ADB

WATER for ALL

Asia-Pacific Water Forum

Country Paper
Cambodia

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Country Chapter – Cambodia[1]

Geoff Bridges

Executive Summary

Some two billion Asians—66% of the Asian population (or nearly 75% of all those in the world without such facilities)—lack access to adequate sanitation. Many Asian countries face huge financial costs to clean up the environment because of a lack of investment in sanitation, leading to massive pollution of surface and groundwater. The cost of cleaning a river already polluted with industrial waste or sewage is far higher than the cost of the infrastructure to dispose of the pollutants properly. Water and sanitation must get top priority from political leadership everywhere; postponing action is not an option because to delay will cost a great deal more. This key message was conveyed by the Asian Development Bank (ADB) at the Stockholm World Water Week, 12–18 August 2007.[2]

Sector Framework

Steady progress has been made to establish a legal and policy framework for the Cambodian water sector. The Government's Rectangular Strategy and National Strategic Development Plan (NSDP) identified the water sector, through improved access to safe drinking water and sanitation, as a key contributor to poverty reduction. Since 1996, the Government has implemented a decentralization and deconcentration program that promotes increased local government and community involvement in natural resources planning and management.

National Water Strategy and Policies

The policy platform of the Government's development strategy is the Rectangular Strategy, with the NSDP 2006–2010 detailing its implementation. The new National Policy on Water Supply and Sanitation (NPWSS) in force since 2004 states that every rural Cambodian should have access to safe water and sanitation by 2025.

Water Resources Management

Cambodia is well supplied with water resources, but contamination with industrial chemical discharges as well as pesticides and agricultural fertilizers is an increasing problem. The key environmental issues are inadequate legislation in pertinent aspects, uncoordinated institutions leading to fragmented and overlapping policies and action plans, unsustainable extractive practices, weak land and water resource management, severe pressure on the Tonle Sap ecosystem, and unplanned urban and industrial development.

Water Supply

Provincial centers generally have access to surface river water in unlimited quantities, although coverage of the piped water system may be as low as 15% in some of them. About 60% of the rural population rely on groundwater, with hand-dug and open wells widespread, but drilled wells

Urban wastewater treatment is largely absent in Cambodia except for primary lagoon treatment of some sewerage in Phnom Penh

Clean drinking water from the tap for this Cambodian boy

with hand pumps are becoming more common. Contamination of groundwater by naturally occurring arsenic further hampers increased access to improved drinking water. Limited coverage of rural water supply and sanitation and lack of maintenance remain critical for the sector. The key areas of concern for the 14 public and 32 private water utilities, except Phnom Penh, are human resources, control of nonrevenue water (NRW), and financial performance. Levels of NRW for public water utilities range from about 15% up to 52% of total supply. Tariffs range from about riels (KR)550/cubic meter (m^3) up to KR3,000/m^3, with the average being around KR1,500/m^3. The dramatic turnaround by the Phnom Penh Water Supply Authority (PPWSA) is often used as an example of what can be achieved with an ailing system and utility. Water services now cover 100% of inner city Phnom Penh and are being expanded to surrounding districts, with priority given to urban poor communities. PPWSA now serves 15,000 families in 123 urban poor communities, giving the poor extra privileges such as subsidized tariffs or connection fees, installment connection fees, etc. The 147,000 connections, up from 26,881 in 1993, bring reliable and safe drinking water to all of Phnom Penh's one million inhabitants 24 hours a day.

Dramatic improvements in urban services and especially rural sanitation should be top priority in the government's agenda

Sanitation

Urban wastewater treatment is largely absent in Cambodia except for primary lagoon treatment of some sewerage in Phnom Penh. An expected doubling of the urban population by 2030 will greatly increase pollutant loads unless there is large investment. Low priority for sanitation and limited awareness on health and hygiene imply that in most rural areas of Cambodia, sanitation facilities are generally considered a lower priority than water supply systems. Most rural Cambodians are unaware of the health effects of unsafe water use and drink untreated surface water, prefer to defecate in the open, and rarely wash their hands.

MDG Target Progress

World Health Organization (WHO)/United Nations Children's Fund (UNICEF) data for 2004, show overall water supply coverage achieved was 41% (64% urban and 35% rural), with overall sanitation coverage 17% (53% urban and 8% rural). Recent (2005) data indicate that water supply coverage is 76% in urban areas and 42% in rural, with sanitation coverage 55% in urban areas and 16% in rural. Cambodia lags behind regional norms. Urban sanitation coverage is significantly behind recently revised national Millennium Development Goal (MDG) targets for 2005, and rural sanitation coverage needs to be given the highest priority if meaningful progress is to be achieved in reaching the MDGs by 2015.

