

SRI LANKA'S WATER SUPPLY AND SANITATION SECTOR: ACHIEVEMENTS AND A WAY FORWARD

Mingyuan Fan

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FOREWORD

The provision of safe drinking water supplies and improved sanitation services are both government priorities in Sri Lanka and targets have been set periodically to improve population access to such services. These development initiatives have largely been successful so that, on a nationwide basis, safe water is provided to almost 85% of the population while 90% of the population has access to improved sanitation.

However, important development challenges remain and the availability of a sustainable and efficient water supply and sanitation services, especially in poorer townships, is vital to sustain the pace of development. As elsewhere in the world, access to clean water is seen as a fundamental human right and is therefore a sensitive political issue. The Sri Lankan government is very cognizant of the importance of the issue and is intent on providing access to clean and safe sources of water as well as improved sanitation services to all its citizens by 2020.

This report presents a comprehensive summary of the historical development of Sri Lanka's water and sanitation sectors together with a review of its plans for future development. The report is intended to act as a guide to help implementation of the government's vision for the sector by identifying the key strategic themes that need to be addressed if the government's ambitions are to be realized. The report also presents a summary of the evolution of the country's water supply and sanitation sector over the past ten years together with a comprehensive assessment of its current operational and financial status.

The Asian Development Bank has played a major role in helping Sri Lanka achieve its impressive achievements in the sector to date through funding no fewer than eight major water supply and sanitation development projects. Looking forward, the Asian Development Bank shall continue to provide a wide range of infrastructure rehabilitation and expansion, institutional development and knowledge-building assistance to the government of Sri Lanka as well as utilities and organisations active in its water supply and sanitation sector. It is hoped that this report will provide a framework and guide for directing such assistance to where it may have the greatest impact.

ACKNOWLEDGMENTS

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ADB is grateful for the excellent cooperation, and support provided from a large number of organisations and individuals who provided invaluable contributions and support to make this report possible. ADB takes this opportunity to express its sincere gratitude to the National Water Supply and Drainage Board, Colombo Municipal Council as well as the Municipal Councils in Kandy, Nuwara Eliya and Jaffna. Many thanks for the support extended by R. W. R. Pemasiri, and B. W. R. Balasuriya. Special thanks also to Sajjan Jayasiriwardena, Deepthi Sumanasekara, R S C George, I V W Ediriweera, Prasad Siriwardena, Thilina Wijetunge, Mangala Abeysekera, Ranjith Samarasinghe, A H Gunapala, D Senevirathne and the Project Directors D V Medawatte and T Bharathithasan of the National Water Supply and Drainage Board and Kumudini Samarasinghe of the Greater Colombo Wastewater Management Project of Colombo Municipal Council for extending immense support and input. We express our sincere thanks and appreciation to Saumya Abeysuriya, Sudisna Peiris and Aravinda Kumara for their support in data processing as well as their efforts to complete the report for timely publication.

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ABBREVIATIONS

ADB	–	Asian Development Bank
BCM	–	billion cubic meters
BOT	–	build–operate–transfer
CBO	–	community-based organization
CKDu	–	chronic kidney disease of unknown etiology
CMC	–	Colombo Municipal Council
DMA	–	district meter area
GIS	–	geographic information system
IBNET	–	International Benchmarking Network for Water and Sanitation Utilities
ICT	–	information and communication technology
IDP	–	internally displaced persons
SLRs	–	Sri Lanka rupee
MDG	–	Millennium Development Goal
NCWT	–	National Community Water Trust
NGO	–	nongovernment organization
NWSDB	–	National Water Supply and Drainage Board
O&M	–	operation and maintenance
RSC	–	regional support center

CURRENCY EQUIVALENTS

(as of 4 June 2015)

currency unit	–	Sri Lanka rupees (SLRs)
SLRs1.00	=	\$ 0.00745434
\$1.00	=	SLRs134.150

I. INTRODUCTION

1. The report from which this document has been abstracted was initiated by the Asian Development Bank (ADB) with the objective of providing guidance to development partners and other interested parties in Sri Lanka regarding the kind of water and sanitation infrastructure development and rehabilitation assistance and associated institutional and capacity building support that will have the greatest potential benefit. The report was principally based on desk research conducted by consultants commissioned by ADB with considerable input provided by the National Water Supply and Drainage Board, Colombo Municipal Council, and other stakeholders.

2. The Democratic Socialist Republic of Sri Lanka is an island in the Indian Ocean lying east of the southern tip of the Indian subcontinent from which it is separated by the Palk Strait. Sri Lanka experiences a tropical climate with distinct dry and wet seasons and two monsoons. There are two distinct rainfall zones in the country: the “wet zone,” comprising the central mountains and the southwest, which receives an average of 2,500 millimeters (mm) per annum (ranging as high as 5,500 mm in some areas); and the “dry zone,” comprising most of the southeast, east, and northern parts of the country, which receives significantly less annual rainfall (ranging from 1,200 to 1,900 mm of rain annually). Average annual temperatures range from 28°C to 32°C. Sri Lanka is the 57th most populous nation in the world with approximately 20 million people according to the 2012 census and an annual population growth rate of 0.73%. Population density is highest in western Sri Lanka, especially in and around the capital, Colombo. Sinhalese constitute the largest ethnic group, accounting for 75% of the total population, while Sri Lankan Tamils are the second major ethnic group, comprising a little over 11% of the population.

3. Rapid economic growth in the past 10 years has resulted in a major decline in poverty—from 23% of the population in 2002 to 9% in 2012. Real per capita consumption of the lower 40% of income earners grew by an average of 4.3% annually between 2002 and 2009. As a result, inequality in per capita consumption expenditure fell during this period, as reflected by a decline in the Gini coefficient from 0.41 to 0.36. Sri Lanka has met the Millennium Development Goal (MDG) target of halving extreme poverty and is on track to meet most of the other MDGs, outperforming other South Asian countries. The International Monetary Fund estimates economic growth potential at approximately 6.5% per annum, which, if realized, would continue the country’s impressive progress in improving the lives of its people.

4. However, economic disparities exist between the nine provinces, with the Western Province contributing 45.1% of the gross domestic product followed by the Southern Province (10.7%) and the Central Province (10.0%). Consequently, important development challenges remain. Access to water supply and sanitation—especially in poorer areas—is a prerequisite for achieving the desired economic success. Access to safe drinking water supply and improved sanitation is also a key MDG.

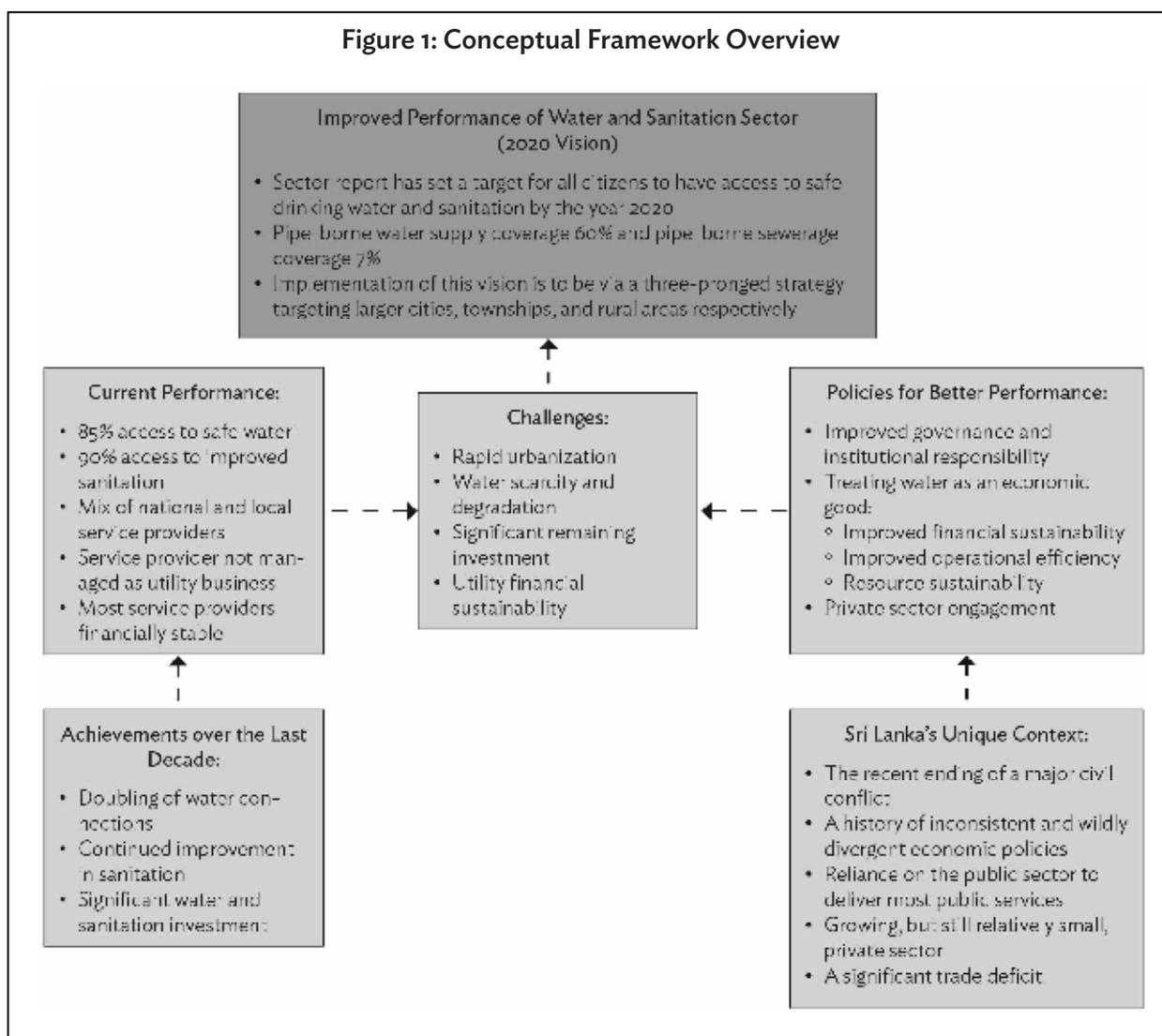
5. The water supply and sanitation sector in Sri Lanka has achieved very positive results over the years with significant assistance being provided by multiple external development assistance agencies. Multiple grants were received between 2005 and 2008 to rehabilitate and improve water and sanitation facilities in coastal regions in the aftermath of the tsunami of 2004. The ending of 30 years of civil conflict in 2009 also triggered development of water and sanitation facilities for the people located in the north and east of the country.

6. ADB has funded eight major water and sanitation projects in the last 2 decades: (i) First Water Supply and Sanitation Project; (ii) Second Water Supply and Sanitation Project; (iii) Third Water

Supply and Sanitation (Sector) Project; (iv) Secondary Towns and Rural Community Based Water Supply and Sanitation Project; (v) Dry Zone Urban Water Supply and Sanitation Project; (vi) Jaffna Kilinochchi Rural Community Based Water Supply and Sanitation Project; (vii) Greater Colombo Wastewater Management Project; and (viii) Greater Colombo Water and Wastewater Management Improvement Investment Programme.

7. The study from which this report has been abstracted reviews the historic and ongoing efforts made to rehabilitate and extend water supply and sanitation services in Sri Lanka and also summarizes the challenges and opportunities to help define a strategic direction for sector development over the next decade.

8. Figure 1 summarizes the conceptual framework underlying water and sanitation sector development in Sri Lanka. The key elements comprising this framework are described in the sections following.



II. SECTOR BACKGROUND

9. Some remarkable achievements have been made in the water supply and sanitation sector in Sri Lanka over the last decade. The government's continued efforts to improve national social development indicators have placed the country ahead of most other South Asian countries. Provision of drinking water supply and sanitation is a government priority and periodic targets have been set for the proportion of the population that should have access to safe drinking water and improved sanitation services.

A. Access to Safe Drinking Water

10. On a national basis, safe water coverage—defined here as the proportion of the population having access to water supplies from piped water systems, protected wells, or rainwater systems—is currently almost 85%. About 44% of the population (over 9 million people) have access to piped water, 3% (more than 0.6 million) have access to hand pump tube wells, 36% of the rural population has access to safe drinking water through protected dug wells, and 1% of the population uses rainwater harvesting systems. The other side of the coin, however, is that 15% of the population is unable to access a safe water source within 200 meters of their residence.

11. Nevertheless, and even though Sri Lanka has a better record than other countries in the region in terms of the provision of access to safe water supplies, challenges remain with respect to maintaining service levels to current users while, at the same time, extending services to the presently unserved population—currently estimated at over 3 million people.

12. Sri Lanka's principal water supply and sanitation utility, the National Water Supply and Drainage Board (NWSDB), had an estimated 840,000 total water connections in 2004 and this figure had doubled by the end of 2013. Another feature characterizing the evolution of Sri Lanka's water supply sector is the increased use of community-managed water supply systems. In 1980s, aside from a few urban pipe-borne water supply networks, the bulk of the rural population was served by small gravity systems and dug wells. At the beginning of 1990, a series of programs got under way for scaling up district-level rural water supply systems that were to be operated by the communities themselves—so-called community-based organization schemes. These schemes delivered a further 500,000 water supply connections.

13. The quality and reliability of water provided by the NWSDB is at an acceptable level. Currently, 98% of the bacteriological tests carried out by the NWSDB show satisfactory results. The reliability of water supply systems in Kandy and Nuwara Eliya is also satisfactory. However, the various small schemes managed by Jaffna Municipal Council are not deemed to be operating at a satisfactory level, and there is a shortage of water in Kurunegala (for which the NWSDB is the bulk water supplier). In rural areas, water quality for a considerable number of community-based water supply systems is not at an acceptable level.

14. Leakage in distribution systems is a component of what is referred to as nonrevenue water, which is a combination of unbilled metered or non-metered consumption, apparent losses (due either to unauthorized consumption or consumption that is under-measured due to metering inaccuracy), and real losses (due to various kinds of leakage). Nonrevenue water levels are variable from moderate to high but losses in Colombo, at 48%, are very high.

15. Overall, the NWSDB and other institutions handling water and wastewater services in Sri Lanka have made remarkable progress in expanding water supply services. However, their performance with respect to operational efficiency, financial sustainability, and the cost effectiveness of investment needs further improvement.

