<http://www.climatenepal.org.np/main/>

4. A study of the vulnerability of communities in watersheds in the middle hill and mountain regions showed that the most vulnerable were in the far west of Nepal with a significant concentration of vulnerable watersheds in the Karnali River Basin.<sup>5</sup> The selected project area is in this basin's West Seti subbasin, where about 75% of annual rainfall occurs during the monsoon season and annual rainfall currently varies from 743 millimeters to 3,351 millimeters. The downscaled projections in Nepal under global climate model for 2030–2061 were analyzed for the subbasin during project design.<sup>6</sup> A temperature rise of about 0.2 degrees per decade is projected to affect the hydrological cycle, which in turn will have an impact on water availability, runoff, and the discharge of rivers. In general, climate change projections show a slight overall increase in precipitation in the West Seti subbasin. Precipitation is expected to increase in pre-monsoon months and decrease during the monsoon, whereas a mixed trend (both increasing and decreasing) in the winter and post-monsoon seasons is projected in the parts of watershed to be covered by the project. Both increasing and decreasing tendencies in annual water yield and actual evapotranspiration are projected. In general, climate change projections show that annual flow volume will slightly decrease. However, it is difficult to make firm predictions on precipitation and flow trends. Uncertainty is the main risk posed by climate change. Rainfall will likely intensify, particularly during rain showers in the pre-monsoon period. This would reduce the amount of water infiltration and groundwater recharge, thereby increasing the potential for soil erosion.<sup>7</sup>

5. Settlement patterns in the Karnali River Basin are controlled by the availability of mountainside land that is not too steeply sloped, allows terracing, and is suitable for agriculture. The majority of such land is found at about 1,200 meters above sea level. Water scarcity was reported by communities to be a significant problem for the 85% of households at these elevations that are not located close to rivers. Water insecurity and shortages of water occur during the extended dry period that begins in October and lasts until the monsoon begins in June. In some settlements, water shortage has been reported to last 3 months, and during this period women and children are reported to spend 3 to 8 hours a day traveling to collect water.

6. Growing competition for water, inappropriate planning, and improper use of water lead to disputes over water sources. Water supply and irrigation have traditionally been planned and managed at the community level without outside support. Many of the problems in the supply and sanitation of drinking water have emerged due to poor water resource management. The shortcomings have included the failure to protect catchments; failure to prevent livestock from polluting water source and storage; and a lack of coordinated, participatory planning of drinking water and sanitation schemes at the local level. Each water source generally serves several communities and is used for multiple purposes, but upstream communities often are reluctant to share water and may extract the maximum volume of water from the source, leaving little or no water for others downstream.<sup>8</sup>

<sup>5</sup> International Water Management Institute (IWMI). 2012. *Climate Change and Vulnerability Mapping in Watersheds in Middle and High Mountains of Nepal*.

<http://www2.adb.org/Documents/Reports/Consultant/NEP/44214/44214-023-nep-tacr.pdf>

<sup>6</sup> With ADB support in 2011–2012, the Asian Disaster Preparedness Center downscaled five global circulation models for Nepal, using three different regional circulation models. Reports have been posted on the Department of Hydrology and Meteorology's website (<http://www.dhm.gov.np/>).

ADB. 2008. *Strengthening Capacity for Managing Climate Change and the Environment*. Manila

<sup>7</sup> IWMI. 2013. *Building Climate Change Resilience in the West Seti Sub-basin, Nepal*. Draft. Kathmandu.

<sup>8</sup> Madan Raj Bhatta, Helvetas. 2011. *Experiences of Water Use Master Plan in Nepal, Rural Water Supply in the 21st Century: Myths of the Past, Visions for the Future*. 6th Rural Water Supply Network Forum. Uganda. 2011. [http://www.solutionsforwater.org/wp-content/uploads/2012/01/WUMP\\_HELVETAS\\_NEPAL\\_RWSN-FORUM\\_2011.pdf](http://www.solutionsforwater.org/wp-content/uploads/2012/01/WUMP_HELVETAS_NEPAL_RWSN-FORUM_2011.pdf)

7. In the project area landslides and gully erosion displace homes and result in the loss of valuable agricultural land. This occurs due to the area's topographical features, changing climatic conditions, badly designed and maintained water infrastructure that concentrates water flow, and poor use of land. Watershed degradation is worsening due to more intensive livestock grazing and a shift in the livestock population from cattle and buffalo to goats, which have a wider diet and whose greater agility allows them to reach more areas of vegetation. This leads to a loss of vegetation cover and changes in vegetation species. Trampling and grazing prevent regrowth and erosion follows. In steep country, gully erosion then leads to landslides.