Utility Performance

The performance of PPWSA and the improvement trends in its efficiency are remarkable, in particular uninterrupted water supply for several years, 2006 NRW of 6%, a reasonable staffing-connections ratio, revenue collection efficiency of 99.9%, and full cost recovery achieved. However, connection fees are relatively high at nearly US$88. Although staffing levels are slightly lower in private utilities, salaries are considerably higher than those for public utilities, typically by a factor of 4 or 5! Private utilities charge a fixed connection fee, whereas public utilities have a variety of charging mechanisms. Private utilities generally charge higher tariffs than public ones. Generally, customer satisfaction and technical performance are better with private utilities. Limited service area and high connection fees are the two most cited reasons for households not having piped water.

Successes/Failures and Key Issues

Although important progress has been made in rebuilding institutions that were barely functioning when the Government began its first mandate in 1993, Cambodia continues to operate far below its economic and social potential because of weak governance. The water sector suffers from fragmentation, with some 8 ministries having responsibility for water sector

issues, in addition to provincial governments and municipalities. Key environmental issues facing Cambodia are inadequate legislation, uncoordinated institutions, and unsustainable extractive practices, together with weak land and water resource management. PPWSA is a beacon of what can be achieved given determination and motivation to turn a water utility around. Its success now needs to be replicated in other utilities. Dramatic improvements in urban services and especially rural sanitation should be top priority in the government's agenda. The main issues and key challenges may be summarized as follows:

- Weak and fragmented institutional and regulatory framework.
- Low tariffs and poor cost recovery due to low willingness to pay.
- The practice of open defecation.
- Poor utility performance due to lack of institutional capacity and investment.
- Increasing pollution of water resources due to lack of wastewater and industrial waste treatment.
- Need to increase sewerage interception and treat all raw sewage.
- Need to translate into action the Government's recognition of the important role that the private sector can play in service delivery.
- Need to connect the urban poor (no connection fee or subsidized fee).

Future Vision

Cambodia needs to increase water sector investments to at least 1% of gross domestic product and also must focus on tariff reform, increased wastewater treatment capacity, strengthening of the fragmented institutional and regulatory framework, and giving top priority to improving progress in urban and rural sanitation coverage.

Introduction

The purpose of the Asian Water and Development Outlook (AWDO) is to enable leaders and policy makers to understand their respective national situations, to appreciate their present sector performance and the key issues in their country and, by learning from the experiences of other countries, to encourage them to take effective action to tackle those issues. Achievement of these goals has been constrained by the limited availability of data and published current status information, as well as detailed future plans.

The Kingdom of Cambodia suffered three decades of conflict and civil war from the 1960s, culminating in the 1991 Peace Accord. Since then, the economy of the country has developed out of all recognition such that in 2005, gross domestic product (GDP) was US$6.2 billion and the GDP annual growth rate 13.4%. Cambodia had a 2005 population of 14.1 million and a population growth rate of 2.0%.[3]

Only 8% of the population live in Phnom Penh, 10% in other urban centers and the remaining 82% in rural areas, where agriculture employs 71% of the workforce and dominates the economy. About 75% of the country consists of the Tonle Sap or Great Lake Basin, the Mekong Lowlands, and Mekong Delta. Tonle Sap Lake provides a huge source of freshwater. During the late wet season, the Mekong River backs up into the lake, increasing its volume ten-fold at the height of the flooding. As the flooding abates, flow reverses and the level of the lake drops.

Cambodia's robust economic performance continued into 2006 with real GDP growth estimated at about 10.5%, a third consecutive year of double-digit growth, underpinned by garment exports, tourism, construction, and agricultural expansion. The garment sector employs 10% of the labor force and accounts for 14% of GDP, but is facing stiffer competition from Viet Nam and the People's Republic of China. GDP growth for 2007 is projected to be about 9%, supported by growing foreign direct investment and the discovery of offshore oil and gas reserves.[4]

The country had a Human Development Index (HDI) value of 0.583 in 2004 (0.536 in 1995), and was ranked 129th worldwide in

Spillway in the rainy season at the rehabilitated reservoir of the Stung Chinit Irrigation Scheme in Kompong Thom Province, Cambodia

terms of HDI. The 2004 GDP per capita was US$2,423 PPP[5] and its Human Poverty Index was 39.3%.[6] Urbanization is significant and increasing rapidly, with 19.7% of the population living in urban areas in 2005 (12.6% in 1990), the annual 1990/95 urban growth rate being 5.62%.[7] In terms of water resource availability, the per capita total actual renewable water resources (TARWR) value reduced from 36,333 cubic meters (m^3)/year in 2000 to 32,880 m^3/yr in 2005, with total water used being 1% of TARWR.[8] Of the 4.091 billion m^3 of water withdrawn in 2000, the proportion of withdrawals by agriculture, industry and domestic users was 98%, 1%, and 2%[9] respectively.