16. Three important features ought to be noted. First, despite the rise in community-based organizations, there remains a marked rural–urban disparity in the quality of services provided to consumers. Second, although substantial progress has been achieved in improving access to safe water supplies in post-conflict areas in the Northern Province, more work needs to be done. Finally, improvement is also needed in providing safe water supply to estate communities such as in Nuwara Eliya district.

17. The main strategic challenge in the water supply sector will be how to maintain and/or improve service levels to current users while, at the same time, extending services to the approximately 3 million people who are presently unserved.

B. Sanitation

18. In the sanitation subsector, coverage (which principally comprises on-site facilities such as septic tanks and closed pit latrines but also some piped sewerage systems) has increased from 83% in 2008 to 90% in 2013. Piped sewerage systems are limited to those locations where other forms of sanitation service provision are not practical due to population and housing density. As a result, sewerage networks presently cover only about 2.5% of the country's population in major urban areas such as Colombo, Kataragama, Hantana, and Hikkaduwa, as well as major housing complexes and condominiums. Industrial zones in various parts of the country are also served by extensive industrial sewerage collection and treatment facilities.

19. Change in people's behavior is another important factor behind the improvement in sanitation coverage. For example, public perception of the importance of sanitation in schools has increased. It is no longer acceptable to randomly construct a set of toilets at schools; rather, parents expect that combined water, sanitation, and hygiene interventions will be installed using resources allocated on the basis of the number of students that need to be served. As a result, the percentage of schools with adequate sanitation coverage had reached 80% by the end of 2012, and 85% of schools had improved drinking water sources.

20. The combined effect of these developments is that, by 2013, Sri Lanka had achieved its Millennium Development Goals for water and sanitation.

C. Financial Performance

21. The NWSDB's revenue position is predominantly determined by the tariffs it charges for water and sanitation services. Revenues from the sale of water increased significantly due to tariff increases made in 2009 and 2012 plus the number of new connections made in the 2009–2010 period.

22. The NWSDB's revenues cover the cost of water sold but they do not cover the overall cost of operations, which have been increasing due to rising costs of fuel, personnel, and energy. Personnel costs constitute 53% of the NWSDB's total operational costs while electricity costs constitute a further 24% of total costs. Together, these two account for almost 80% of total operating costs. Finance costs

will also increase in the future as the scale of debt on the NWSDB balance sheet is growing. This will increase pressure on the NWSDB's liquidity position.

23. Overall, for the 2006-2012 years, the NWSDB's financial performance could be described as relatively static, with increasing costs being generally offset by higher revenues gained from tariff adjustments.

24. The future profitability of the organization will depend on several key factors including the adequacy of ongoing tariff adjustments, increased attention to efficiency initiatives with a focus on energy conservation, a reduction in nonrevenue water, the optimization of staffing costs, and an expansion of service territory utilizing the present staff complement.

25. The NWSDB has only limited autonomy as it is mandated to report to Parliament through the Ministry of Urban Development, Water Supply and Drainage while its staff numbers and associated salaries are subject to approval by the Ministry of Finance. Annual funding is allocated to the NWSDB via Parliament's budgetary approval for the Ministry of Water Supply and Drainage. Despite this lack of financial autonomy, the NWSDB's capital reserves have been increasing in recent years due to the number of domestic and foreign grants and loans that have been received. These reserves now presently outweigh the NWSDB's accumulated net losses from operations.

26. At present, a uniform national tariff is applied on all NWSDB-operated schemes regardless of the actual cost of operating them. As a consequence, cross-subsidization takes place between those regions and schemes that are more expensive to operate and those that are less expensive. As the sector continues to evolve, a key question to be considered is whether the form and scale of this cross-subsidization is either desirable or sustainable. The current model strives for financial sustainability at the national level with cross-subsidization applied between the provinces. In a more decentralized environment, it might be appropriate to aim for financial sustainability at a provincial level with cross-subsidization applied between schemes within the province. Irrespective of the issue of cross-subsidy, tariffs are normally revised on a 3-year cycle.

27. The financial performance of sewerage facilities is difficult to assess. At present, major sewerage facilities have only been developed in Colombo, Ekala, Jaela, Moratuwa, and Ratmalana.. In addition, there are a number of housing schemes having individual wastewater systems. Colombo city sewerage is managed by the Colombo Municipal Council (CMC) while most other sewerage systems are managed by the NWSDB. Sewerage systems installed at housing schemes are either managed by individual households or, in some cases, by the NWSDB.

28. It is difficult to assess the financial performance of the Colombo sewerage system since its operations have been decentralized into six administrative districts operating under the CMC Drainage Division's central office, which also manages the city's surface water drainage system.

29. Based on various assumptions made as part of the study, it was concluded that the system's ratio of staff to service population is about 30% higher than the benchmark median of over 4,000 water and sanitation utilities around the world based on data compiled by the International Benchmarking Network for Water and Sanitation Utilities (IBNET),¹ The staffing level per 1,000 connections, on the

¹ IBNET is an international network of water and sanitation utilities that compiles and shares a set of core cost and performance indicators (www.ib-net.org). The network has compiled a common set of data definitions and a minimum set of core indicators, and provides software to allow easy data collection and calculation of the indicators, plus resources to analyze data and present results. The datasets are managed through "dataset owners," which can include regulatory agencies, water supply and sewerage associations, performance monitoring units, or citizen groups. A typical dataset or

other hand, is about 270% to 500% higher than the IBNET benchmark figure, depending on which staffing level is used. These figures are distorted by the number of multiple customer connections that are counted as a single connection (at an apartment block, for example). Correctly accounting for the number of connections would lower CMC's staffing ratio but, even so, the staffing ratio is unlikely to compare favourably with relevant international comparators.

III. CHALLENGES

30. In spite of the achievements made, there remain five major challenges that will need to be overcome: rapid urbanization, water scarcity and degradation, investment needs, sector governance, and the need to achieve greater financial sustainability.

A. Rapid Urbanization

31. Urbanization is a global phenomenon and one of the world's most challenging issues—the global urban population is estimated to be increasing by over a million people a week, creating enormous challenges for the delivery of infrastructure and basic services such as housing, electricity, water, and sanitation. These problems will continue to intensify as economic development and the associated migration of people out of rural areas continues. The quality of life in the developing world's rapidly growing cities will not be sustainable without reliable access to safe drinking water and adequate sanitation facilities.

32. As elsewhere in the world, improving and redeveloping urban infrastructure poses a serious challenge in Sri Lanka. The number of people without access to improved water sources is rising while drainage networks and flood control systems require rapid improvement. A sewerage system is present only in Colombo city and is rather overburdened.

33. On the positive side, the economic growth that is attracting people to the cities and that is further fuelled by this migration also creates wealth that will help enable cities to both expand water and wastewater services and upgrade standards of service.

B. Water Scarcity and Degradation

34. With an island-wide rainfall average close to 1,900 mm, total annual precipitation amounts to approximately 132 billion cubic meters (BCM) while total surface runoff is estimated to be 50 BCM. The annual internally renewable water supply capacity has been estimated at 43.2 BCM and annual withdrawals amount to 8.7 BCM. In principle, therefore, there is no shortage of water.

35. However, there is a wide variation in regional water availability, which causes water stress in dry zone areas. These problems are compounded by a combination of factors concerning water resource management that are harming the water sector.

36. Competition between water users, lack of compliance in relation to pollution control, and poor land-use policy are threatening critical watersheds. A lack of data and information concerning real-time water planning also hinders equitable water allocation, while the absence of a strong legal basis for

node in IBNET includes not only the data for a set of utilities of a specific country, but also a minimum set of performance indicators that presents a first analysis of the data at the country or utility level.

safeguarding water rights discourages user commitment to water resource protection and conservation.

37. Groundwater in Sri Lanka is widely used for domestic, agricultural, industrial, and other purposes. Groundwater conditions, in terms of yield and quality, vary considerably throughout the country depending on prevailing rainfall, topography, geology, and hydrogeological conditions. However, highly productive aquifers are only found in the sedimentary limestone zone extending from Puttalam to the Jaffna Peninsula and Mullativu. The remaining parts of the country have local and discontinuous weathered and fissured hard rock aquifers of rather low productivity. Although 35,000 wells have been drilled, systematic analysis and mapping of groundwater resources, in relation to either quantity or quality, has only just begun.

38. The issue of water rights is becoming more of a challenge as evidenced by an increasing number of related conflicts. Administrative water allocation is the most commonly practiced system in Sri Lanka as most developed water resources are utilized by national agencies. The national agencies act as the owners of water rights and water allocation priorities are fixed. Variations may take place within user groups according to politically and socially determined priorities, but essentially major water agencies such as the Irrigation Department and the Mahaweli Authority of Sri Lanka carry out de facto water allocation functions according to a predetermined plan based on the needs of project beneficiaries, and are mandated to appropriate water from any source. The consequence is that there are no provisions within the system to allocate water rights to new users. This administrative allocation process therefore needs to be complemented by the increased adoption of two alternative approaches: (i) user-based allocations to water user groups, which determine how water should be allocated to members of the group; or (ii) market-based systems in which water rights can be bought, sold, and traded with prices being set based on demand. In any event, a more transparent system of water rights that promotes equity is needed and will require amendment of current practice.

39. Degradation of river environments due to sand and clay mining and waste dumping are damaging river health and water resources systems. Controlling this problem requires strong political will and, so far, success has been limited, particularly in the western region where much of nation's industrial development is taking place.

40. The result is a shortage of cost-effective water resources for expanding safe drinking water supply to the growing population in spite of significant investment made in the water sector over the past 3 decades. Even though Sri Lanka's rivers are not as polluted as those of many other countries in the region, it is necessary to be proactive to avoid the inevitably high cost of restoration in the future.

C. Meeting Investment Needs

41. Investment needs for the sector are large and will grow due to the combined effects of increasing demand, the need to deal with existing water scarcity and degradation problems, and national aspirations to improve the scope and quality of water and sanitation services.

42. The Government of Sri Lanka estimates total investment requirements for water and sanitation through to 2020 to be about SLRs700 billion (\$5.38 billion). Of this total, about 80% (SLRs564 billion) is estimated as being required to achieve the sector targets of 60% piped water supply coverage and 7% piped sewerage coverage by the year 2020.

43. Since the program is proposed to be implemented over a 7-year period, an average annual expenditure of SLRs100 billion is implied. The government and foreign donors combined are expected

to provide between SLRs35 billion and SLRs50 billion per annum with a further SLRs33 billion to be provided by local banks, leaving a significant financial gap if all the proposed programs are to be implemented.

D. Improving Sector Governance

44. Sri Lanka's water and sanitation sector, in contrast to the electricity and telecommunications sectors, is not presently subject to independent regulatory oversight. There have been several unsuccessful attempts to institute such oversight.

45. The introduction of some kind of autonomous regulatory direction would potentially be beneficial for the water and sanitation sector in at least two important respects:

- Presently, the NWSDB, community-based organizations, and locally governed utilities are responsible for overseeing their own performance, which may not result in the most efficient operational and investment decisions. An independent regulator that sets operational, customer service and investment performance targets for these utilities could potentially make a significantly positive impact.
- The public sector dominates the sector but there is an increasing expectation that the private sector will take an interest in financing and/or operating water and wastewater assets in the future. However, with its profit-seeking mind-set, the private sector will seek to maximize its return for any given level of risk. If that risk can be mitigated or controlled through the introduction of a credible supervisory regime, then the cost of private sector participation should be reduced.

E. Improving Financial Sustainability

46. The financial sustainability of Sri Lanka's water and sanitation utilities depends on a number of factors, many of which are beyond the scope of the utility's influence. These factors include tariff levels, the subsidy regime, the nature of environmental and service standards, financing options, and operating cost levels.

47. The tariffs set by the government for NWSDB-managed schemes historically have not been sufficient to cover total operating expenses and debt service requirements (principally to the Government of Sri Lanka). Although there was a significant increase in tariffs in 2009, this change was soon followed by a substantial increase in staff salaries and in other operating costs, including electricity prices. As a result, it was only in 2011 that the NWSDB managed to fully repay its debts to the government.

48. The absence of an automatic tariff adjustment formula means that the NWSDB will continue to face difficulties in covering its operating costs and so the utility must rely on improving operational and investment efficiency to reduce its operating and debt servicing costs.

49. Water supply schemes managed by community-based organizations (CBOs) are required by statute to be self-sustaining, meaning that they need to recover all their operation and maintenance costs through user charges in order to remain solvent. As a consequence, most functioning CBOs demonstrate adequate financial capacity—they maintain bank accounts and keep accounting records in a systematic manner, are vigilant with respect to their financial transactions, carry out regular internal audits, and are subject to external accounting audits carried out by divisional secretaries.

50. Many CBOs benefited from receiving initial funding to cover their investment requirements. As such, their ongoing capital investment requirements are relatively limited, but in any event they are restricted by the tariff levels they feel able to levy. This financial limitation also helps ensure that the CBOs act in an operationally efficient manner. Such efficiency is further enhanced when the CBOs themselves need to fund part of any future capital requirements.

51. While the financial capacity of operational CBOs is generally sufficient, they frequently face technical and social issues for which they need ongoing training and support. Financial management guidance and support is required for those CBOs that have not proven to be self-sustaining in the past—a task that could be allocated to the NWSDB.

52. The financial stability of the sewerage operations of the Colombo Municipal Council (CMC) depends partly on sufficient budget support to the council's Drainage Division and partly on the operational and financial efficiency of the sewerage operation itself. The poor state of Colombo's sewerage infrastructure has meant that the limited budget allocation the division has historically received has been insufficient to even maintain the assets in a fully operating condition.

53. However, the CMC, with the assistance of various development partners such as ADB, is presently investing considerably in both rehabilitating and extending the sewerage system. Given this major new financial commitment and the need to achieve as full a level of cost recovery as possible, the existing council budget allocation process needs to be replaced with a sewerage tariff as soon as possible. At a minimum, this tariff should be set to cover operation and maintenance costs, but ideally it should also cover debt service on future capital costs.

54. Water supply schemes managed by local authorities, like CBOs, are also expected to be self-sustaining. As such, most local authorities impose their own tariff structure to recover all operation and maintenance costs except those relating to permanent staff salary costs.