8. Most of the people in the project area are engaged in agriculture but productivity is low. Adoption of improved technology is limited. Even though most cultivated areas are devoted to cereals, a food deficit<sup>9</sup> exists and malnutrition is high.<sup>10</sup> The communities targeted by the project undertake rain-fed agriculture and not able to develop water resources, benefit from irrigation, or engage in year-round cultivation. In addition, the opportunities for market-based agriculture are limited by inadequate transport systems.

9. Seasonal and semipermanent out-migration of men, driven by the lack of and worsening livelihood opportunities, is leaving more and more of local agriculture and the use of land in the hands of women. Although these women remain in the villages to work the land, they do not own the land or have the social standing to make the decisions about land use management required for planning. The land owners who migrate out of the area are hard to contact, which makes it difficult to involve them in the watershed protection planning process. People leasing land are less motivated than owners to protect the land and its resources.

10. A positive development in the sector involves forestry. About one-third of Nepal's forests are in the middle hills eco-region. Signs indicate that loss of tree cover has been brought under control by the adoption of community forestry. The pressure on forests will continue to decrease due to increasing urbanization, economic growth, and strengthened institutions for community-based forestry. Forestry institutions and policies will become more inclusive, democratic, and transparent. This will generate more employment opportunities and help reduce poverty. Opportunity exists for greater income generation from non-timber forest products if market systems are developed.

## 2. Government's Sector Strategy

11. The government assigns overall responsibility for managing and conserving watersheds and their water and land resources to the Department of Soil Conservation and Watershed Management (DSCWM). The government's national goal in this effort is to contribute to the livelihoods and well-being of the country's people through sustainable watershed management of river basins.<sup>11</sup> The DSCWM's main objectives are (i) to assist in maintaining ecological balance by reducing pressure from such natural hazards as floods, landslides, and soil erosion by conserving and developing important watersheds; and (ii) to maintain land productivity, reduce soil erosion, and help protect development infrastructure through scientific management

<sup>9</sup> A household survey conducted under the project preparatory technical assistance in watershed study areas found that 40.1% of households were in food deficit for more than 9 months in a year and that about 32.3% suffered annual food deficits of 6–9 months. Only 1.2% of the households reported food surpluses.

<sup>10</sup> In the Far-Western Development Region in 2009, the percentage of the population considered to be undernourished—i.e., consuming less than 1,810 kilocalories per person per day, was 26.40%. The percentage of underweight children under 5 was 44.40%, and the child mortality rate was 9.40%.

<sup>11</sup> Department of Soil Conservation and Watershed Management. 2007. *Logframe of Soil Conservation and Watershed Management Programme*. <http://www.dscwm.gov.np/files/Logframe%20of%20SCWM-Nepal.pdf>

of watersheds.<sup>12</sup>

12. The government understands the limits of top-down planning and has requires its staff to involve local citizens in conservation activities. The DSCWM requires direct contributions from local communities to watershed management activities. However, it has not been able to prepare participatory plans for areas larger than 25 square kilometers. While participatory planning for small areas is effective in addressing local issues, it fails to recognize the interests of stakeholders downstream and outside of these limited areas. Nonetheless, the highly intensive, consultative, small watershed approach to watershed management developed by the DSCWM has been found to be more successful than a large watershed approach for incorporating user group demand and inputs into planning and implementing an activity. Rural communities are small and scattered and have poor transport and communication links. The types and size of development possible are constrained by the settlement patterns and topography. The DSCWM assesses land capability and encourages appropriate land use. It uses locally available, low-cost materials in the design and construction of infrastructure, and it gains local cooperation for long-term protection of an area by increasing awareness of the need for resource conservation. This approach has allowed the development of visions for the future within these limited geographical areas, as well as a greater focus on fewer objectives and small, affordable activities.

13. The current watershed management strategy lacks institutional arrangements. Plans have been developed and implemented but they have had no ongoing support and only limited capacity building. In addition, the strategy does not provide links to other programs, particularly those for water resource management and agricultural development. Watershed planning and management and water resource planning and management are best based on hydrologic areas. An emphasis on hydrology is needed for the sustainable management of watersheds as water sources, as proposed in the Nepal's Water Resources Strategy.<sup>13</sup>

### **3. ADB Sector Experience and Assistance Program**

14. ADB has been a key development partner in the water sector in Nepal, focusing on irrigation, flood management, hydropower, and water supply. ADB support to the country has included five irrigation investment projects and irrigation components in two other projects since 1994. These efforts have concentrated on rehabilitating and expanding medium-size and small irrigation schemes and transferring management to water user associations, as well as boosting the powers of these associations. ADB has supported 11 projects in water supply since 1982, including 5 projects in community-based water supply and sanitation. ADB has also been a lead government partner in providing technical assistance for climate change adaptation since 2008, with support aimed at strengthening the capacity of government agencies, mainstreaming climate change risk management in government practices, and promoting the generation and dissemination of knowledge on climate change.