Sector Status and Performance Overview

Sector Framework

Cambodia has more than 1,000 irrigation schemes but only about 55% are operational; many of them, especially those constructed during the Khmer Rouge regime in the late 1970s, are damaged after decades of neglect and in urgent need of rehabilitation irrigation. The Government's Rectangular Strategy and National Strategic Development Plan (NSDP) identified the water sector as a key contributor to poverty reduction, including through improved access to safe drinking water and sanitation. In recent years steady progress has been made to establish a legal and policy framework for the water sector. The Ministry of Water Resources and Meteorology (MOWRAM) has overall responsibility for water resources planning and management and was established in 1999. The National Water Resources Policy was approved in early 2004, and the Law on Water Resources Management was approved by the National Assembly in May 2007. Regulations have been prepared for (i) river basin management and planning, (ii) water allocation and basin management, (iii) organization of farmer water-user communities, and (iv) irrigation management transfer. MOWRAM has prepared its Strategic Development Plan (SDP) in line with the Rectangular Strategy and NSDP. Elements of the SDP are incorporated into the Medium Term Strategy for Agriculture and Water (MTSAW 2006–2010) developed by the Technical Working Group for Agriculture and water Resources. The SDP institutional goal is to strengthen MOWRAM's capacity to implement water-related legislation and policy, improve water resources information management, and develop administration, management, and human resources. The legal and policy framework promotes sustainable water resources planning and management in a river basin context through integrated water resources management (IWRM), although the policy has yet to be fully implemented.[10]

Breached embankment that no longer stores water for use later in the dry season. With each rain season, the breach gets wider.

Since 1996, the Government has been implementing a decentralization and deconcentration program that promotes increased local government and community involvement in natural resources planning and management. In 2003, the Cambodia National Mekong Committee began encouraging local governments and communities to adopt river basin management principles consistent with the basin planning process of the Mekong River Commission.

Responsibility for the provision of drinking water is split between the Ministry of Industry, Mines and Energy (MIME), responsible for urban and provincial areas as well as the regulation of the private sector involved in piped water systems, and the Ministry of Rural Development (MRD) which is responsible for drinking water in rural areas. Under the supervision of MIME, the Phnom Penh Water Supply Authority (PPWSA) is the autonomous water authority responsible for water supply in the capital city Phnom Penh, with the Department of Potable Water Supply responsible for water in provincial and other towns. In 1995, MRD issued the "Water and Sanitation Guidelines" and in February 2003 its "Policy Framework for

Rural Water Supply and Sanitation Sector" was approved by the government. The Cambodian National Drinking Water Quality Standards were prepared by the National Committee on Drinking Water Quality between 1999 and 2003 and are based on the World Health Organization (WHO) drinking water quality guidelines (2003) adapted to suit the water quality problems in Cambodia.

Although MOWRAM, MIME, and MRD are the major sector players, several other government institutions have some responsibility in the water sector, leading to undue bureaucracy, potential confusion, and indecision, as well as fragmentation. The Ministry of Health plays an important role in setting water quality standards, and in the monitoring and control of drinking water quality in urban and rural areas. Other institutions having some responsibilities in the sector are as follows[11]:

- The Cambodia National Mekong Committee (CNMC)
- Ministry of Public Works and Transport (MPWT)
- Ministry of Environment (MoE)
- Ministry of Agriculture, Forestry and Fisheries (MAFF)
- Ministry of Economics and Finance (MEF)
- Ministry of Health (MoH)
- Provincial Governments, Municipalities, and Development Committees.

National Water Strategy and Policies

With the assistance of international funding agencies, the Coordinating Committee for the Water and Sanitation Sector developed a long-term national strategy for the sustainable and cost effective urban water supply and sanitation sector as well as a new sectoral policy framework consisting of two national policies: The National Policy on Water Supply, and the National Policy for Urban Sanitation. Both policies foster demand-based approaches to system planning and investment, private sector participation, and cost recovery tariffs.