F. Sri Lanka Specific Context

55. Meeting these challenges will require a combination of policies that fit the country's political and economic context. A socioeconomic development strategy for the next decade is set out in the sector vision. This strategy envisages a Sri Lanka that

- has an economy that marries a green environment with rapid development;
- aspires to be a stable society with a high quality of life for all people with access to a decent living, electricity, water, schooling, and health facilities;
- maintains the best of Sri Lankan culture, traditions, and long-standing global identity;
- aims to consolidate an emerging market economy integrated into the global economy and that is internationally competitive; and
- aims to have the characteristics of a middle-income economy with a knowledge-based society.

56. Within this context, Sri Lanka has a number of unique characteristics that help shape its economic and political activities including the following:

- the recent ending of a major civil conflict that has left some parts of the country in need of significant rehabilitation;
- a history of inconsistent and wildly divergent economic policies that have resulted in a reliance on the public sector to deliver most public services and a growing, but still relatively small, private sector that needs ongoing support and incentives to fully develop; and

- a significant trade deficit arising from a reliance on oil imports combined with recent pro-growth policies leading to the import of investment goods.

IV. SECTOR VISION FOR YEAR 2020

57. Looking forward, the Government of Sri Lanka has given high priority to water supply and sanitation sector development, setting a target for providing access to safe drinking water and improved sanitation to all citizens by the year 2020 (Table 1).

Table 1: Sector Targets

Year	2005	2009	2015	2020 ^a
Safe water coverage (%)	80	85	94	100
Pipe-borne water availability	29	37	44	60
Water connections (NWSDB schemes '000)	907	1,267	1,600	3,000
Pipe borne sewerage coverage (%)	2.0	2.5	3.0	7.0

NWSDB = National Water Supply and Drainage Board.

^a Projected

Source: Government of Sri Lanka, Development Policy Framework 2010, Colombo.

58. The provision of adequate water supply and sanitation services not only serves to promote national development but also relieves, at least in part, government spending on free medical and preventive health care for the thousands of people (especially children) who are easily susceptible to waterborne diseases.

59. Implementation of this vision will be via a three-pronged strategy encompassing larger cities, townships, and rural areas, each of which has its own approach.

A. Water Supply

60. According to the 2012 census, Sri Lanka's population was 20.3 million and growing at an annual rate of 0.7%. Total population is therefore expected to be 20.4 million in 2013 and 21.9 million in 2020. Since the target for pipe-borne water supply increase, about 4.0 million more people that need to be provided with pipe-borne water. As the population per household is presently around four, this implies installation of 1.0 million new water supply connections over the next 7 years. However, considering that the Vision target (see below) envisages that the 1.7 million current connections shall be increased to 3.0 million connections by 2020, then perhaps a more accurate estimate is for an additional 1.3 million new water connections to be provided over the next 7 years.

61. At the same time, some CBO systems may be incorporated into the main water supply scheme, in which case the number of CBO-managed rural piped water schemes will be reduced. Experience suggests that around 25% of the CBO schemes may be incorporated into large piped water supply schemes. Some other CBO schemes—estimated to be up to 15% of the total—are also likely to cease operation due to quality problems. This implies that up to 40% of the 550,000 existing CBO

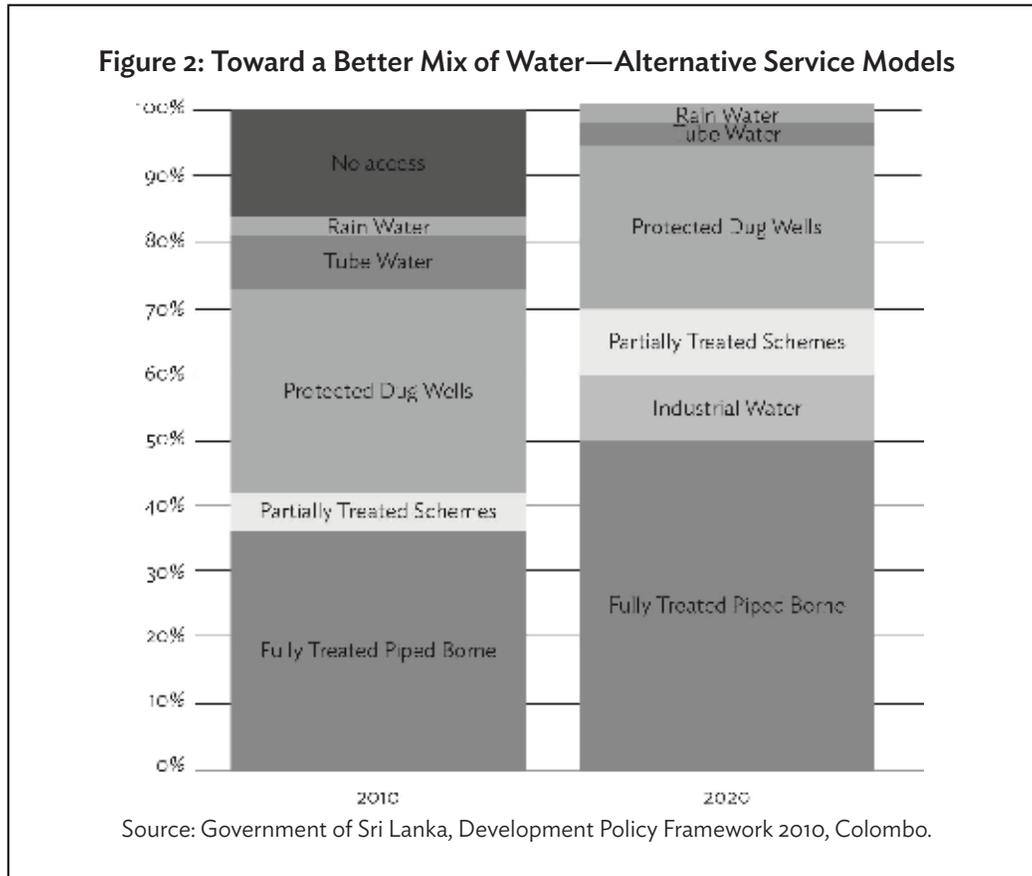
schemes may disappear. If the national water supply coverage figure of 10.5% that is presently provided by CBOs is to be maintained, then a further 220,000 connections by CBO schemes will be needed.

62. In summary, therefore, the following new connections are expected to be required between 2014 and 2020: (i) 1.29 million by the NWSDB and (ii) 0.22 million by CBOs.

63. Additional expenditures will be required to improve service quality. Of the 332 schemes managed by the NWSDB, about 60 require improvements to be made to their treatment facilities to respond to deterioration in their raw water quality. In addition, approximately 400 CBO-managed systems need new treatment facilities.

64. Economic development meanwhile will produce an increase in demand for industrial water (i.e., water required for industrial processes or cooling) which, given the aforementioned scarcity of water resources, will need to be addressed through alternative means such as the recycling of wastewater and harvesting of rainwater.

65. This strategic shift toward utilizing multiple sources of water supply is illustrated in Figure 2.



B. Sanitation

66. Sanitation technology options fall into two main domains: “on-site sanitation” and “off-site sanitation.” The majority of households in the country utilize some form of on-site sanitation system using one of four approved systems: (i) water-sealed latrines with septic tanks and soakage pits, (ii) water-sealed latrines with disposal pits, (iii) ventilated improved pit latrines, and (iv) ecological sanitation (dry compost latrines).

67. Off-site sanitation is usually used where on-site sanitation is not a feasible option, such as where housing and building densities are high (as in many urban locations) and/or the distance from point sources of water such as wells do not conform to stipulated standards given relevant soil conditions. Off-site sanitation covers a spectrum of technologies ranging from combined collection systems, pipe-borne sewerage systems with treatment, and constructed wetlands. Pipe-borne sewerage is the most commonly adopted off-site option.

68. At present, major sewerage facilities have only been developed in Colombo, Ekala, Jaela, Moratuwa, and Ratmalana. In addition, there are a number of housing schemes having individual wastewater systems. Colombo city sewerage is managed by the Colombo Municipal Council while most other sewerage systems are managed by the NWSDB. Sewerage systems installed at housing schemes are managed by individual households or, in some cases, by the NWSDB.

69. Finally, in a few secondary towns such as Chillaw, Mannar, Puttalam, and Vavuniya, septage treatment systems are being introduced. Unlike in the past, when sewage collected by vacuum truck from septic tanks was simply dumped at some remote location, the waste will now be treated. This transformation is due to population pressure—the volumes of waste being collected are becoming significant and ongoing dumping is causing major environmental issues.

70. It is estimated that the additional population that needs to be provided with a pipe-borne sewerage system is more than 1.0 million. Accordingly, some 260,000 new sewerage connections will be required over the next 7 years. The government also plans for all large and strategic cities to have centralized sewerage facilities by the year 2020. While 11 municipal councils and 4 urban councils will have pipe-borne sewerage facilities, 12 municipal councils and the remaining 40 urban councils will need septage treatment systems.

71. The government has estimated the total investment required to achieve these water supply and sanitation objectives to be about SLRs700 billion (\$5.38 billion) (Table 2). It is estimated that about 80% of this total expenditure—approximately SLRs564 billion² (\$4.34 billion)—will be applied to achieving the sector targets of 60% piped water supply coverage and 7% piped sewerage coverage by the year 2020 as well as other non-piped water and sanitation targets.

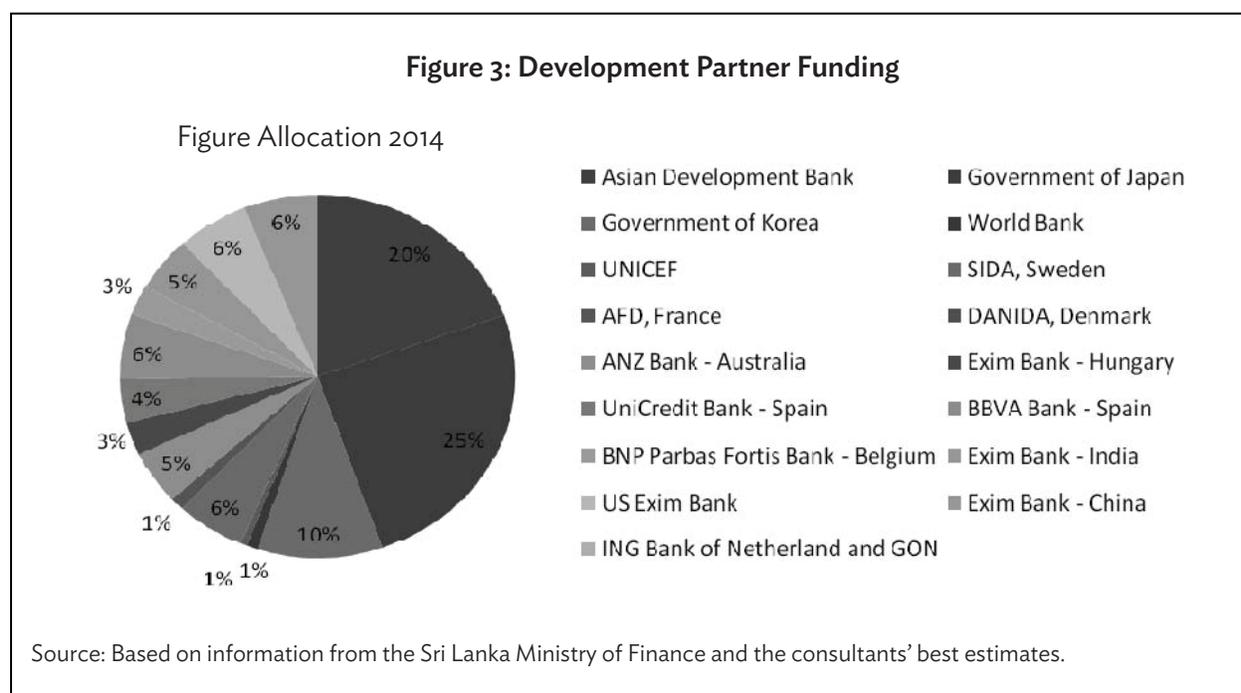
² This is the consultants' estimate based on a number of assumptions concerning key inputs such as number of connections, degree of septage coverage, extent of rural schemes rehabilitation, etc. The remaining SLRs136 billion is for other water and sanitation projects not directly contributing to targets.

Table 2: Investment Requirements by the Year 2020

Category	Investment Needs	
	SLRs Billion	\$ Million
a. Priority water supply projects to commence between 2013–2015	330	2,540
b. Projects to be funded by local banks	33	250
c. Projects identified other than (a) in 2014 estimate	105	800
d. Water supply and sewerage projects identified other than (a), (b), and (c) in 2014–2016 Public Investment Programme	214	1,650
e. Other requirements not planned to date	18	140
TOTAL	700	5,380

72. Since the government has proposed that these activities will be completed within the next 7 years, this implies that an average of SLRs100 billion per annum will be required. The government and foreign donors combined are expected to provide between SLRs35 and SLRs50 billion per annum with a further SLRs33 billion to be provided by local banks. Consequently, there will be a significant financial gap—in the range of SLRs17 to SLRs32 billion per annum—if all the programs summarized above are to be completed. This gap is expected to be filled by the private sector.

73. Figure 3 presents the forecasted level of development partner funding that will be routed through the Government of Sri Lanka.



V. STRATEGIC THEMES

74. Water supply and sewerage service provision island-wide are expected to be streamlined and delivered through the implementation of a three-pronged strategic framework encompassing larger cities, townships, and rural areas.

A. Long-Term Water Supply and Sewerage Service Needs in Cities

75. The government has developed the City and Township Development Strategic Framework as the basis for planning national infrastructure development encompassing expressways, highways, sea ports, airports, telecommunications, and information technology.

76. This strategic framework prescribes how all urban areas within the country are expected to be developed. Table 3 summarizes this urban development strategic framework. The key elements are as follows:

- Three large cities (Colombo, Hambantota, and Trincomalee) are to be developed as “global business cities.”
- Jaffna city is to be developed as a “diversified city.”
- Nine other cities will be developed as “strategic cities.”
- All other municipal councils and urban councils will be developed as “emerging cities.”
- Small towns in *pradeshiya sabhas* (i.e., non-municipal councils or urban councils) will be developed as “urban service centers.”

