

SECTOR ASSESSMENT (SUMMARY): IRRIGATION AND WATER-BASED NATURAL RESOURCES MANAGEMENT¹

Sector Road Map

1. Sector Performance, Problems, and Opportunities

1. While Sri Lanka has ample water resources—annual per capita endowment of 2,600 cubic meters (m³)—these resources are not well distributed in time and space as a result of the topography and monsoon climate. The country is split between (i) the wet zone of the central and southwest districts, which occupy about 25% of the area but have 70% of the water resources; and (ii) the dry zone of the north and east, which have 30% of the water but more than 80% of the water demand (predominately for irrigated agriculture).²

2. In the northern dry zone,³ the annual per capita endowment is about 1,200 m³—indicating severe water stress—and this is predicted to decline to water scarcity levels of less than 1,000 m³ by 2025.⁴ Large seasonal differences also exist, with 80% of this rainfall occurring in the Maha season.⁵ These districts suffer from frequent droughts, especially in the Yala season, which severely impacts on irrigated agriculture production (and therefore household food security and incomes) and drinking water supplies (adversely affecting public health). Irrigated agriculture is dominated by paddy production. Cropping intensities vary between districts, zones, and irrigation systems—from close to 200% in the water-rich districts to less than 130% in the water-scarce northern districts. Paddy yields are below potential levels of 6–7 tons per hectare (t/ha), and less than 4 t/ha in districts constrained by water availability. Water productivity for paddy is less than half of potential values, at 0.33 kilograms (kg) per m³ and \$0.05/m³.

3. The sector challenges are to increase overall agricultural productivity through improved paddy yields and diversification to higher value crops, particularly during the Yala season. Potential exists to increase cropping intensities in irrigation schemes, increase water productivity levels for paddy to closer to 1 kg/m³, and through diversification, increase returns to water (and land) to more than \$0.10/m³. The utilization of ample, but spatially and temporally constrained water resources, could be improved to enable these productivity improvements and to improve the security of drinking water supplies within the water-scarce northern districts and provinces.⁶ This can be achieved through increased water harvesting, with the construction of additional storage reservoirs, and interbasin transfer of water from wet to dry zone districts. It can also be enhanced and complemented through improved water resources management at all hydrological levels—from river basin to field levels; management and conveyance efficiencies can be raised from 30%–40% to 60%–70% and field application rates can be reduced by 40%–50%. Improved efficiency, both conveyance and operational, will increase water productivity, water supply security, and therefore water utilization.

4. Future climate change impacts are predicted to cause an increase in temperatures, leading to increased irrigation water demand and suppression of paddy yields. Seasonal rainfall patterns are also likely to shift, with an anticipated increase in Maha rainfall and

¹ ADB. 2014. *Technical Assistance Consultants Report: Water Resources Development Investment Program*. Manila

² U.A. Amarasinghe et al. 1999. *Water Scarcity Variations within a Country: A Case Study of Sri Lanka*. Research Report No. 32, Colombo, Sri Lanka: Integrated Water Management Institute

³ Districts include Jaffna, Killinochchi, Trincomalle, Vuvaniya, Mullaitivu, Puttalam, Kurunegala, and Anuradhapura.

⁴ ADB. 2011. *Water Operational Plan, 2011–2020*. Manila. The plan identifies water stress when the annual per capita amount is below 1,700 m³ and water scarcity when it is less than 1,000 m³.

⁵ Sri Lanka has two principal monsoon periods—the northeast monsoon (Maha) from December to February and the southwest monsoon (Yala) from May to September.

⁶ The northern provinces are the North Central, North West, and North.

decline in Yala rainfall, both accompanied by a higher frequency of extreme weather events. These impacts could exacerbate the water resources differential between wet and dry zones, and increase the frequency and severity of droughts in the dry zone. However, the impacts are also likely to increase water resources within the wet zone areas and therefore raise the potential for interbasin transfers.

5. The Mahaweli river basin is Sri Lanka's largest and most water-rich basin, with 20% of the country's total resources. In the 1970s, a multisector development program (the Mahaweli Development Program) constructed a cascade of hydropower dams, transfer canals, and irrigation systems. The program could be expanded, with the transfer of 1,000 million cubic meters (MCM) of unallocated water to the northern dry zone. This could increase the irrigated area supplied from 146,000 ha to 233,000 ha, and supply 160 MCM to water-short communities annually. These transfers would enable increased cropping intensities (with more secure water supply, particularly for the Yala season) and diversification to non-paddy crops to improve household incomes.