The policy platform of the Government's development strategy is the Rectangular Strategy, with the National Strategic Development Plan (NSDP) 2006–2010 detailing its implementation. The NSDP 2006–2010 replaces the Socio-Economic Development Plan 2001–2005 (SEDP II) and the National Poverty Reduction Strategy 2003–2005 (NPRS). SEDP II focused on growth promotion, regional integration, and poverty reduction, and was previously the Government's principle planning document, with the NPRS closely based on it (and including many references to water resources management and water service delivery) to elaborate the poverty reduction agenda and provide a framework and a comprehensive set of indicators to monitor progress towards achievement of the Millennium Development Goals (MDGs).[12]

The new National Policy on Water Supply and Sanitation (NPWSS), in force since 2004 and prepared jointly by MIME and MRD and issued in February 2003, states that every rural Cambodian should have access to safe water and sanitation by 2025 and specifies that (i) ministries are to function as regulatory and monitoring bodies instead of implementing agencies, (ii) provision of rural WSS is to be based on user demand and include the willingness of users to share related costs, and (iii) private sector participation (PSP) is to play an important role.[13] The issues of the policy can be summarized as follows:[14]

A man drinks clean water in front of Cambodia's National Assembly in Phnom Penh

The NPWSS states that every rural Cambodian should have access to safe water and sanitation by 2025

- Greater community participation, more active hygiene and sanitation promotion, and increased involvement of the private sector in implementation.
- Changing role of the Government from direct implementation to that of monitoring, facilitating, and coordinating.
- High rural/urban coverage disparities and, at only 8%[15] rural sanitation coverage, is the lowest in the region and the second lowest outside Africa.
- Arsenic contamination of aquifers, a significant problem especially in lowland areas near the Mekong River and its major tributaries.

The private sector in Cambodia is dominated by the informal sector, which accounts for over 80% GDP and close to 90% of employment outside the public sector. However, complex registration, licensing procedures, and associated formal and informal charges impose significant burdens, encouraging enterprises to remain informal to avoid these high costs.[16] The Government is seeking to bring the benefits of privately run water services to unserved areas and especially to poor people in secondary towns across the country. Expected service providers are local, private, small-scale operators. In six pilot towns, output-based aid (OBA) approach contracts have been awarded to expand access to basic water and sanitation services. Eight new contracts were put out to bid in March 2006, with the first systems operational by May 2006. The second phase of the pilot projects will scale up the program to new towns, and then possibly nationwide.[17]

Water Resources Management

Cambodia is well supplied with water resources, and is a signatory to the Mekong Agreement. Surface water from the Mekong River supplies most of the eastern parts of the country, while the Tonle Sap River supplies the west and central areas. Both systems provide ample good quality drinking water which only requires basic treatment such as disinfection. Tonle Sap Lake covers 2,500 square kilometers (km^2) in the dry season, increasing to over 13,000 km^2 at the end of the rainy season, but is contaminated with industrial chemical discharges as well as pesticides and agricultural fertilizers during the wet season. In most areas groundwater is available in abundant quantities throughout the year, although it frequently requires treatment to remove iron before disinfection, a characteristic that has been a major issue for some provincial water supply treatment plants.[18] With the increased use of tubewells, contamination by naturally occurring arsenic in groundwater is of concern but not to the extent of bacteriologically contaminated water from surface water sources.

Contamination with industrial chemical discharges, pesticides and agricultural fertilizers is an increasing problem

The key environmental issues facing Cambodia are inadequate legislation, uncoordinated institutions, unsustainable extractive practices, weak land and water resource management, severe pressure on the Tonle Sap ecosystem, and unplanned urban and industrial development. Concerning legislation, there is only one environmental protection law which does not provide a sufficient legal framework for environmental protection and natural resource management, so the pressing need is for a law on natural resources conservation. Environmental institutions are largely uncoordinated, with overlapping responsibilities arising from unclear mandates and resulting in large inefficiencies; for example, there are 14 agencies involved in management of the Tonle Sap biosphere reserve. Institutional capacity is weak, particularly at the provincial level. There are increasing pressures on water resources for expanded irrigation, increasing water supply requirements for domestic and industrial uses, and hydropower. There is no plan to conserve and manage groundwater. Such weaknesses in management result in irrational water resource use which further depletes water resources for maintaining ecological systems. Water resources management is not undertaken in an integrated manner; water is used with little regard to its impact on ecological systems. Integrated approaches are required at regional, basin, and sub-basin level because Cambodia is a downstream riparian country vulnerable to upstream developments.[19]