Table 3: City and Town Development Strategic Framework

City Order	Development Strategy	Cities
Large cities	Global business city	Colombo
		Hambantota
		Trincomalee
Strategic cities	Diversified city	Jaffna
	Heritage city	Kandy
		Galle
	Ancient city/ historical	Anuradhapura
		Polonnaruwa
		Logistical corridors
	Tourism corridors	
Ratnapura		
Nuwara Eliya		
Secondary cities	Emerging cities	Batticaloa
		Municipal and urban councils except above
Urban service centers	Pura neguma	Small towns under <i>pradeshiya sabhas</i> (local authority other than urban and municipal councils)

Source: Government of Sri Lanka, *Public Investment Strategy 2014–2016*. Colombo.

77. The large cities (Colombo, Hambantota, Trincomalee, and Jafna) as well as the strategic cities of Kandy, Galle, Anuradhapura, Polonnaruwa, Dambulla, Kurunegala, Ratnapura, Nuwara Eliya, and Batticaloa and all other municipal and urban councils are expected to attract a substantial portion of the increased economic activity plus population movement and growth in the coming years.

78. Water supply and sewerage related infrastructure assets will therefore need to be created to cater to the long-term and growing demands of these cities through the implementation of major schemes that can create economies of scale. Part of the nondomestic water requirements of these cities will be met through the recycling of domestic wastewater, and it is planned that all these cities will have centralized sewerage systems by 2020.

B. Needs in Small Townships

79. Many small townships are expected to be revitalized so as to function as local service centers to the hinterland. Water supply and sanitation services in these towns will have to be fully upgraded and augmented to a level appropriate to this purpose and will be expected to be managed locally. Schemes in towns that have already been initiated in this regard include Valachchenai, Anamaduwa, Pathadumbara, Dambadeniya, Padaviya, Thambuththegama, Warakapola, Badalkumbura, and Alawwa-Polgahawela.

C. Needs in Rural Water Supply and Sanitation

80. The principal means of water provision in rural areas is protected dug wells. However, depending on the population density of villages, small scale pipe-borne schemes may also be implemented under the purview of their respective local authorities.

81. In general, priority will be given to enhancing the safe water coverage in districts where coverage is below the national average, which include main cities, emerging townships, and rural areas. Nonrevenue water levels are to be reduced by rehabilitating distribution networks and enhancing water quality testing facilities for all types of water sources. Existing community-based schemes are to be sustained through institutional and technical support.

D. Key Policy Themes and Strategic Directions

82. Some of the key policy themes that are expected to underlie Sri Lanka's water and sanitation infrastructure development, summarized in Table 4, are as follows:

Table 4: Strategic Direction for Key Policy Themes

Policy Theme	Strategic Directions
Governance and institutional framework	<ul style="list-style-type: none"> • Acknowledge the need for widespread infrastructure and asset development at all levels. • Accelerate adoption of community-based systems. • Undertake capacity development initiatives for institutions active in the sector. • Introduce sector regulation. In the long term this should involve establishing an independent regulatory body. An interim measure will be to establish a regulatory cell within the National Water Supply and Drainage Board.
Water as an economic good:	<ul style="list-style-type: none"> • Financial stability • Cost-reflective pricing should form the basis of water and sanitation service provision. • Regular tariff adjustments combined with increased numbers of connections are expected to result in improved financial sustainability for most utilities. • Larger utilities are looking to utilize blend of financing sources but remain reliant on central government and development partner support. • Operational efficiency • Reduce levels of nonrevenue water. • Improve energy efficiency. • Utilize utility staff more effectively. • Emerging and sustainability issues • Ensure particularly needy and marginalized groups are involved in, and benefit from, water and sanitation programs. • Develop appropriate programs for the sustainable management of water sources and their reserves and catchments. • Adopt innovative approaches to water and sanitation services.
Private sector engagement	<ul style="list-style-type: none"> • Consider the full spectrum of private sector participation models. • Provide appropriate incentives to project developers and financiers. • Any private sector intervention should fit into an overall sector reform plan and only replace the public sector where a cost-benefit appraisal demonstrates a need.

83. The key considerations are:

- **Governance and institutional framework.** Policy, planning, financing, and operational activities in the water and sanitation sector are presently—and will likely continue to be—dominated by the public sector. However, in many instances public sector organizations fail to provide an appropriate framework of policies and practices for effective sector management, resulting in inconsistent policy making, weak or misguided planning, and the inefficient application of financial and human resources. Public sector organizations need to ensure that properly skilled individuals are empowered to make decisions within a governance framework that is transparent and accountable. Furthermore, such decision making ought to be focused on enhancing the efficiency of water and sanitation utilities so that national goals such as improving the environment, protecting public health, and providing good quality service to customers at a reasonable price can be achieved.
- **Water as an economic good.** Fresh water is a finite and vulnerable resource essential to sustain life and ecosystems and, as such, has an economic value that needs to be, but is not always, recognized. Attaching a value to water resources encourages proper management to help improve sustainability. Proper management has a number dimensions including the following:
 - **Financial stability and planning.** Water and sanitation utilities need to earn sufficient income to cover costs associated with rehabilitation, maintenance, and extension of the existing asset base to better serve their customers. Furthermore, the water and sanitation sector is a highly capital-intensive business and a significant level of investment will be

- required to meet national goals and targets. Careful planning of this spending can appreciably reduce costs and free up resources for alternative use.
- **Operational efficiency.** Water utilities cannot rely solely on raising revenues from their customers to finance their operations. They also need to continually improve operational efficiency—such as through reducing water losses—to help preserve scarce resources and enhance their financial situation.
 - **Sustainability.** Utilities need to act in an environmentally sensitive manner (e.g., through complying with effluent standards) and be cognizant of resource management (e.g., reducing the rate of extraction of surface water and groundwater).
 - **Private sector engagement.** The water and sanitation sector needs to recognize and respond to the differing needs of its users. In many instances public sector organizations are able to meet this challenge, but where they are not, some form of private sector engagement may provide the solution. Furthermore, the private sector may be able to offer innovative solutions for dealing with challenges such as sourcing financing, meeting the specific needs of particular customer groups, and offering integrated solutions.

VI. GOVERNANCE AND INSTITUTIONAL FRAMEWORK

A. Existing Arrangements

84. The water supply and sanitation sector is almost wholly owned and managed by government entities. The principal organizations and sectors active in the sector include (i) the Government of Sri Lanka, through various ministries and state agencies, (ii) provincial councils, (iii) local authorities, (iv) Colombo Municipal Council, (v) the NWSDB, (vi) nongovernment organizations, (vii) community-based organizations (CBOs), (viii) the National Community Water Trust, (ix) the private sector, and (x) plantation companies. The key central government ministry is the Ministry of Urban Development, Water Supply and Drainage while the agency principally responsible for the development, operation, and maintenance of water supply and sanitation is the NWSDB, which reports to the ministry.

85. **National level agency.** Established under an act of Parliament in 1975, the NWSDB (i) supports sector development particularly through provision of technical expertise to sector partners, training, and capacity building; (ii) develops macro-level development and investment plans for piped water and wastewater systems; (iii) is responsible for the design, construction, and operation of small, medium, and major pipe-borne water supply and sanitation systems for smaller towns and cities; (iv) builds partnerships in operational areas to enhance service levels and build the capacity of small-scale operators to ensure sustainability; (v) provides support through rural water and sanitation units to CBOs and local authorities to ensure proper operation and maintenance of rural water supply schemes; (vi) maintains a database on access to water supplies, water quality, etc.; and (vii) promotes and is actively involved in water source and catchment protection programs.

86. The NWSDB's Corporate Plan 2012–2016 sets out seven organizational goals: (i) to increase water supply and sanitation coverage, (ii) to improve business efficiency, (iii) to improve service to customers and promptly attend to public complaints, (iv) to promote information and communication technology solutions as a catalyst for business growth, (v) to ensure greater accountability and transparency, (vi) to promote human resources development, and (vii) to facilitate safe drinking water supply and sanitation to rural underserved communities.

87. In the 38 years since its inception, the NWSDB has developed into a large organization with more than 10,000 employees, having 11 regional support centers at the provincial level for overall

management, 24 regional offices for operation and maintenance of 323 water supply schemes, and 19 district support units to provide technical assistance for rural schemes.

88. The NWSDB is a vertically integrated organization headed by a general manager who reports to a board of directors. Each regional support center is headed by a deputy general manager who reports to the general manager through three additional general managers. The autonomy of the NWSDB is controlled and all staff numbers and salaries are subject to approval by the Ministry of Finance. The organization remains centralized with limited functions being transferred to the regional support centers. Annual funds are allocated to the NWSDB through a vote approved by Parliament to the Ministry of Urban Development, Water Supply and Drainage.

89. **Subnational level.** At the subnational level, provincial councils and local authorities, such as municipal and urban councils as well as *pradeshiya sabhas* and CBOs, have been delegated responsibility for the delivery of water and sanitation services in certain areas. The functions of some of the agencies are devolved, while others remain centrally managed. In certain instances, there is an overlapping mandate of agencies and target clientele and only limited coordinating mechanisms exist between agencies and decentralized units.

90. The primary role of the provincial councils is to ensure equitable allocation of resources and the quality and standards of services. Local authorities include municipal councils, urban councils, and *pradeshiya sabhas*. Local government water and sanitation utility providers vary in size but most are small. The notable exception is Colombo Municipal Council, which is responsible for managing the greater Colombo sewerage system, including the operation and maintenance of piped sewers serving 80% of the city area, collection of septage from individual and communal septic tanks, and disposal of large volumes of wastewater transferred to Colombo for this purpose by a number of industries.

91. The water supply systems of Kandy, Kurunegala, Nuwara Eliya, and Jaffna are managed by municipal councils; Kuliyaipitiya by urban councils; and a few water supply systems by *pradeshiya sabhas*. Like the provincial councils, local authorities ensure equitable allocation of resources and the quality and standards of services. They also determine tariffs for the water and sanitation schemes they manage.

92. **Other agencies—community-based organizations.** CBOs are rural groups or community organizations responsible to their beneficiary communities for the provision and sustainable management of water supply and sanitation facilities. Registered as a trust, development society, nongovernment organization, or company under the Companies Act, CBOs are authorized to raise funds, obtain loans, receive grants, develop services, levy tariffs and manage water and sanitation facilities subject to regulations and standards set by the Government, provincial councils and local authorities.

93. CBOs play a major role in water supply operation in Sri Lanka with CBO-managed water supply and sanitation representing 10.5% of water supply piped coverage in Sri Lanka. Most rural water supply schemes are managed by CBOs.

94. Pipe-borne rural water supply is normally managed through institutional arrangements whereby the CBO, the local authority, and the technical service provider operate within a tripartite agreement stipulated in a memorandum of understanding in most, but not all, cases.

95. **Other agencies—National Community Water Trust (NCWT).** To achieve sustainable CBO service provision, an efficient chain of service support functions needs to be provided. The NCWT was therefore established by the Government of Sri Lanka in 2010 to (i) support and guide CBOs to protect, maintain, and upgrade capital assets created by the government or any other organization; (ii) enhance the sustainability of water supply and sanitation services provided; and (iii) enhance the capacities and retain the momentum of communities.

96. The NCWT's board is made up of officials of the Ministry of Urban Development, Water Supply and Drainage and the NWSDB and provides a good forum to deal with cross-cutting issues in the rural water supply and sanitation sector. At present it is funded mainly by the central government. The NCWT is still at a stage where it is finding a role to play in the sector amidst different institutions that already have some overlapping responsibilities. However, the creation of the NCWT is a positive development for the sector and the focus should be on how best to carve out a well-defined role for the NCWT during the coming years.

97. **Other agencies—nongovernment organizations (NGOs).** NGOs are nonprofit institutions registered with a relevant authority and engaged in providing services to communities. Their scope extends to a variety of functions including provision of water and sanitation facilities and hygiene education. They are not, however, involved in the operation and maintenance of water supply schemes. Sector development activities initiated by NGOs are expected to conform to and contribute toward the development plans of the government, the NWSDB, provincial councils, and local authorities. It is the responsibility of the NGO concerned to obtain clearance from the appropriate authorities prior to commencing any sector development activity.

98. **Private sector.** Private sector individuals and corporate bodies provide facilities and services subject to terms and conditions specified by the regulatory institutions under which they are registered. They are accountable to the communities they serve and to the relevant regulatory institutions. Current private sector involvement in the water sector is restricted to bottled water distribution. In the sanitation sector, private firms are providing de-sludging services to customers with septic tanks.

99. **Plantation companies.** Tea plantations were established in the hill country during British rule nearly 150 years ago and have become major earners of foreign exchange for the country. The terrain and land availability in plantation areas do not favor large-scale development of common amenities. Water supply systems in the estate sector are characterized by numerous small systems using a large number of sources. These are maintained by the plantation companies and monitoring and technical advice is provided by the Plantation Housing Development Trust, although this has very limited funds. Sanitation facilities consist of latrines with on-site disposal, and watercourse pollution from these is common. The performance of plantation water schemes is generally not monitored or documented by the authorities.

B. Sector Governance and Regulation

100. There is currently no independent regulatory institution for water supply and sanitation in Sri Lanka, despite several attempts to establish one. In its 1999–2005 Corporate Plan, the NWSDB identified the need to create a regulatory body to help ensure the quality and reliability of services, establish reasonable tariffs for water and sewerage services and safeguard stakeholder interests. Under the Policy Reform Programme assisted by ADB, the design of such a regulatory body was finalized and a draft statute prepared.

101. It was intended that the regulator would (i) advise the government on policy relating to water and sanitation with a view to improving services and promoting efficiency; (ii) license service providers to connect, provide, and maintain water services to consumer premises within the area for which a license is granted; (iii) review contents of private sector service providers agreements; (iv) review and approve tariff and other changes; (v) establish and monitor service quality and performance indicators; (vi) promote consumer rights and obligations; (vii) facilitate public education, consultation, and awareness; and (viii) undertake dispute resolution and conduct or commission surveys and research studies.

102. In 2003, a water service reform bill was published in the government gazette and presented to Parliament for a vote. This bill sought to regulate “water services” and to empower the regulatory body for the energy sector—the Public Utilities Commission of Sri Lanka—to also regulate the water and sanitation sector and carry out the functions listed above. However, concerns that the supply of pipe-borne water was one of the functions of local authorities and part of the powers vested to provincial councils ultimately resulted in a Supreme Court decision not to go ahead with the bill without obtaining the concurrence of each provincial council.