6. Physical constraints to realizing the sector's full potential include (i) additional large-scale infrastructure, such as dams and canals, to increase water retention and availability, and interbasin transfers; and (ii) improvement of cascade irrigation systems (rehabilitation and modernization) to improve the adequacy and equity of water deliveries. A number of nonphysical constraints also exist, such as improving multisector river basin management, cascade irrigation system operation and maintenance, and improving the management of farming systems to optimize water productivity.

7. The sub-sector could improve their contribution to national growth by (i) raising agricultural and water productivity, farmer incomes, and food security; (ii) improving public health via improved quality and security of water drinking water supplies; and (iii) achieving environmental benefits in dry zone districts through the sustainability of minimum river flows.

2. Government's Sector Strategy

8. The overall national development strategy is to promote inclusive growth, with the objective of an 80% increase in per capita gross domestic product from 2010 to 2016.⁷ This will be achieved through multisector investments in agriculture, water, transport, education, communications, and manufacturing.

9. The strategic direction of the agriculture and national resources sector is to increase productivity to attain the goals of food self-sufficiency and increased water productivity. For paddy production, the goal is to increase annual production from current levels of 4.5 million t to 8.2 million t by 2030⁸ to meet projected domestic demand. For other field crops, the target is to attain self-sufficiency by 2020.⁹ To increase irrigation water productivity, the government plans to construct new reservoirs and canals to harvest and transfer water, and improve water management. The national sector goals are to increase (i) average cropping intensity to 160% (from 147% in 2011); (ii) paddy rice yield to 6.5 t/ha (from 5.5 t/ha in 2011); and (iii) paddy rice irrigation water productivity to 1.3 kg/m³.

10. More than 50 investment projects have been identified for the sector, of which 37 are water-related (irrigation and water-based natural resources management), with costs amounting to about \$4.4 billion (footnote 7). These investments can broadly be classified into water resources development (infrastructure projects to increase water availability and interbasin water transfers) and water resources management projects (improving water utilization and productivity). There are 27 water resource development projects, with an

⁷ Government of Sri Lanka, Ministry of Finance and Planning. 2013. *Public Investment Strategy, 2014–2016*. Colombo, Sri Lanka.

⁸ This is inclusive of projected paddy exports of about 0.5 million t.

⁹ According to the public investment strategy, imports for other field crops are about 40% of domestic demand.

estimated total cost of more than \$3.8 billion, including (i) two large dams, Moragahakanda and Kalu Ganga, both under construction; and (ii) two major water transfer projects: (a) the North Central Province Canal Program to the north, and (b) the Upper Uma Oya Project to the south. These projects are predominately physical works, with construction of reservoirs and conveyance structures, canals, and tunnels. There are 10 water management projects amounting to \$570 million. These projects are mainly nonphysical interventions such as capacity building, but they include complementary minor works such as rehabilitation of canals and provision of monitoring equipment.

11. While the government's strategy and development plans envisage significant development of the sector, limitations within the current policy and institutional arrangements pose constraints. Multiple agencies have water management responsibilities, more or less independent of each other, resulting in distortions and inefficiencies including (i) no reliable and impartial mechanism for allocation of bulk water between sectors, leading to inequities between users; (ii) environmental and social needs that are insufficiently safeguarded over other users; (iii) a perceived reduction in water security by existing water users owing to new water developments; and (iv) a lack of flexibility with current allocations to enable transfer between users and uses, reducing performance. Within the irrigation sector, performance is adversely affected since (i) a number of agencies are involved in operation and maintenance activities; (ii) sector reform is incomplete and ongoing, particularly the involvement of farmer organizations; (iii) operation and maintenance activities are underfunded; and (iv) incentives are lacking to attract private sector participation and investment.

12. Sector reform has faltered in the past, so sector development must be accompanied by improvements in water resources, irrigation systems, and farm management. A current World Bank initiative on integrated water resources management, which is particularly relevant to large-scale interbasin projects, can be a platform for further sector reform. Irrigation system performance could be improved through better system regulation and monitoring. Agriculture support, services, and inputs also need to be improved to raise agricultural productivity.