15. ADB's strategic focus in the 2013–2015 pipeline will be on integrated water resources management through this project at the community and sub-watershed levels, and through the proposed Bagmati River Basin Improvement Project at the national and basin levels.<sup>14</sup>

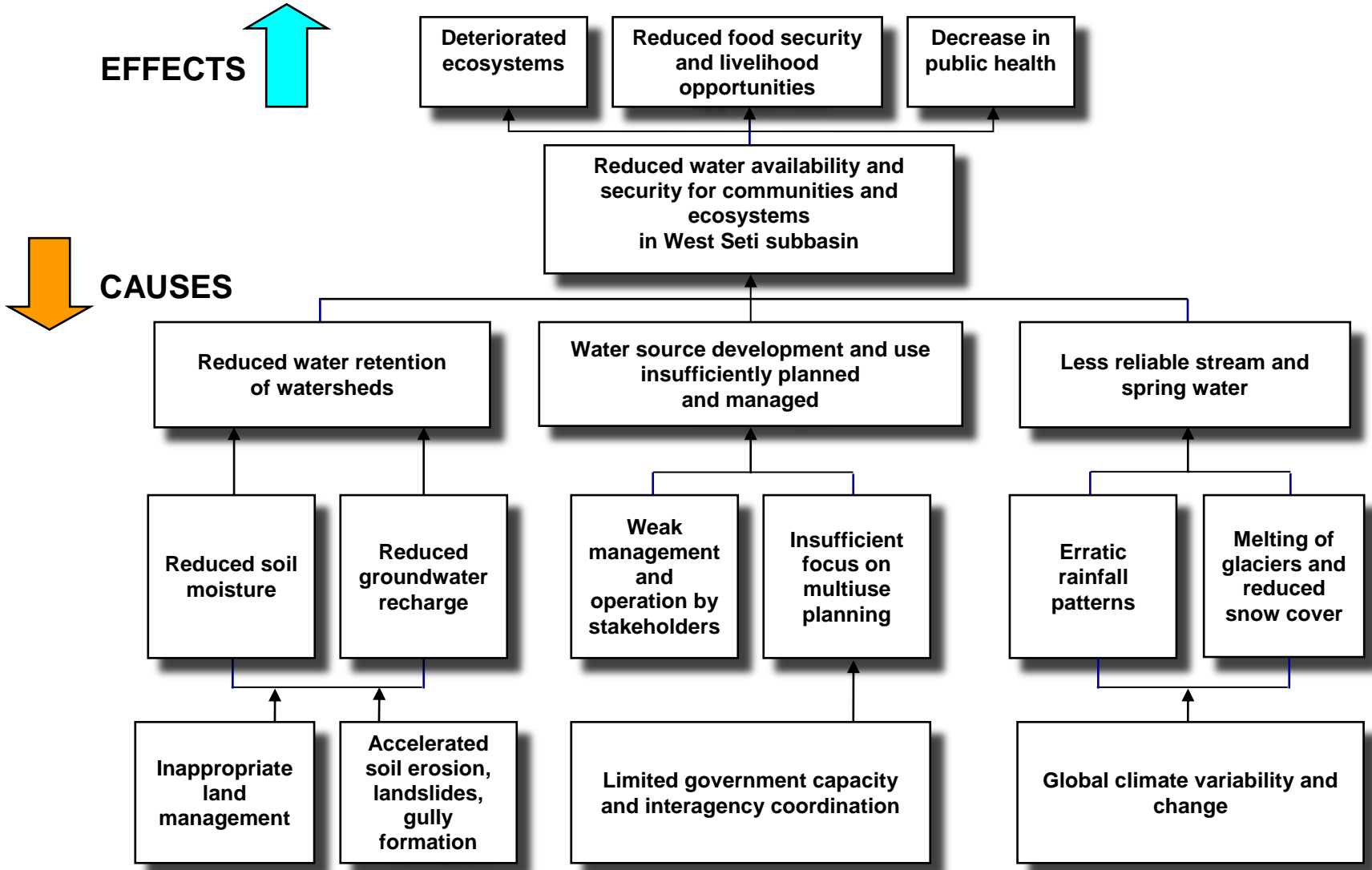
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<sup>12</sup> Further details on the DSCWM's objectives and policies are available on its website. <http://www.dscwm.gov.np/objective.html>

<sup>13</sup> Government of Nepal. 2002. *Water Resources Strategy*. Kathmandu.