103. Subsequently, amendments were suggested to the NWSDB Act to give powers to the Public Utilities Commission to regulate water service provision by the NWSDB and any private operators. These initiatives were also unsuccessful due to objections from the trade unions of the NWSDB.

104. Finally, strengthening of internal monitoring and regulation systems was suggested in 2010 and ADB assistance was requested under the ADB technical assistance project Institutional Strengthening for Decentralized Service Delivery in the Water Sector (TA 7078-SRI). The recommendations in this study are likely to form the basis of future regulatory arrangements as described below.

105. A number of institutional and governance reforms will be needed to help meet the government’s objectives and targets for the water and sanitation sector. Implementing these reforms will require two forms of support for water and wastewater utilities: sector-wide governance support and organization-specific support. Organization-specific support will encompass both asset development and capacity development initiatives.

106. In terms of asset development, all water and sanitation organizations are presently undertaking significant levels of investment in order to meet the sector goals. Two of the larger investment programs are being undertaken by the Colombo Municipal Council (sewerage asset rehabilitation and extension in greater Colombo) and the NWSDB (reduction of nonrevenue water in Colombo city in particular). In terms of sanitation, a program of installing pipe-borne sewerage projects into 16 major urban areas across the country over the course of the next 7 years, as identified in the 2014–2016 Public Investment Programme.

107. In rural areas, a number of strategies are planned for extending water supply service coverage. First, city water supply schemes will extend to adjacent rural areas. Around 50,000 families are projected to benefit from this expansion in the 2014–2016 periods. Second, safe water coverage in rural areas, in particular the dry zone, will also be improved through a number of government interventions.

108. Finally, there is a plan for an additional 220,000 water supply connections to be provided through systems managed by community-based organizations (CBOs). For the purpose of efficiently allocating scarce financial resources, a priority list of districts in which rural water supply projects will be implemented has been created although it will be subject to ongoing updates as new sources of funding become available.

109. To help ensure the sustainability of existing CBO systems, schemes are categorized into four groups:

- (i) **Reliable in terms of both water quantity and quality.** For these, the NWSDB will expand water quality testing and surveillance facilities to help assure reliability.
- (ii) **Not reliable in terms of either quality or quantity.** For these, one of two strategies will be adopted. Those located close to, or within, urban water supply schemes will receive—where possible—bulk supply water from the urban system. Isolated rural schemes will receive national government funding to identify and utilize new water sources and to construct associated new water treatment facilities.
- (iii) **Unreliable quantity.** They will receive technical support from the NWSDB to help improve yields. If required, additional boreholes may also be constructed using government funding.
- (iv) **Reliable in terms of quantity but not quality.** About 400 schemes have been identified as falling into this last category, and they will be provided with additional water quality testing and treatment facilities.

110. More generally, the National Community Water Trust, which was established to support the CBOs, is to be further strengthened to help ensure that CBOs are able to manage their water supply systems in a satisfactory manner and to also assist them in taking steps to solidify their status such as through clarifying the legal ownership of water assets. The rural water supply units of the NWSDB are also to be strengthened to provide a greater level of support to the CBOs.

111. A large number of capacity development initiatives are already under way, many of which involve the NWSDB. These include programs funded by development partners focusing on issues such as the adoption of regional benchmarking and enhancing regional business planning as well as internally funded schemes contained in the NWSDB's 2014-2016 Corporate Plan, such as improving customer service procedures, promoting the use of information and communication technology (ICT), improving financial controls, and promoting better human resources development.

112. Two components of the ADB technical assistance project Institutional Strengthening for Decentralized Service Delivery in the Water Sector relate to improving the performance of the NWSDB:

- (i) *Regional benchmarking* led to the collection, analysis, and comparison of key provisional performance data; this serves as an effective management, monitoring, and planning tool to help address localized problems and improve overall performance.
- (ii) Regional business plans were prepared for provision of safe drinking water and enhancing NWSDB service levels. A corporate business plan for the NWSDB was prepared by the Merchants Bank of Sri Lanka, and through this business planning process it emerged that a regional tariff was required.

113. A number of organizational improvements are also planned in line with the NWSDB's Corporate Plan 2014-2016, including the following:

- *Improve service* to customers through developing and implementing procedures to attend to customer complaints.
- *Promote ICT solutions* as a catalyst for business growth through upgrading in-house ICT capacity; implementing enterprise resource planning solutions; establishing a paper-optimized

ICT culture; implementing online real-time customer services; and improving the flow of management information and coordination among divisions to enable planning and monitoring activities.

- *Ensure greater accountability and transparency* through improving financial control to ensure proper management of funds; achieving better performance of regional support centers with improved services; and meeting the debt service obligation of subsidiary loan agreements with the Government of Sri Lanka.
- *Promote human resources development* through achieving performance excellence through changes in employee attitudes and organizational culture; building expertise within employee groups for different subject areas; improving work processes in all divisions according to their internal charter; and taking action to motivate employees.

114. In addition, there are proposals for institutional reforms to decentralize the NWSDB further at the provincial level and also to outsource delivery of specific schemes. The World Bank proposed the following program of actions to deliver an improved water and sanitation sector:

- Develop a performance agreement between the NWSDB and the Government of Sri Lanka that would provide clear performance targets and allow management flexibility to deliver against those targets. As part of this agreement, specific incentives should be included to reward management and staff for achievement of targets.
- Consider increased decentralization within the NWSDB at the provincial level allowing regional support centers to take on greater responsibility for financial and technical performance within the province. The NWSDB head office would provide central services and backstopping.
- Consider piloting ring-fenced provincial entities responsible for ensuring service delivery across all subsectors with increased accountability to the province while remaining part of the NWSDB on which they would rely for central services and backstopping.
- Initiate a program to outsource service delivery of specific schemes and/or activities through a competitive public-private partnership process on a pilot basis, for example, nonrevenue water reduction.

115. The Colombo Water Supply Service Improvement Project is a part of the Greater Colombo Water and Wastewater Management Improvement Investment Programme. The program comprises three tranches, two of which are related to water services improvement. The Colombo Water Supply Service Improvement Project aims at delivering better urban water supply services in an effective and efficient manner by reducing nonrevenue water, mainly in Colombo.

116. The investment envisioned under the project includes rehabilitation or replacement of 520 km of pipes and replacement of over 30,000 defective water meters. Expected results include a reduction of nonrevenue water in Colombo city from 48% in 2013 to 20% by 2020 and in critical areas in particular from 60% in 2013 to 18% in 2020. Also, enhancements in the institutional and operational capacity of the regional support center (western central) will result in 100% 24-hour quality water supply in Colombo.

117. Local authorities are also the subject of multiple knowledge and capacity building programs. Examples include the following:

- support for Kandy Municipal Council under the World Bank-funded Strategic City Development Project, including a training program for council staff, tariff development, budget preparation and development of cost recovery strategies, and establishment of zone office consumer complaint centers and a call center;

- ongoing technical assistance for Kurunegala Municipal Council from the regional support center (north western) of the NWSDB; specifically, under the Greater Kurunegala Water Supply and Sanitation Project, joint training is planned for council and the NWSDB staff on nonrevenue water, operation and maintenance of treatment plants, maintenance of polyethylene pipe networks, geographic information systems, water resource management, etc.;
- provision of ongoing training for Nuwara Eliya Municipal Council staff by the NWSDB on nonrevenue water reduction, billing and collection, construction management, etc.; the NWSDB has also prepared a nonrevenue water reduction master plan for the Nuwara Eliya water supply system; and
- various capacity development activities for Jaffna Municipal Council under the ADB-funded Jaffna Kilinochchi Water Sanitation Project, including improvement of accounting and financial management and billing functions.

118. As mentioned, ADB is supporting the Colombo Municipal Council (CMC) in reforming its wastewater organizational structure as part of the Greater Colombo Wastewater Management Project. Specifically, a wastewater section and a drainage section will be formed within the existing drainage department, a process that will likely take several years. The council also intends to strengthen its institutional, operational, and financial capacity including (i) introducing a volume-based wastewater tariff; (ii) introducing a number of financial improvements including building up and implementing a cost recovery mechanism, implementing a performance -based budgetary system, and creating a dedicated accounting code and an exclusive budget line for sewerage operations; (iii) introducing an asset management system; and (iv) institutionalizing a customer database and services.

119. Despite the major role played by community-based organizations (CBOs) in water supply operations, efforts made for CBO capacity development, to date, have been minimal. Major needs exist in relation to technical know-how, financial management, and leadership training. Most CBOs run with the support of capacity development programs undertaken during the implementation stage of water supply schemes, but there has been no systematic approach for ongoing capacity development once this training is completed. Until recently, no formal institutional arrangement has existed to provide capacity building support to CBOs except for the technical assistance provided by the regional support centers (RSCs) of the NWSDB. This situation is now changing with the establishment of the National Community Water Trust to provide more generic support.

120. Under the ADB-assisted Third Water Supply and Sanitation Sector Project, by-laws were prepared for *pradeshiya sabhas* to provide legislative support to CBOs. So far, these by-laws have been adopted by the northern and eastern provinces.

121. Finally, as discussed above, there is presently no independent regulatory institution for the water supply and sanitation sector in Sri Lanka despite several past attempts to establish such a body. A set of proposals for strengthening internal monitoring and regulation systems were made in 2010 but were not acted upon. Further assistance in this regard was requested from ADB under the technical assistance project Institutional Strengthening for Decentralised Service Delivery in the Water Sector (TA 7078-SRI). The project report included a series of recommendations based on its key finding that it will be difficult for the NWSDB to be an effective regulator since it remains the central service provider across the country. The existing NWSDB culture and structure is fraught with conflicting priorities even in areas where the regulator has no direct responsibility. Moreover, regional support centers do not have sufficient authority and resources or the necessary commercial and financial systems to fully improve their own operations. Recommendations arising out of this finding included the following:

- The NWSDB should formulate policy statements incorporating objectives and linkages for setting up an internal monitoring and regulatory unit including its mandate, functions, and authority. The specific functions of this internal monitoring and regulatory unit would be focused on initiating institutional and organizational reforms, the institutionalization of a web-based monitoring system, and regulatory functions starting with the selection of specific key performance indicators. The internal monitoring and regulatory unit would be referred to as a regulatory cell. Its initial activity would be (i) setting up norms, targets, and standards of performance; and (ii) collecting and gauging the monthly performance of regional support centers based on key performance indicators set in monthly monitoring sheets or templates. Performance analysis could be based on time series comparison and/or comparison with a norm, the industry average, or with business plan targets.
- To prepare the NWSDB to undertake the priority activities in a 2-year program designed specifically for the regulatory cell, there would be capacity building workshops, coaching sessions, and parallel activities provided under the technical assistance. These activities would strengthen institutional and technical understanding of roles and functions and encourage brainstorming among regional support center monitoring coordinators and other key proponents.

VII. FINANCIAL STABILITY

A. Water and Wastewater Tariffs

122. In formulating a water tariff, the costs associated with operating, maintaining, and extending water and wastewater networks as well as achieving some minimum levels of service all have to be taken into account. Relevant costs include system operation and maintenance expenses, depreciation of plant and equipment, and repayment of loans. Consideration also needs to be given to efforts to minimize these costs through actions such as nonrevenue water reduction, energy conservation, and effective staff utilization. Finally, the utility itself may also wish to earn a return on its assets in addition to simply seeking to cover its operating costs.

123. If the consumer base is sufficiently large, with a significant proportion of higher-consumption customers who may be expected to pay higher charges, then cost recovery becomes more viable and may even allow some customer groups—such as low-consumption domestic customers—to pay a relatively low tariff. Financial viability is also assisted by ensuring that the entire customer base is billed and bills are paid promptly.

124. A dependable source of safe water and the provision of effective wastewater facilities are services that are valued, and it has been shown that customers are willing to pay for such benefits. Higher levels of consumption can also be charged at progressively higher rates. However, there is a limit to this willingness to pay. Various studies have shown that the affordability of water becomes limiting when the cost amounts to approximately 5% of household income.

125. Water tariffs applied to domestic customers increase in line with consumption levels so as to encourage water conservation. Charges for low levels of water consumption (up to 15 m³) are relatively low, meaning that consumers can enjoy a “lifeline” level of water consumption at very little cost.

126. The domestic tariff structure applied in 2005 levied a single charge for poor and rich consumers alike. This was changed in the 2009 and 2012 with the introduction of a new category of

“Samurdhi” consumers, defined as customers with low levels of income. The bill for a non-Samurdhi consumer is presently around 150% of the bill faced by Samurdhi consumers for up to 15 m³ of water consumption.

127. In the 2005 tariff structure, the commercial to domestic tariff ratio was 9:1 for 20 m³ of water consumption. However, in 2009 and 2012, the cross-subsidy between commercial and domestic consumers was reduced with the result that the ratio dropped to 3.4:1.

128. A sewerage tariff has been introduced for all sewerage schemes except for that of the Colombo Municipal Council (CMC). The current sewerage tariff was revised in 2012 for consumers connected to all sewerage systems or networks owned, operated, and maintained by the NWSDB. The sewerage tariff utilizes an increasing block structure based on water consumption levels plus a monthly fixed charge.

129. As mentioned, the CMC does not presently apply a sewerage tariff. Instead, a portion of the property tax receipts are allocated to the Drainage Division to help cover its costs. CMC residents who do not receive sewerage services (living in so-called “undeveloped areas”) pay 10% lower property tax than those who do receive a sewerage service. There is no way of determining to what degree the approximately SLRs3 billion in property tax revenue the CMC allocates to help cover sewerage service costs compares with the Drainage Division’s actual costs.

130. This uncertainty is one of the fundamental problems of using a general property tax to charge for sewerage services. In any event, applying a general levy of this kind is inherently unfair—those who utilize the sewerage system less pay the same amount as those who use it more.

131. The CMC is presently developing a sewerage tariff with the expectation that it will be introduced in 2016. The precise form of the tariff has not yet been determined, but it is likely to be similar in many ways to the approach adopted by the NWSDB. Specifically, (i) the tariff will include both a fixed and a variable charge, (ii) the variable sewerage charge will be levied on the basis of the volume of water consumed by each customer, and (iii) customers within a particular consumer category (e.g., domestic, commercial) will face the same structure and level of tariffs.