Water Supply

Provincial centers generally have access to surface river water in unlimited quantities, although coverage of the piped water system may be as low as 15% in some of them and with service restricted to central areas. Rural areas utilize streams, lakes, ponds, and groundwater resources from tube, pipe, and dug wells. Information on coverage should be treated with caution as there are discrepancies between data sources resulting from differing definitions of what constitutes a

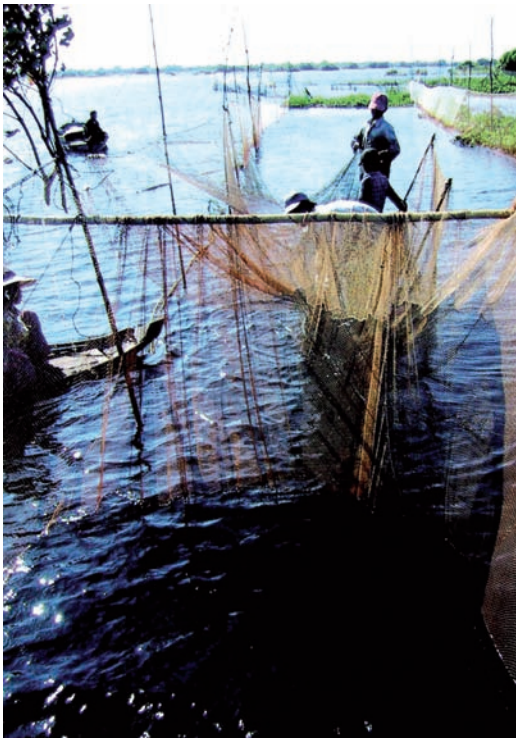
"safe" water supply and what conditions need to be met to declare a source suitable for consumption.

About 60% of the rural population rely on groundwater, with hand dug and open wells widespread, but increased rural development drilled wells with hand pumps are becoming more common. The remaining sources of water are rainwater harvesting (26% in the rainy season falling to 1% in the dry season) and surface water (16% in the rainy season and 26% in the dry). Infectious waterborne diseases are still endemic throughout Cambodia, mainly because people also use their drinking water source for washing and bathing. Compounding the situation, sanitation practices in rural Cambodia are often poor and while sanitary conditions in the central districts of the larger urban areas have improved, adequate sewage disposal is nonexistent in most rural and suburban areas. Although the quality of water resources is generally good, some chemical pollution of surface sources does occur, and in a recent groundwater survey, naturally occurring arsenic was found at above the WHO guideline level in 7 of the 13 provinces surveyed, resulting in an emergency Arsenic Mitigation Program being initiated, involving all the key ministries related to the water supply sector. The seven provinces having the highest risk of arsenic contamination are Kandal, Kampong Cham, Kratie, Kampong Thom, Prey Veng, Kampong Chnnang, and peri-urban areas of Phnom Penh; current data showing that 38% of tubewells within these areas are contaminated. In addition to arsenic, the 2000 studies found 10 additional parameters (manganese, nitrate and nitrite, fluoride, barium, cyanide, lead, selenium, molybdenum, and chromium) of potential health concern that exceeded the Cambodian National Water Quality Guidelines. Elevated fluoride levels were found in 18% of wells tested in five central and southeastern provinces (Kampong Cham, Kampong Chhnang, Kampong Speu, Takeo, and Svay Rieng).

As tubewells have only recently been introduced in Cambodia, exposure to arsenic is likely to have been relatively short. However, in August 2006, a survey team observed signs of arsenicosis in the inhabitants of Praek Russei village, Koh Thom District of Kandal Province about 40 km south of Phnom Penh. In October 2006, WHO collaborated with the Ministry of Health and confirmed the presence of the disease through clinical investigation and biological sampling of suspected arsenicosis cases.[20]

Limited coverage of rural water supply and sanitation and lack of maintenance remain critical for the sector. MRD has not developed an overall rural water supply and sanitation (RWSS) strategy to implement the NPWSS policy yet, only a few guidelines having been developed, although it approved the RWSS Sector Investment Plan (SIP) 2005–2015 in January 2005, describing overall sector financing requirements and expected levels of coverage based on the Cambodian rural water MDGs. However, despite increased access to services, Cambodia has one of the lowest RWSS service levels in Southeast Asia. ADB experience in rural piped water systems managed by the private sector shows excellent satisfaction and payment rates of 85% and 99%, respectively. Following the Government's introduction of the decentralization and deconcentration approach to development management, another lesson learned relates to integrated approaches in water, sanitation, and hygiene education in RWSS projects, which create a higher level of sanitation awareness in rural Cambodia for good sanitation practices and the improvement of public and household sanitation infrastructure. Villages