<sup>14</sup> ADB. Forthcoming. *Country Partnership Strategy, 2013–2017*. Manila.

### Problem Tree for Watershed Management



## Sector Results Framework (Agriculture and Natural Resources, 2013–2017)

Country Sector Outcomes		Country Sector Outputs		ADB Sector Operations	
Sector Outcomes with ADB Contribution	Indicators with Targets and Baselines	Sector Outputs with ADB Contribution	Indicators with Incremental Targets	Planned and Ongoing ADB Interventions	Main Outputs Expected from ADB Interventions
Agricultural production, productivity, and food security are increased.	<p>Agricultural GDP per capita grows. <i>Baseline (2012): NRs9,866</i> <i>Target (2016): NRs12,660</i></p> <p>Cropping intensity: <i>Baseline (2012): 198%</i> <i>Target (2016): 226%</i></p> <p>Area used for commercial crops increases. <i>Baseline (2012): 822,664 ha</i> <i>Target (2016): 929,610 ha</i></p> <p>High-value-crop production increases. <i>Baseline (2012): 5.6% pa</i> <i>Target (2016): 6.5% pa</i></p> <p>Proportion of population generally food secure grows. <i>Baseline (2009): 60%</i> <i>Target (2016): 65%</i></p> <p>Export of agricultural products increases. <i>Baseline (2011): NRs14.54 billion</i> <i>Target: Baseline + 16%</i></p>	<p>Year-round irrigated area increased</p> <p>Rural connectivity increased</p> <p>Agricultural production diversified and commercialized</p> <p>Resilience to impacts of climate change and disaster risks increased</p> <p>Efficient and inclusive extension services expanded</p>	<p>Area with year-round irrigation increases. <i>Baseline (2012): 1.3 m ha</i> <i>Target (2016): 1.5 m ha</i></p> <p>All-season rural road network expands. <i>Baseline (2012): 10,200 km</i> <i>Target (2016): 14,000 km</i></p> <p>Proportion of households within 30 minutes' walk to the nearest market rises. <i>Baseline (2011): 45%</i> <i>Target (2016): 55%</i></p> <p>Climate screening and proofing tools are applied, along with environmental assessment. <i>Baseline: noncompliant</i> <i>Target: compliant</i></p> <p>Representation and participation of women in executive levels of farmer groups, cooperatives, and water user associations increase. <i>Baseline (2012): N/A</i> <i>Target (2016): 33%</i></p>	<p><b>Planned areas</b> Irrigation, drainage, and flood protection (irrigation system management, flood protection) Water-based natural resource management (water system development and conservation) Agriculture and rural sector development (rural infrastructure)</p> <p><b>Pipeline projects with estimated amount</b> Bagmati River Basin Improvement Project (\$30 m) Building Climate Resilience of Watersheds in Mountain Eco-regions Project (\$23.5 m) Community-Managed Irrigated Agriculture Sector—Additional Financing (\$30 m) Second Bagmati River Improvement Project (\$30 m)</p> <p><b>Ongoing projects with approved amount</b> Community-Managed Irrigated Agriculture Sector Project (\$20 m) Commercial Agriculture Development Project (\$18 m) Rural Reconstruction and Rehabilitation Sector Development Project (\$50 m) Community Irrigation Project (\$26.4 m) Raising Income of Small and Medium Farmers Project (\$20.1 m) High Mountain Agribusiness and Livelihood Improvement Project (\$20 m) Decentralized Rural Infrastructure and Livelihood—Additional Financing (\$25m) Water Resources Project Preparatory Facility Project (\$11 m)</p>	<p><b>Planned areas</b> Irrigation systems improved Development of hill agriculture accelerated through improved efficiency of irrigation systems Rural and remote areas connected with market and service centers</p> <p><b>Pipeline Project</b> River riparian environment improved, water availability increased, and water-induced disasters reduced through integrated water resources management in the Bagmati River Basin Water-induced disasters reduced and loss of life, crops, and property decreased Access by rural people to markets, social services, and income opportunities increased Availability and reliability of water for mountain communities enhanced in western development regions</p> <p><b>Ongoing projects</b> 111 irrigation schemes constructed/rehabilitated 840 km rural roads and 366 rural water supply schemes constructed/rehabilitated 290 trail bridges constructed About 13,000 ha of land irrigated High-value crops worth \$20 m produced per year 7,500 jobs created About 7,500 ha under high-value crops (64,500 metric tons worth \$44.5 m with gross margin of \$9.5 m) 200 km new and 60 km upgraded rural roads constructed</p>

ADB = Asian Development Bank, GDP = gross domestic product, ha = hectare, km = kilometer, m = million, NRs = Nepalese rupees, pa = per annum  
Source: Asian Development Bank.