B. National Water Supply and Drainage Board Financial Situation

132. Since making a pre-tax loss in 2008, the NWSDB earned an operational surplus each subsequent year, reaching SLRs3,520 million in 2011 before falling back to SLRs3,168 million in 2012. The decline in 2012 was due to the lag time between a 25% salary increase provided to staff that came into force in January 2012 and a corresponding tariff increase that only came into force in October 2012. In 2013, forecast operational revenue was SLRs18.4 billion and forecast operational expenditure was SLRs14.0 billion, giving an expected operational surplus of approximately SLRs4,400 million. Notwithstanding these good results, the organization faces ongoing problems servicing its debt and so, on a pre-tax basis, the NWSDB makes a loss.

133. Between 2007 and 2013, the NWSDB’s total service connections increased from 1.1 million to 1.7 million, representing an average annual increase of about 9.7%. For planning purposes, it is assumed that connections will increase at an average of 8.0% per year for the foreseeable future. If it is also assumed that a 25% tariff increase will be permitted every 3 years, the NWSDB’s debt service requirements are expected to account for only about 30% of forecast revenues, leaving sufficient funds to cover projected operational and rehabilitation costs and thus ensure financial stability.

134. The financial stability of the CMC is somewhat more difficult to assess as it does not presently charge a separate tariff in relation to its sewerage services. Anecdotal evidence suggests that some 10% of the property tax is informally earmarked to cover sewerage-related costs. If that were the case then the 2012 allocation would be approximately SLRs251 million, which was only about 79% of the Drainage Division's costs for delivering sewerage services for that year.

135. Local authorities, municipal councils, community-based organizations, and other local service providers typically apply a similar level of tariffs to those levied by the NWSDB with some adjustment for local cost conditions. Most of these local service providers remain financially sustainable. This is in large part due to the central government providing grant funding for system rehabilitation and extension, meaning the utilities have little or no debt to repay.

VIII. IMPROVING OPERATIONAL EFFICIENCY

136. Among a range of operational efficiency measures available to Sri Lankan water and sanitation utilities, three have the greatest impact potential: reduced levels of nonrevenue water, improved energy efficiency, and improved personnel utilization.

A. Nonrevenue Water Reduction

137. The NWSDB's efforts to provide safe drinking water to its customers are being confounded by high levels of water loss, reducing both revenues and service levels due to low pressures and/or intermittent supply. To help compensate for the revenue losses, the NWSDB has had to significantly increase water tariffs, placing an additional, unfair burden on customers. Reducing these losses would provide a net benefit to both the NWSDB and its customers. The problem is of particular importance in Colombo.

138. The Colombo city water supply system was managed by CMC for over 100 years until the NWSDB assumed control of operations in 2001. However, the NWSDB had been addressing the problem of water losses since the early 1980s. Specifically, the utility had replaced galvanized iron customer connections with polyvinyl chloride (PVC) pipes, replaced defective water meters, installed meters on unmetered connections, increased efforts to detect water theft, reduced incidences of estimate-based billing, and eliminated duplicate and erroneous bills from the billing system. Since the NWSDB formally took over management of the Colombo water supply system, further improvements have been made to the distribution network resulting in a reduction in intermittent supply that was prevalent in most areas and the provision of a better quality of service at sufficient pressure.

139. Another initiative was introduction of the Randiya Program, through which common outlets are disconnected and replaced by individual connections to the underserved populace on concessionary terms. Most of the occupants of these settlements are daily wage earners, so mobile offices were established in large settlements in 2012 to make it more convenient for these individuals to apply for water supply service and to make required payments.

140. Some 1,571 underserved settlements have been identified in Colombo. In the longer term, the government plans to relocate these settlers to locations outside Colombo city. However, in the short term, the NWSDB continues to implement the Randiya Program as the provision of individual connections to settlers results in improved hygiene conditions and an enhanced quality of life.

141. Tenement garden areas are characterized by groups of around five households, rather than individual households, utilizing a connection. A decision was therefore made to provide common outlets or yard taps for each group of households instead of seeking to provide individual connections. These common outlets are metered and charges are based on a concessionary rate to encourage regular payment by the beneficiaries. This practice was introduced in 2010 and by the end of 2012 about 979 common outlet committees had been established.

142. A series of steps have been undertaken by the NWSDB to help reduce nonrevenue water levels. Key initiatives include the following:

- **Carrying out a customer premises survey.** Visits to customer premises were initiated in 2009 with the objective of identifying and addressing all factors that may be contributing to nonrevenue water within the customer's premises. This action resulted in system pressure improvement, a drop in nonrevenue water in selected areas, and an increase in water consumption. The survey showed that, even in the "best" residential areas, unmetered and/or unauthorized water consumption was occurring.
- **Empowering operations and maintenance staff to carry out nonrevenue water reduction.** A grant project funded by the Japan International Cooperation Agency, Capacity Development in Nonrevenue Water Reduction in Colombo City, sought to address key factors contributing to nonrevenue water in two zones in the city: Borella and Kotahena. Specific actions taken included surfacing buried valves and either making them operational or replacing them; replacing bundled pipes; and identifying the condition of pipes and subsequently updating asset maps. It was discovered that deteriorated pipelines contributed most heavily to water losses, and following the replacement of cast iron pipes, nonrevenue water was reduced by almost 30%.
- **Addressing the deteriorated pipe issue** in other parts of the city through a project implemented in late 2010 in the central business district to replace distribution cast iron (CI) pipes less than 6" (150 mm) in diameter with un-plasticized polyvinyl chloride (uPVC) pipes and to convert all customer connections to newly laid polyethylene pipelines. Nearly 56.5 km of distribution pipes and 14,000 customer connections were replaced.
- **Commencing metering and billing** of all previously free water outlets in the city in 2013.
- **Completing an assessment of the reasons for the high level of nonrevenue water** in the Greater Colombo area as well as existing mitigation practices. The study, completed in 2013, recommended an updating of geographic information systems (GIS), the designation of 38 distinct management areas,³ the rehabilitation of smaller-diameter galvanized iron pipelines, and carrying out a condition assessment of larger diameter pipelines in the Colombo.

143. In 2012, ADB agreed to provide a multitranche financing facility for nonrevenue water reduction. The first two tranches will finance network rehabilitation to reduce physical losses supported by institutional and management capacity development initiatives.

³ One increasingly common principle of managing a large water network is to subdivide it into a number of areas, typically of between 500 and 3000 connections, each established area having a well geographical and/or hydraulic boundary. Such areas are referred to as "distinct management areas" or, more commonly, district meter areas (DMAs). Ideally each DMA has a single source of supply to maximize accuracy of data, with a strategically placed and suitably sized meter installed capable of accurately measuring flow into the area. A network of DMAs is usually easier to manage than a large singular network. Utility operators are able to monitor and analyze the pressure and flow data separately for each area. Analysis of the data from a DMA, particularly night flow minimums, allows greater sensitivity in determining if consumption has progressively or suddenly increased, indicating undetected leakage or a burst, thus benefiting nonrevenue water detection and reduction. (Loveday, M. and J. Dixon. 2005. DMA Sustainability in Developing Countries. In *Proceedings of Leakage 2005*. Halifax, Nova Scotia.)

144. One tranche will target system rehabilitation in the northwest part of the city and will entail (i) provision of a consultant to manage nonrevenue water reduction activities, (ii) replacement of nearly 280 km of distribution pipelines, (iii) replacement of 17,000 defective customer meters, (iv) installation of 5,000 automatic meter reading meters on customer connections, (v) formation of district meter areas (DMAs) in the target area, (vi) replacement of nearly 51,000 customer connections with polyethylene pipes, (vii) validation of GIS, (viii) establishment of a nonrevenue water performance audit cell, (ix) construction of a dedicated nonrevenue water office for the city, (x) implementation of a public awareness campaign, and (xi) staff training and capacity building. The estimated cost of the activities to be undertaken under the first tranche is \$112 million.

145. The second tranche will cover the southeast part of the city and is expected to cost \$114. Components include (i) provision of a consultant to manage nonrevenue water reduction activities, (ii) replacement of nearly 242 km of distribution pipelines, (iii) replacement of 14,800 defective customer meters, (iv) formation of DMAs in the target zone, (v) replacement of nearly 44,500 customer connections with polyethylene pipes, (vi) validation of GIS, (vii) implementation of a public awareness campaign, and (viii) training and capacity building.

146. In 2013, ADB assisted the Project Management Unit with a small-scale capacity development technical assistance program to help it develop its own nonrevenue water reduction strategies and to further strengthen the expected outcomes of the proposed two projects under the multitranchise financing facility.

147. A number of nonrevenue water reduction activities are under way, or have been completed, outside Colombo. Most have focused on physical asset replacement and include the following:

- Regional support center (western north): 15 km asbestos cement pipe replacement in five selected areas and identification of asbestos cement pipeline to be replaced in two other areas.
- Regional support center (western south): replacement of 12,710 defective meters. Replacement of asbestos cement pipes, asbestos cement pipe abandonment, relocation of one bulk flow meter, and replacement of 800m galvanized iron pipes in another area.
- Regional support center (central):: relocation and sealing of 52,000 house connections, improvement in the operating procedure for provision of new service connections, pipeline extensions, relaying under-depth and aged pipelines, preparing leakage database, bulk meter installation at reservoir sites, distribution improvement and development of zones, pressure management in the distribution system, ensuring the material quality, integration of house connections, and leakage database with the maps.
- Regional support center (north-western province): implementation of a pilot project that reduced average nonrevenue water in the pilot area by 6%.
- Regional support center (southern):: relocation and sealing of 5,000 water meters, replacement of defective water meters, improvements to new connection practices, nonrevenue water measurement with adequate accuracy, reduction of leakage distribution improvements, and ensuring quality of materials used for water works.
- Regional support center (Sabaragamuwa): distribution network improvements in two areas, replacing some asbestos cement pipelines, construction of 16 valve chambers, and removal of bundle pipes.
- Ampara water supply system: implementation of a leak detection and elimination program; updating the network GIS; and design and operation of four DMAs, with the result that nonrevenue water levels are being monitored.
- Negombo water supply system: in 2008, an integrated network management strategy was proposed to introduce best practice water distribution, nonrevenue water management, and

investment prioritization techniques, as well as to establish DMAs within the existing water network. When the project ended in 2013, 25 DMAs had been established, each covering 1,500–2,000 customer connections. A GIS was also developed that links the existing billing system and the network model.

B. Energy Management and Efficiency Improvement

148. The NWSDB has developed an energy management program that has achieved significant results, with particular emphasis on pump house energy auditing. A dedicated team of engineers and a technician has been created to conduct systematic energy audits of the largest pump houses in the system. A key output of the audit is an assessment of pump performance and identification of unwarranted power losses and/or overconsumption due to either system characteristics or a mismatch between system and pump characteristics. Rectification measures include replacement of pumps, installation of variable speed drives, or implementation of changes in operating schedules and/or methods. If pipeline flow velocities exceed relevant standards, pipes will be replaced; and/or duplicated pipelines will be implemented; and/or pumping rates or pumping schedules will be changed.

C. Improved Staff Productivity

149. The NWSDB's personnel costs in 2012 were SLRs6.5 billion or approximately 53% of total operational expenditure. Between 2007 and 2013, the NWSDB managed to reduce its ratio of total staff per 1,000 connections from 8.2 to 5.8 and is targeting a further reduction to 5.0 by the year 2020. Achieving this reduction requires transferring non-productive staff to more useful activities as well as utilizing other human resource techniques such as multitasking and job rotation.

150. One of the more challenging tasks is to ensure that all relevant staff is able to manage new and planned operational water supply and sanitation technologies. This can be achieved in several ways—new staff can be selected on the basis of their knowledge and understanding of relevant systems while existing staff can undergo extensive job training programs and be provided with comprehensive procedure manuals relating to all key operations.

151. Another strategy available for improving staff productivity is to outsource all non-core functions to enable middle-level management to focus their attention on more technical matters related to water and sanitation operations. However, within the Sri Lankan context this outsourcing can only take place if there is no redundancy in relation to the existing workforce.

IX. EMERGING AND SUSTAINABILITY ISSUES

152. A number of emerging and sustainability issues need to be addressed if the government's target for providing safe drinking water and sanitation to all citizens by the year 2020 is to be achieved. The three most important are meeting the needs of areas affected by chronic kidney disease of unknown etiology (CKDu),⁴ ensuring participation of particularly marginalized groups in water and sanitation projects, and addressing water and sanitation needs in conflict-affected areas.

⁴ The prevalence and associated mortality of chronic kidney disease (CKD) has been on the rise in Sri Lanka over the last 2 decades with this trend being exacerbated in the last decade by the emergence of an apparently new form of CKD of unknown etiology (CKDu). CKDu is not attributed to hypertension, diabetes, or other etiologies typically associated with traditional CKD. This emerging disease is slowly progressive, irreversible, and asymptomatic until late stages. CKDu is most pronounced in North Central Province and primarily affects people of low socioeconomic status, particularly those involved in farming or living in agricultural areas. The disease mainly affects males who are involved in paddy farming. Significant predictors of kidney disease in these patients included age, history of smoking, being under treatment for

153. Other issues that need to be addressed include improving the response to disasters and emergencies and tackling escalating problems related to climate change, seawater intrusion, poor water quality, and pollution.

A. Provision of Safe Drinking Water to CKDu-Affected Areas

154. CKDu has been prevalent in the North Central province for over 20 years. In certain areas, as much as 5% to 10% of the population is affected and the incidence is increasing. CKDu is also prevalent in parts of North Western, Uva, Central, Eastern, and Northern provinces.

155. Those affected depend heavily on state-run hospitals for their medical treatment and the cost of dialysis for CKDu patients has become a severe burden on the government health authorities, with annual expenditure exceeding SLRs400 million.

156. CKDu has become a serious issue for affected communities. In cases where the family breadwinner becomes a patient, livelihoods are seriously affected with knock-on effects for their dependents. Children and young adults are also affected by this disease. Afflicted communities are subject to trauma and even social stigma due to the fact that the disease is not treatable.