About 60% of the rural population rely on groundwater, with hand-dug and open wells



Fishing and agriculture are the two main sources of livelihood for the 3 million people who live around the Tonle Sap

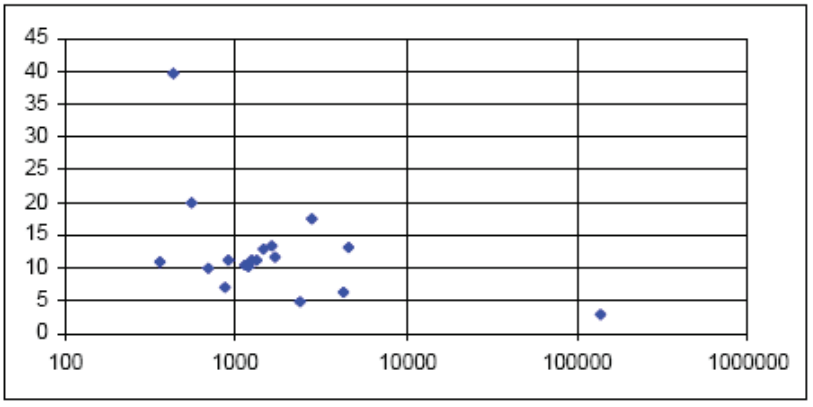
Tonle Sap

and commune councils need to be placed at the center of the decision-making process regarding the selection, preparation, and implementation of sub-projects.[21]

There are 14 public water supply utilities in Cambodia (including the Phnom Penh Water Supply Authority – see below and 32 private water supply systems operating under licenses from MIME. The key areas of concern in all water utilities, except Phnom Penh, are human resources, control of nonrevenue water (NRW), and financial performance.[22] Levels of NRW for public water utilities range from about 15% up to 52%. A comparison of staff per thousand connections against the size of the system is given in Figure 1 below, and shows that most utilities have a ratio of 10–15.

A comparison of tariffs from a selection of public and private utilities indicates that they range from about riel (KHR)550/m^3 to KHR3,000/m^3, with the average being around KHR1,500/m^3. It can also be seen in Figure 2 that the tariffs of public utilities are significantly lower than those for private utilities.

Figure 1: Staffing Levels vs. System Size



The dramatic turnaround of the Phnom Penh water supply system is often used as an example of what can be achieved with an ailing system and utility. As a result of decades of conflict, the capacity of the system shrank from 155,000 m^3/day in the 1960s, to 65,000 m^3/day by 1993. With century-old pipes and a poor distribution network, only about 25% of the population received piped water. Employees of the Phnom Penh Water Authority (PPWSA), the government-owned water supply utility granted autonomy in 1986, were demoralized, underpaid, and under-qualified. Only 13% of connections were metered, leading to inaccurate billing, and only 28% of water production was actually sold, with the collection rate less than 50%. Illegal connections were prolific (PPWSA employees were responsible for much of the water theft as they were installing illegal connections at US$1,000 per connection) and unaccounted-for water was 72% of total supply.

From 1993, with the assistance of external funding agencies and through internal reforms, PPWSA transformed itself into an efficient, self-financed, autonomous organization in a city still recovering from long years of war and civil strife. A "culture of change" was initiated, starting with the education and motivation of PPWSA staff, followed by many reforms, including:

- **streamlining the workforce** by giving more responsibility to higher management, promoting promising staff, giving staff higher salaries and incentives, fostering teamwork spirit;
- **improving collection levels** by installing meters for all connections, computerizing the billing system, updating the consumer base, confronting high ranking non-payers and cutting off their water if they refused to pay;
- **rehabilitating the distribution network and treatment plants** by hiring local instead of international consultants, manually looking for pipes (all drawings were destroyed during the civil war), mobilizing communities to report leaks;
- **minimizing illegal connections and unaccounted-for water** by setting up inspection teams to stop illegal connections, penalizing those with illegal connections, giving incentives to the public to report illegal connections; and
- **increasing water tariffs to cover main-**

tenance and operating costs through a three-step increase in tariffs over 7 years, although the third step was not needed because by then revenues already covered costs (unconnected residents used to pay KHR1,000 a day for water bought from private water vendors, but now they only spend about KHR5,000 per month for PPWSA-supplied piped water)