3. ADB Sector Experience and Assistance Program

13. ADB's strategic sector objectives in Sri Lanka, as presented in the interim country partnership strategy, 2015–2016, are aligned with the government's main development objectives—economic growth and poverty reduction. The Interim Country Partnership Strategy includes assisting the government to address major constraints for sustaining inclusive economic growth, with infrastructure development support that improves connectivity and service delivery to lagging regions.¹⁰ It is also consistent with ADB's strategic and sector goals as articulated in (i) Strategy 2020 and its Midterm Review;¹¹ (ii) the Water for All policy;¹² and (iii) the Water Operational Plan, 2011–2020 objectives of reducing the water demand–supply gap in water-scarce areas, fostering integrated water resources management (IWRM), improving water governance and the delivery of services, and improving resilience to climate change.

14. ADB has had mixed results from its agriculture and natural resources sector experience in Sri Lanka. In the 1990s, it initiated a move to support sector reforms in line with its policies to encourage a more holistic approach to water resources management and development. In 1995, the technical assistance Institutional Strengthening for Comprehensive Water Resources Management set out to assess institutional capacity, develop a single overarching policy and law governing water resources, and establish a

¹⁰ ADB. 2015. *Interim Country Partnership Strategy: Sri Lanka 2015-2016*. Manila

¹¹ ADB. 2014. *Midterm Review of Strategy 2020: Meeting the Challenges of a Transforming Asia and Pacific*. Manila.

¹² ADB. 2003. *Water for All: The Water Policy of the Asian Development Bank*. Manila.

single apex body (subsequently called the National Water Authority) for coordinating water-related activities.¹³ In 2001, the Water Resources Management Project was established to finance infrastructure construction and continue support implementation of the National Water Authority.¹⁴ Both projects were controversial, largely because of politicization of the issues related to water entitlements and intense media interest. The apex body was never formed, and the policy development process ultimately collapsed.¹⁵ A key lesson from these projects is that reform requires extended periods of stakeholder consultation, public awareness campaigns, and political consensus creation—activities that are to a large extent political.¹⁶

15. ADB has been more successful in supporting infrastructure development and climate adaptation projects. The ongoing Improving Community-Based Rural Water Supply and Sanitation in Post-Conflict Areas of Jaffna and Kilinochchi Project aims to reduce poverty and improve the quality of life in rural communities in Jaffna and Kilinochchi districts through improved water supply and sanitation services.¹⁷ The Conflict-Affected Region Emergency Project is supporting the rehabilitation of minor and medium tanks systems in the North Central and Northern provinces.¹⁸

16. The investment program will finance three projects under the North Central Province Canal Program: (i) the Upper Elahera Canal Project, (ii) the North Western Province Canal Project, and (iii) the Minipe Left Bank Canal Rehabilitation Project. The investment program also includes two nonphysical elements to support the physical investments and to overcome shortfalls in current sector and system management: (i) Strengthening Integrated Water Resources Management will help develop institutional policy and capacity for improved river basin management, with emphasis on the Mahaweli systems and the North Central Province Canal Program,; and (ii) Improving System Efficiencies and Water Productivity will identify and promote improvements in irrigation system management and farm water productivity.

17. The remaining NCCP investments not included in the investment program are (i) the Lower Uma Oya Reservoir, (ii) the Randenigala–Kalu Ganga Transfer Canal, (iii) the Kalinganuwara Pumping Complex, and (iv) the North Central Province Canal. These investments will utilize the Upper Elahera Canal Project to convey additional diverted Mahaweli River water to the northern dry zone area, where it will supplement drinking water supplies to Jaffna and Kilinochchi. The investment program complements current and planned projects of development partners. The Moragahakanda reservoir is financed by China Development Bank (\$558 million), and the Kalu Ganga reservoir by the Saudi Fund for Development, the Kuwait Fund for Arab Economic Development, and The OPEC Fund for International Development (\$270 million). The World Bank's Dam Safety and Water Resources Planning Project (\$148 million) includes components for national water use and pilot river basin planning. The Upper Uma Oya Multipurpose Development Project (\$450 million) is financed by the Export Development Bank of Iran. Japan International Cooperation Agency is preparing the Poor Economic Advancement and Community Enhancement Project (\$40 million) for improvements in irrigated agriculture production in minor tank cascades in the North Central Province, which will be supplied with water from the North Central Province Canal Program.