157. There is no agreement on what causes CKDu. Alleged causes include cadmium or arsenic contamination of drinking water, pesticides and fertilizers, fluoride in drinking water, fluoride in combination with the use of aluminium cooking utensils, and algal toxins, to name just a few.

158. The most authoritative opinion on the problem is contained in a report of an extensive study carried out by the World Health Organization and the Ministry of Health that attributes the disease to substances such as cadmium and arsenic (which could be present in chemical fertilizers, weedicides, and pesticides) as well as high levels of hardness in the drinking water.

159. At present only a few areas in North Central province have access to piped water from surface water sources, but CKDu is almost nonexistent in these areas. The rest of the population depends on groundwater from tube wells, hand pumps, dug wells, etc. In the CKDu-affected areas, ground water is hard and contains high fluoride levels. Areas where the groundwater is recharged from the Mahaweli waters and is soft and has low fluoride content are free of the disease. Thus, there seems to be a correlation between CKDu and the quality of drinking water. The World Health Organization study stresses the importance of supplying good quality water to CKDu-affected areas.

160. In March, 2011, in response to the study findings, a pilot project was initiated to supply good quality water for drinking and cooking purposes to Billewa village in the Anurdhapura district, which had a high incidence of CKDu. It has been reported that the health status of the patients has improved and they are recovering. Following this pilot, similar projects have been implemented at Sandamaleliya in Anuradhapura and Hangurakketha Yaya in Girandurukotte.

hypertension, and drinking well water in the fields. The etiology of CKDu of Sri Lanka is probably multifactorial involving one or more environmental factors and a possible genetic predisposition in vulnerable populations.

Sources: Wanigasuriya, K. 2012. Aetiological Factors of Chronic Kidney Disease in the North Central Province of Sri Lanka: A review of evidence to-date. *Journal of the College of Community Physicians of Sri Lanka*. Vol. 17, No. 01; and Hoponick Redmon, J. et al. 2014. Additional perspectives on chronic kidney disease of unknown aetiology (CKDu) in Sri Lanka—lessons learned from the WHO CKDu population prevalence study. *BMC Nephrology*. Vol. 15, No.125.

161. The Ministry of Urban Development, Water Supply and Drainage and the NWSDB consider that while the Ministry of Agriculture and other agencies take action to control the quality and use of agrochemicals, the effects of which will be long term, providing good quality water to CKDu-affected areas would be immensely beneficial and should be resolutely pursued. Accordingly an action plan has been drawn up with short-, medium-, and long-term strategies.

162. **Short-term implementation:** As the quantities for drinking and cooking are small, it is not practicable to adopt wide-scale piped distribution systems. In most of the affected areas, small reverse osmosis systems will be established to remove hardness and fluoride from groundwater and tankers will be deployed to transport water. Community tanks with a capacity of 1,000–1,500 litres, each serving 3–5 houses, will be provided and typically refilled twice monthly.

163. Capital expenditure would be in the range of SLRs15,000 to 18,000 per beneficiary household, with operation and maintenance costs of approximately SLRs180 to SLRs275 per household/month. Where there is an existing water supply scheme with satisfactory water quality, the same concept could be adopted at a lower cost as additional water purification would not be needed.

164. As far as possible, it is preferred that these small systems are operated by community-based organizations (CBOs). In some instances, CBOs prefer to supply water to individual households and often also provide 20-liter storage containers. In areas where CBOs do not exist, new ones will have to be established. Where it is not possible to establish CBOs, the local authority or the NWSDB will have to undertake the operation and maintenance responsibility.

165. In small isolated communities of 100–200 houses where establishing water purification systems is not practicable, rainwater harvesting could be an option. CKDu-affected areas have an average annual rainfall of 1,000–1,100 mm. With these levels it would be possible to harvest rainwater sufficient for drinking and cooking purposes providing houses have a minimum of 50 m² of roof area and can be fitted with gutters. A 2,000-liter storage tank and related gutter system would cost approximately SLRs40,000 per household. One such system consisting of 150 rainwater tanks has been established as a pilot in Polpithigama in Kurunegala district. One disadvantage of this approach is its inability to cope with extended droughts of 7–8 months, which could be expected due to climate change. Supplementary water supplies would have to be provided in such circumstances, making rainwater harvesting suitable only for small-scale applications.

166. **Medium-term implementation:** In some areas, medium-sized water supply schemes based on surface water sources have been identified. These systems will cover small towns and surrounding areas and can be implemented in the medium term. These schemes include the following:

- Anuradhapura district:
 - Galenbindunuwewa water supply (SLRs1,793 million)
 - Thambuttegama water supply (SLRs1,810 million)
- Polonnaruwa district:
 - Welikanda water supply (SLRs2,700 million)
- Monaragala district:
 - Hambegamuwa water supply (SLRs1,600 million)
- Matale district:
 - Wilgamuwa water supply (SLRs930 million)

167. It has been reported that CKDu is spreading to new areas in the Monaragala district as well as in the Hambantota district, the Sabaragamuwa district, and others. It would be prudent to carry out water quality surveys in these areas so that timely mitigation measures can be taken. This process could form part of the medium-term implementation program.

168. **Long-term implementation:** Several large-scale water supply projects are also planned. For example, the Anuradhapura North Water Supply Project is being implemented with funding from Japan International Co-operation Agency and will cover the areas of Horowpatana, Kahatagasdigiliya, Kebitigollewa, Medawachchiya, Padaviya and, Rambewa, . While the project will mainly focus on the urban areas, small towns, and surrounding areas, provision has also been made for tankers to transport water from the system to remote villages where a piped water supply is not feasible. The same approach will also be adopted in other large-scale projects. However, in certain areas, reverse osmosis plants and tanker supplies will have to be continued even after large-scale project implementation has been completed.

169. The long-term projects identified for implementation are as follows:

- Anuradhapura district:
 - Anuradhapura North water supply (SLRs22,830 million)
- Kurunegala district:
 - Deduru Oya integrated water supply (SLRs8,480 million)
 - Galgamuwa integrated water supply (SLRs3,000 million)
- Monaragala district:
 - Monaragala Buttala Integrated water supply (SLRs4,430 million)
- Trincomalee district:
 - Yan Oya water supply (SLRs6,200 million)
 - Padavi Sripura water supply (SLRs6,215 million)

B. Addressing the Needs of Marginalized Groups

170. It is essential that schemes to provide clean water and sanitation serve the neediest of groups as well as the general community. However, the design of many programs makes this difficult. Donor-funded projects are increasingly focused on the economic sustainability and viability of investments and, as such, the demand for facilities, affordability, and ability to contribute to such investment have become the major deciding criteria for the selection of beneficiaries, resulting in the exclusion of some of the most disadvantaged groups.

171. There are many reasons why people become marginalized including poverty, social and cultural factors, illiteracy, and family status. It has been noted that in most demand-driven projects a small percentage of potential beneficiaries are left behind and, in spite of special attempts made to maximize inclusion, progress in getting marginalized groups involved in implementation is usually very poor. Beneficiary contribution is a requirement in any project implemented under a demand-responsive approach, but this also can act as a barrier for some beneficiaries and exclude marginalized groups.

172. It is therefore important to develop methodologies for promoting the involvement of poor or marginalized groups in project activities to improve the dissemination of the project benefits to a broader spectrum of the community. These methodologies should be aimed at improving the social recognition of these groups and opening the door for their social and economic development. However, it is important to note that sector projects alone cannot solve all the issues related to

inclusion of poor groups and an integrated development approach is more appropriate when addressing extremely poor communities.

C. Provision of Water and Sanitation Services to Conflict-Affected Areas

173. Recommencement of hostilities between government forces and the Liberation Tigers of Tamil Elam following a breakdown of the cease-fire agreement in 2007 created a humanitarian disaster and resulted in large numbers of conflict-affected people in the north and east migrating to the north central area of Vavuniya district. The availability of water was one of the major factors considered in setting up internally displaced persons (IDP) camps. Following a high-level meeting held between defense authorities and the NWSDB, it was decided to establish a mega IDP camp at Menik Farm in Vavuniya district.

174. Considered the largest IDP settlement in Asia, Menik Farm at the height of the war extended over 700 hectares and provided emergency shelters for over 280,000 people by 2009. As of 2010, it still housed up to 80% of the country's total IDP population.

175. It was a challenge for the NWSDB and humanitarian agencies to mobilize necessary resources given the large influx of IDPs in a very short time. Also, since the displacement lasted longer than expected, the facilities provided were required to be semi-permanent. Some people had to wait over 2 years to get back to their homes while the de-mining, restoration, and construction of new houses took place. Many agencies who participated in the water, sanitation, and hygiene cluster became aware that there is no shortcut for resettlement in this type of a situation, which required (i) provision of adequate water and proper sanitation to meet applicable standards; (ii) continuous improvement of services to ease the trauma of IDPs due to length of displacement; and (iii) care and maintenance of water, sanitation, and hygiene facilities, which was costly.

176. A number of schemes are now under way to improve the quantity and quality of water made available to communities in conflict-affected areas. For example, one component of a reconstruction program entitled the Vadakkin Vasantham Programme is the North Central Canal Development Project, which is designed to provide an auxiliary water supply to tanks located in towns.

D. Coping with Climate Change

177. Maintaining an adequate and uninterrupted supply of freshwater is a significant challenge in the context of climate change and its impacts on rainfall patterns. Changes in the availability of water for irrigation and public use could have wide-ranging and serious implications on Sri Lanka's food security and nutrition, public health, and economic development. Sea level rise and other features associated with climate change could also increase the prevalence of natural disasters such as floods, droughts, landslides, and storms with consequent negative impacts on livelihoods, economic development, and civil life. As an island nation, Sri Lanka is particularly vulnerable to the risk of sea level rise and increased frequency of storms.

178. Analysis of climate data for Sri Lanka clearly indicates widespread changes in rainfall and temperature. As climate change is expected to alter the pattern and quantity of rainfall, evapotranspiration, surface runoff, and soil moisture storage, changes in water availability for irrigated agriculture and public use could well be anticipated.

E. Preventing and Responding to Seawater Intrusion

179. Seawater intrusion is one factor seriously affecting the quality and quantity of groundwater resources in Sri Lanka. Seawater intrusion takes two forms:

- *Seawater intrusion into river mouths*, which has a significant impact on drinking water supply, agriculture, groundwater, etc. This is caused by severe drought and rapidly deepening river beds, which results in the water level of rivers becoming lower than sea level so that saline water flows into the river at high tide.
- *Seawater intrusion into groundwater*. This is the movement of seawater into fresh water aquifers due to natural processes and human activities. When groundwater in near-coastal areas is over-extracted, the groundwater surface declines, which can result in an influx of saline seawater. This may adversely affect the water quality not only at pumping well sites, but also at other well sites and undeveloped portions of the aquifer.

180. **Managing seawater intrusion.** Actions can be taken both to prevent saline intrusion happening in the first place and to overcome the effects once intrusion has taken place. Preventative measures include (i) controlling sand mining in rivers, (ii) stopping sand mining around intakes, (iii) undertaking riverbank protection measures, (iv) carrying out awareness-raising activities for nearby communities on the causes and effects of seawater intrusion, and (v) controlling pumping in wells and close monitoring of aquifer water levels. All such measures are presently being undertaken in Sri Lanka

181. Once intrusion has taken place, the effects can be mitigated by constructing permanent or temporary salinity barriers and controlling pumping until aquifers are recharged. One such scheme is under way on the Kelani River, a major source of water for Colombo's residential and industrial population.

F. Improving the Quality of Water Produced

182. In addition to enhancing water production capacity, improving the quality of water being produced will be a major focus over the coming years. Chemical and microbiological contamination of water is reported in some areas and this is likely to increase as a result of rapid urbanization and growing industrial activities. While reducing sources of contamination will be one important aspect of the strategy to tackle this problem, treatment facilities will also need to be improved to meet new requirements. Approximately 60 existing water supply schemes that currently have partial treatment facilities will be upgraded to full treatment facilities on a priority basis.

183. In addition, a properly designed water quality surveillance system will be established utilizing modern equipment. Surveillance is needed to promote improvement of the quality, quantity, accessibility, coverage, affordability, and continuity of water supplies (known as service indicators) and is complementary to the quality control function of the drinking water supplier.

184. The surveillance agency needs to have relevant technical expertise, knowledge of relevant laws, and the capacity and authority to carry out review and approval of water safety plans. It should support the development of water safety plans for community-managed drinking water supplies, household water treatment, and storage and management. It also needs to ensure that any transgressions are appropriately investigated and resolved.

185. One of the basic principles of an effective control system is the differentiation of the roles and responsibilities of service providers from those of the surveillance agency. However, no agencies in Sri Lanka other than the service providers have the necessary technical expertise, capacity, and legal authority to carry out all the above mentioned surveillance functions. It will be necessary, therefore, to implement surveillance through a mechanism of appropriate collaboration between the Ministry of Health and the Ministry of Urban Development, Water Supply and Drainage, utilizing the technical services of the NWSDB.

186. The responsibility of developing the water safety plans lies with the water supplier, be it a national board, local authority, community-based organization, or private sector party (concessionaire, owner). The plan is presented to the duly appointed district water quality surveillance committee for approval and registration. The committee audits the water safety plans and reports to the national government stakeholders.

G. Tackling Water Resource Pollution

187. Sri Lanka has 103 rivers of which approximately 20 are perennial. Catchment areas range from 10 to 10,000 km² and, together, they cover about 90% of total land area. Though the country has no large natural reservoirs, there are a number of tanks (some of them centuries old) and an irrigation canal system. There are roughly 12,000 tanks in dry zone areas, ranging from 1 to 6,500 hectares, although most cover less than 300 hectares. A cascade system created by the interconnection of several tanks in the dry zone is also an important component of the national water resource conservation strategy.

188. In addition to these water sources, there are 3,540 springs located across the island including 1,544 in Nuwara Eliya district, 204 in Kandy district, 319 in Kurunegala district, 210 in Monaragala district, and 288 in Matale district. Aquifers lying within the inner limestone layers in the dry zone areas are another major water resource.

189. Water catchments, source areas, and reserves play a vital role in ensuring the sustainability of the country's water sources. Critical areas include micro-catchments at high altitudes from which the rivers are fed, reservoir tanks and catchments, river and stream reservations, and flood plains.