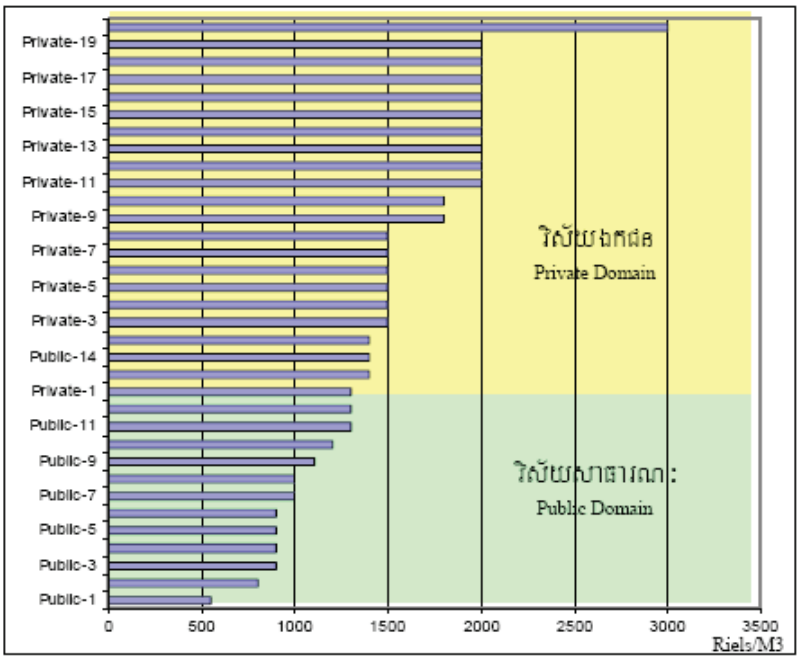
Water services now cover 100% of inner city Phnom Penh and are being expanded to surrounding districts, with priority given to urban poor communities. PPWSA now serves 15,000 families in 123 urban poor communities, giving the poor extra privileges such as subsidized tariffs or connection fees, installment connection fees, etc. NRW has also decreased from 72% to 6%, while bill collection is now at 99.9%. The 147,000 connections, up from 26,881 in 1993, bring reliable and safe drinking water to all of Phnom Penh's one million inhabitants 24 hours a day. An indication of the improvement in performance of PPWSA can be gained from the comparative summary in Table 1.[23]

PPWSA has added more than 750 kilometers (km) of new mains to the original 280 km network, repaired two pumping stations and treatment plants, and added a third. Pipes and equipment have been renewed and meters installed on all connections. The tariff charged by the PPWSA is almost US$0.25/m^3, but it is still a lot less than what poor people paid to private vendors for water delivery. PPWSA is now making money and loans are being repaid. The Authority has also ensured that the rich pay for the water they use by cutting off supply if necessary when bills are not paid. As a result, illegal connections have fallen dramatically. Although there are fewer employees, they are better paid and trained than before, and corruption has been virtually eliminated. This achievement of having one of the best water supply systems in Asia, despite being one of the poorest countries in the world and with massive unemployment, was recognized by the Asian Development Bank (ADB), which awarded a prize to the PPWSA in 2004.[24]

Sanitation

Urban wastewater treatment is largely absent in Cambodia except for primary lagoon treatment of some sewerage in Phnom Penh, a small plant at Battambang and planned investment

Figure 2: Comparison of Public and Private Utility Tariffs



in Siem Reap and Kampong Som. An expected doubling of the urban population by 2030 will greatly increase pollutant loads unless there is large investment, for example US$300 million, was spent on rehabilitation of the Phnom Penh sewerage system. Private sector involvement in urban water supply and sanitation requires that companies can be assured of a reasonable return within a regulatory environment that protects both private and public interests.[25]

Low priority for sanitation and limited awareness on health and hygiene imply that in most rural areas of Cambodia sanitation facilities

Table 1: Comparative Summary in Performance of PPWSA

Indicators	*1993*	*2006*
Staff per 1,000/connections	22	4
Production Capacity	65,000 m^3/day	235,000 m^3/day
Nonrevenue Water	72%	6%
Coverage Area	25%	90%
Total Connections	26,881	147,000
Metered Coverage	13%	100%
Supply Duration	10 hours/day	24 hours/day
Collection Ratio	48%	99.9%
Total Revenue	KHR0.7 billion	KHR34 billion
Financial Situation	Heavy subsidy	Full cost recovery