¹³ ADB. 2001. *TA Completion Report: TA 2422-SRI: Institutional Strengthening for Comprehensive Water Resources Management*. Manila

¹⁴ ADB. 2000. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to Sri Lanka for the Water Resources Management Project*. Manila

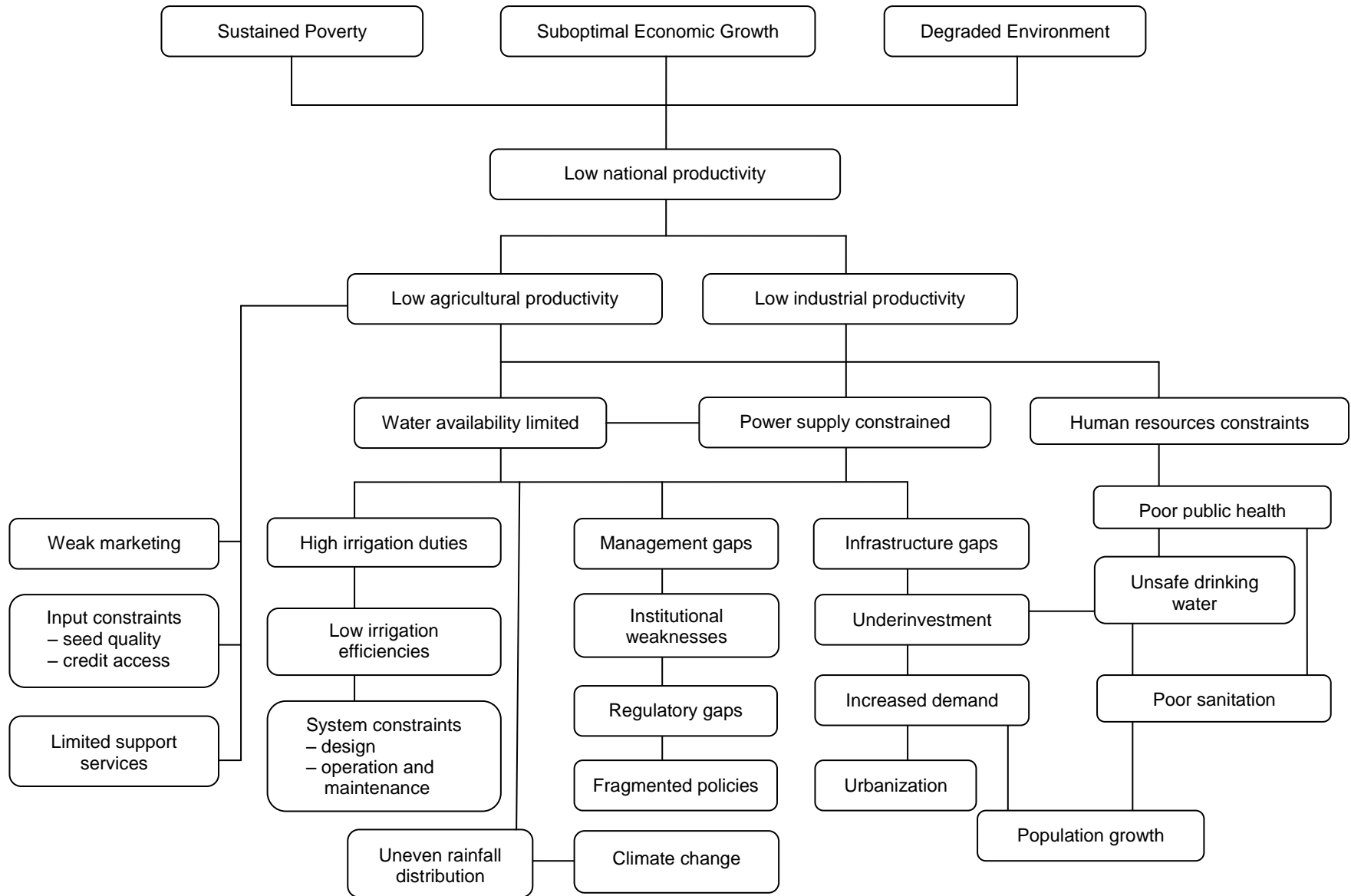
¹⁵ R. Ariyabandu. 2008. *Swings and roundabouts: A narrative on water policy development in Sri Lanka*. Working Paper No. 296. London: Overseas Development Institute.