190. A number of institutions in Sri Lanka are involved in activities related to the conservation of water sources, but they are hampered by a shortage of human and physical resources, various institutional and technological constraints, and inadequate exchange of spatial data. Although a number of foreign-funded projects have been launched for the conservation of catchment areas, their objectives were generally not achieved. Preparation of an appropriate program for the sustainable management of water sources and their reserves and catchments has therefore become a pressing need.

H. Innovative Approaches to Water and Sanitation Services

191. Application of innovative water and wastewater treatment technologies. With the advancement of technology, new and innovative water and wastewater treatment processes such as membrane technology and constructed wetlands have been developed that can provide affordable, user friendly and sustainable solutions. These technologies need to be reviewed for their relevance to the situation in Sri Lanka and then pilot tested to assess their suitability.

192. There is high potential to use rainwater harvesting as Sri Lanka's average rainfall exceeds 1,800 mm. Although domestic rainwater harvesting technologies have been promoted over the last 2 decades by different water sector agencies and projects, widespread adoption has been hampered for both technical and social reasons. Nevertheless, these systems have great potential and more work needs to be done to adapt the technology to local conditions and to understand and overcome the social constraints.

193. There is also potential for development of surface water reservoirs as drinking water sources. The NWSDB's general practice is to obtain water from irrigation tanks and rivers by developing water sharing agreements with other water users. This has sometimes triggered conflicts among water users. With increasing competition for water, it will be essential to develop water reservoirs for drinking water supplies where this option is technically feasible. The following schemes are under way or in the planning stage:

- Development of multiple water reservoirs upstream of the Kelani River is expected to be implemented within next 4 years to increase water supply levels to the Greater Colombo region.
- In North Western Province, a large reservoir in Deduru Oya will be constructed within the next 4 years to serve the population located in the dry and intermediate zones of Kurunegala and Puttalam districts, who frequently suffer from water shortages.
- In North Central Province, the Yan Oya Reservoir Project comprises a 2.5-kilometer dam to be constructed at Angurugasweva across the lower side of the Yan Oya, creating a reservoir with a capacity of 254 million m³. Water from the reservoir will be diverted to another major reservoir in Padaviya, from which nearly 9,500 hectares of land will be irrigated. The project is expected to be completed by 2017.

194. The above strategies are "supply-side management" strategies, which focus on the supply of water. Another set of tools available to water resource managers are "demand-side management" strategies, which focus on managing the demand for water. There are five categories of demand-side management tools available:

- (i) Financial tools concern the effective pricing of water, which, in turn, requires the widespread adoption of metering. It is often argued that the introduction of full-cost reflective pricing acts as the greatest incentive for utility customers to limit their water consumption.
- (ii) Technological tools typically relate to the installation of water-efficient appliances (e.g., toilets, clothes washers, lawn watering systems, etc.) or the retrofitting of existing appliances to make them more efficient (e.g., through leakage reduction).
- (iii) Educational tools include public awareness programs and distributing informational materials such as leaflets and bill inserts to increase customer understanding of the need for water conservation.
- (iv) Operation and maintenance activities are mostly directed at reducing leakage in water networks.

- (v) Regulatory and legislative measures cover a wide range of activities ranging from the introduction of plumbing codes to applying water allocations and use restrictions.

195. Some or all of these tools are often applied together to help maximize their effectiveness. The key element, however, is commitment by implementing agencies and governments to consistently implement them.

196. The reuse of wastewater is becoming more and more common around the world as water scarcity increases. In some places, such as Tel Aviv in Israel, 100% of the sewage from the metropolitan area is treated and reused as irrigation water for agriculture and public works. In addition to conserving valuable drinking water, wastewater reuse also reduces the release of nutrient-rich wastewater into rivers and the ocean. The planned development of two wastewater treatment plants in the Colombo municipal region opens up the potential for wastewater reuse in Sri Lanka.

197. There are multiple potential applications for wastewater reuse. Urban reuse includes the irrigation of public parks, playing fields, highway medians, and residential landscapes and potentially also fire protection and toilet flushing in commercial and industrial buildings. Agricultural reuse includes irrigation of non-food crops (such as animal fodder), commercial nurseries, and pasturelands. High-quality reclaimed water may also be used to irrigate food crops. Recreational reuse includes the creation of ponds and lakes. Environmental reuse entails creating artificial wetlands, enhancing natural wetlands, and sustaining stream flows. Finally, industrial reuse applications include the use of process water and cooling tower water.

X. PRIVATE SECTOR ENGAGEMENT

198. Private sector participation can potentially help water utilities improve their performance, accountability, and transparency as well as reinforce the utility's commitment to cost recovery. The private sector can also be a valuable source of investment financing.

199. Part of Sri Lanka's post war development strategy involved attempting to create a friendly investment climate to encourage private sector investment. However, these efforts stalled in recent years, resulting in limited private sector engagement in the water and sanitation sector. This is potentially a major problem because, as discussed earlier, a considerable amount of private sector funding is likely to be required if the sector targets are to be achieved.

200. If one ignores the contribution made by community-based organizations, which are not strictly speaking private sector entities, then current private sector involvement in the water sector in Sri Lanka is restricted to bottled water distribution—an activity that is not presently carried out by the NWSDB. In the sanitation sector, private firms are engaged in providing de-sludging services to customers utilizing septic tanks.

201. Changes in the government's policy priorities and the current political stance of non-privatization of public utilities have resulted in stagnation in reform initiatives targeted at increasing private sector participation. Consequently, policy (and possibly also legal) reform will be essential if the state wishes to see private and other forms of capital flow into the water and sanitation sector to help rehabilitate and extend service coverage.

202. This can be achieved by (i) introducing clear investment policies that feature incentives to attract the private sector and (ii) identifying priority areas where private investment is needed. In developing such investment policies, it is important for the government to consider all possible forms of private sector participation, ranging from the lightest forms of intervention (such as management contracts) through to concessions and outright sale of assets. In each case, a cost-benefit analysis is needed to evaluate the case for and against public-private service provision or infrastructure development. Other endeavors, such as the introduction of independent regulatory oversight, may also help attract private sector interest.

203. The government rejected a proposal made by the World Bank to introduce concessionary arrangements for water supply in the cities of Kalutara and Negombo. Similarly, the concept of utilizing a build-operate-transfer (BOT) arrangement for the Ambatale Treatment Plant was abandoned in 2005. In 2013, a BOT concept paper was prepared in relation to the Haragama Water Supply and Sanitation in Central Province with the assistance of the Board of Investment. However, the proposal submitted was not acceptable to the government nor was the NWSDB ready to embrace the concept of a build-operate-transfer.

204. A technical assistance project has been proposed by Republic of Korea's national aid agency, the Economic Development Cooperation Fund, to investigate the feasibility of introducing a public-private partnership arrangement for the provision of water supply in Sri Lanka and also to prepare bidding documents for the selection of a suitable partner through a competitive bidding process should such an arrangement be deemed appropriate. Some form of public-private partnership arrangement is also expected to be adopted in relation to the design, construction, financing, and operation of two new wastewater treatment plants to be commissioned by the Colombo Municipal Council to treat sewage generated in the greater Colombo area. Indeed, discrete large-scale investments such as these are particularly well suited to private sector engagement.

205. The Board of Investment is actively trying to encourage domestic and foreign private companies to invest across the infrastructure spectrum including in water supply and sanitation. Special fiscal and other economic incentives are offered to private developers that qualify to provide "strategic development projects." These benefits are negotiated on a project-to-project basis with the Treasury and finally approved by Parliament. In order to be classified as a strategic development project, it needs to demonstrate its qualifications in four areas: (i) volume of foreign currency inflow into Sri Lanka, (ii) employment opportunities for Sri Lankan citizens, (iii) impact on the country's economic and/or social landscape, and (iv) technology transfer.

206. It is likely that many water supply and sanitation projects would qualify, at least to some degree, on all four counts and therefore could be selected as a strategic development project, thereby greatly increasing the chances that private businesses would be interested, although the lack of independent regulatory oversight of the sector is likely to be a continuing disincentive.

XI. STRATEGIC ACTION PLAN

207. Sri Lanka has made some remarkable achievements in its water and sanitation sector over the past decade with the result that the country has already managed to reach its Millennium Development Goal targets with respect to the provision of safe water and improved sanitation to its people. However, as previously discussed, a number of challenges remain.

208. Meeting these challenges will require a combination of financial, social, and organizational development policies that fit the country's political and economic context. Table 5 provides a summary of the themes and key strategic directions presented in this report. It also indicates who will have principal responsibility for carrying out these actions and in what time frame. The time frame also serves as a guide to actions that are under way or being considered for implementation. Clearly however, successful implementation of all these strategies will require the sustained attention and commitment of a wide range of stakeholders including government, utilities, advocacy groups, private sector businesses, and the general public.

Table 5: Summary Strategic Action Plan

Theme 1: Sector Governance and Institutional Framework		
Strategic Direction	Key Actors	Time Frame
Sector governance and regulation	NWSDB	2016–2020
<ul style="list-style-type: none"> • Development of a regulation cell 		
<ul style="list-style-type: none"> • Introduction of independent regulator 	Ministry of Urban Development, Water Supply and Drainage	2020–2030
Infrastructure development and rehabilitation	NWSDB	2012–2020
<ul style="list-style-type: none"> • Network expansion and rehabilitation • Construction and rehabilitation of water treatment plants • Asset management planning 		
<ul style="list-style-type: none"> • Network expansion and rehabilitation • Construction of new wastewater treatment plants • Asset management planning 	Colombo Municipal Council	2010–2020
<ul style="list-style-type: none"> • Network expansion and rehabilitation 	Local authorities	2013–2020
<ul style="list-style-type: none"> • Network expansion and rehabilitation 	CBOs	2013–2020
Capacity development	NWSDB	2013–2020
<ul style="list-style-type: none"> • Training in new technology • Empowerment of O&M staff 		
<ul style="list-style-type: none"> • Training in new technology • Empowerment of O&M staff 	Colombo Municipal Council	2013–2020
<ul style="list-style-type: none"> • Training in new technology 	National Community Water Trust	2013–2020
Institutional reform	NWSDB	2013–2020
<ul style="list-style-type: none"> • Establish a regulation cell in the near future. • Decentralize the O&M function to regional support centers in the NWSDB. 		
<ul style="list-style-type: none"> • Introduce a volume-based wastewater tariff in the Colombo Municipal Council area. 	Colombo Municipal Council	2016

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Table 5 continued

Theme 2: Financial Stability & Planning		
Strategic Direction	Key Actors	Time Frame
Increased water and sanitation revenue	Cabinet	2014–2020
<ul style="list-style-type: none"> • Regular tariff increases 		
<ul style="list-style-type: none"> • Cost-reflective pricing • Increased number of connections • Improved collection and billing 	NWSDB	2014–2020
<ul style="list-style-type: none"> • Cost-reflective pricing • Introduction of a sewerage tariff • Increased number of connections 	Colombo Municipal Council	2014–2020
<ul style="list-style-type: none"> • Increased number of connections • Improved collection and billing 	Local authorities, community-based organizations	2014–2020
Utilizing a wide range of financing sources	NWSDB	2013–2020
<ul style="list-style-type: none"> • Direct borrowing from capital markets • Private sector financing • Further national and development partner lending 		
<ul style="list-style-type: none"> • Direct borrowing from capital markets • Private sector financing • Further national and development partner lending 	Colombo Municipal Council	2013–2020
Theme 3: Operational Efficiency		
Strategic Direction	Key Actors	Time Frame
Reduction in nonrevenue water	NWSDB, local authorities, community-based organizations	2012–2020
<ul style="list-style-type: none"> • Replacement of cast-iron pipes • Asset identification and rehabilitation • Reduction in commercial losses • Demand management 		
Energy efficiency	NWSDB	2012–2020
<ul style="list-style-type: none"> • Energy audits • Pump replacement • Exploiting time-of-day pricing 		
Enhanced staff utilization	NWSDB, Colombo Municipal Council	2013–2020
<ul style="list-style-type: none"> • Staff rotation • Multitasking • Outsourcing 		
Theme 4: Emerging and Sustainability Issues		
Strategic Direction	Key Actors	Time Frame
Involve needy and marginalized groups in program design and implementation	Central government, NWSDB, local authorities	2013–2020
<ul style="list-style-type: none"> • Establishment of management committees • Cash and in-kind contributions 		
Develop policies for sustainable management of water resources	Ministry of Urban Development, Water Supply and Drainage, NWSDB	2013–2030
<ul style="list-style-type: none"> • Development of upstream reservoirs, water tanks, and other water resources • Construction of salinity barriers 		

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Table 5 continued

Theme 4: Emerging and Sustainability Issues		
Strategic Direction	Key Actors	Time Frame
Adopt innovative approaches to water and sanitation services <ul style="list-style-type: none"> • Rainwater harvesting • Reuse of wastewater • Improved septage management 	Ministry of Urban Development, Water Supply and Drainage, NWSDB	2013–2030
Theme 5: Private Sector Participation		
Strategic Direction	Key Actors	Time Frame
Consider the full spectrum of private sector participation models <ul style="list-style-type: none"> • Apply cost–benefit analysis to private sector participation decision making. • Utilize private sector sources for asset financing, asset construction, operations management, etc. 	Board of Investment, NWSDB, Colombo Municipal Council	2013–2030
<ul style="list-style-type: none"> • Provide appropriate incentives to project developers and financiers: • Fiscal and monetary incentives • Land provision • Monopoly rights 	Treasury/Board of Investment, NWSDB, Colombo Municipal Council	2013–2030

NWSDB = National Water Supply and Drainage Board, O&M = operation and maintenance.

Sri Lanka's Water Supply and Sanitation Sector *Achievements and a Way Forward*

This working paper uses the most recent urban water supply and sanitation sector data to provide a comprehensive summary of the historical development of Sri Lanka's water and sanitation sectors together with a review of plans for future development. It presents the evolution of the country's water supply and sanitation sector over the past 10 years, with a comprehensive assessment of its current operational and financial status. This report is intended as a guide to help implementation and realization of the government's vision for the sector by identifying key strategic themes that need to be addressed. It also recommends the strategic action plan in (i) sector governance and institutional framework, (ii) financial stability and planning, (iii) operational efficiency, (iv) emerging and sustainability issues, and (v) private sector participation.

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