¹⁶ ADB. 2008. *Validation Report: Water Resources Management Project*. Manila.

¹⁷ ADB. 2011. *Proposed Grant Assistance to Sri Lanka for Improving Community-Based Rural Water Supply and Sanitation in Post-Conflict Areas of Jaffna and Kilinochchi*. Manila.

¹⁸ ADB. 2010. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to Sri Lanka for the Conflict-Affected Region Emergency Project*. Manila.

Problem Tree for Irrigation and Water-based Natural Resources Management



Sector Results Framework (Irrigation and Water-Based Natural Resources Management, 2014–2016)

Country Sector Outcomes		Country Sector Outputs		ADB Sector Operations	
Outcomes with ADB Contribution	Indicators with Targets and Baselines	Outputs with ADB Contribution	Indicators with Incremental Targets	Planned and Ongoing ADB Interventions	Main Outputs Expected from ADB Interventions
<p>Increased water availability for agriculture sector and drinking water subsector</p> <p>Increased agriculture productivity</p>	<p>Urban water supply Baseline 2012: 65% 2020: 90%</p> <p>Cropping intensity average: Baseline 2012: 147% Government target 2020: 160% Major systems: Baseline 2012: 170% Target 2020: 180%</p> <p>Paddy production: Baseline 2012: 3.84 million t Target 2020 : 8.20 million t</p> <p>Other food crops production Baseline 2012: 0.53 million t Target 2020: 1.16 million t</p> <p>Fruit and vegetable production Baseline 2012: 1.65 million t Target 2020: 2.31 million t</p> <p>Water use efficiency Baseline 2012: 0.6-0.9 m Target 2020: 0.4-0.5 m</p> <p>Non-revenue water: Baseline 2012: 29% Target 2012: 20%</p>	<p>Transfer of water from wet zone to intermediate zone and dry zone to improve water availability for increased cropping intensities</p> <p>Increased agricultural productivity within existing irrigation systems, by improving water distribution, improved conveyance, and system operation</p> <p>Improved water resources planning and management following the principles of IWRM</p>	<p>Interbasin water transfers of 1,000 MCM per annum from wet zone to Sri Lanka's northern intermediate-zone and dry-zone areas</p> <p>About 80,000 ha to be provided with reliable water supply to raise average cropping intensity from 137% to 180%</p> <p>Guidelines prepared for a program for a 10% increase in conveyance and distribution efficiencies</p> <p>Guidelines prepared for the strengthening of IWRM activities nationally</p>	<p>Planned key activity areas Water resource infrastructure development (90%) Introduction of water saving irrigation technologies and agriculture support services (5%) Capacity building for IWRM (5%)</p> <p>Pipeline projects with cost estimate Technical assistance: Preparing the Water Resources Development Investment Program (\$800,000) 2014</p> <p>Multitranche financing facility: Water Resources Development Investment Program (\$675 million)</p> <p>Ongoing projects with approved cost Jaffna–Kilinochchi Water Supply and Sanitation (\$90 million)</p> <p>Conflict-Affected Region Emergency Project (\$150 million)</p>	<p>Planned key activity areas Increased water supply (900 MCM) to about 80,000 hectares and 255,000 beneficiary households</p> <p>Increased drinking water supplies (160 MCM) to 820,000 households</p> <p>Pipeline projects Construction of new (160 km) and rehabilitated canals (75 km)</p> <p>Water use efficiency program for selected minor tank irrigation systems.</p> <p>Guidelines and program for strengthening and development of IWRM.</p> <p>Ongoing projects Improved water supply infrastructure, improved sanitation infrastructure, strengthened water resource protection and management</p> <p>Improved medium and minor tanks systems for improved productivity</p>

ADB = Asian Development Bank, ha = hectare, IWRM = integrated water resources management, km = kilometer, m = meters, MCM = million cubic meters, t = ton.
Sources: Asian Development Bank; Government of Sri Lanka, Ministry of Finance and Planning. 2013. Public Investment Strategy, 2014–2016. Colombo, Sri Lanka.