Most rural Cambodians are unaware of the health effects of unsafe water use

are generally considered a lower priority than water supply systems. Most rural Cambodians are unaware of the adverse health effects of unsafe water use and the lack of hygiene, and continue to drink untreated surface water, prefer to defecate in the open, and rarely wash their hands (less than half use soap in ADB project provinces). The Department of Rural Health Care (DRHC) and nongovernment organizations (NGOs) have therefore developed information, education, and communication materials, but financial support has been insufficient to organize comprehensive countrywide education campaigns.[26]

Latrine use in most rural areas of Cambodia is uncommon, the major obstacles being their high cost (US$50 for the most common pour-flush latrine) and the lack of information and awareness on water use and hygiene. As sanitation facilities are generally considered a lower priority than water supply systems, the DRHC of MRD and several other agencies, such as the United Nations Children's Fund (UNICEF) have focused on education and awareness to stimulate demand for adequate sanitation facilities.[27]

MDG Target Progress

Urban sanitation coverage is significantly behind recently revised national Millennium Development Goal (MDG) targets for 2005

WHO/UNICEF data for 2004 indicate that overall water supply coverage achieved was 41% (64% urban and 35% rural), with overall sanitation coverage 17% (53% urban and 8% rural).[28] Of the 64% urban water supply coverage, 36% was through house connections, the equivalent figure for rural water supply being 2%. Coverage by public standpipes was 1.7% urban and 0.3% rural (2000 data). For the 53% urban sanitation coverage, 23% was due to sewerage connections, while for rural sanitation sewerage, connections were 0%.[29] Recent data from the Ministry of Planning indicate that in 2005, water supply coverage had increased to 76% in urban areas and to 42% in rural areas and, at the same time, sanitation coverage was reported as being 55% in urban areas and 16% in rural.[30] These are significant improvements in a very short time. However, coverage by itself as a monitoring indicator without an assurance that existing facilities continue to give appropriate service, in particular the quality of water delivered at the customers premises or the need to effectively treat sewage, becomes less meaningful. Coverage figures are therefore likely to overestimate the true provision of acceptable improved facilities for both water and sanitation.

There have been two problems associated with measuring achievement of the MDG targets in Cambodia: (i) the definition or urban and rural areas, and (ii) the definition of quality and reliability of the reported access to water supply. Urban areas in Cambodia were reclassified by the Ministry of Planning in November 2004 as the basis to measure progress in expanding water supply coverage in urban areas for 2005. There has also been considerable uncertainty over the definition of access to a safe water supply (as well as the definition of access to improved sanitation). In rural areas, the definition is based on access rather than the quality or reliability of the water, whereas in urban areas the definition reflects the water quality and reliability of the service rather than access. Safe water in the urban context must meet the National Drinking Water Quality Standards, with water supplied through an operating water meter. Urban sector performance indicator targets are summarized in Table 2.[31]

Progress on meeting the MDG goals in urban areas by 2015 is not reported in most authoritative publications due to the absence of a consistent 1990 baseline from which to measure it, and also because of the difficulties of defining urban and rural areas as well as the changed definitions of what constitutes improved water and sanitation facilities. It is clear, though, that Cambodia lags behind regional norms, with much remaining to be done. The 2005 data from the Ministry of Planning show significant recent progress, such that the urban water supply target for 2005 has been met but urban sanitation progress is still significantly behind recently revised national MDG targets for 2005, reportedly as a result of the large rural/urban drift. Rural sanitation coverage in particular needs to be accorded the highest priority if meaningful progress is to be achieved in reaching the MDGs.

Future Plans

In January 2005, MRD approved the RWSS Sector Investment Plan 2005–2015 to reach the Cambodian MDG targets of 50% of the rural population to have access to safe water and 30% to have access to improved sanitation by 2015. This will require capital investments of US$116 million, plus US$4.8 million in recurrent costs, making a total of US$120.8 million (US$70.7 million on water supply, US$50.1 million

on sanitation). Communities are expected to contribute 33% (to cover the maintenance cost of water facilities, and total investment and maintenance costs of sanitation), government 9% and external assistance of 58%.[32]

Planned program expenditure on water and sanitation infrastructure under the NSDP2007–2009 is US$114.4 million, 5.2% of the total NSDP budget, with environment and conservation activities accounting for a further US$77.9 million.[33]

Table 2: Summary of Urban Sector Performance Indicator Targets

	1998	2005	2010	2015
Proportion of urban population with access to safe water	60%	68%	74%	80%
Proportion of urban population with access to improved sanitation	49%	59%	67%	74%

Governance

Governance can be considered in several ways, ranging from the transparency of government and business dealings, the efficiency of the business process (delays in project implementation), to the implementation of regulations and sector performance, e.g., NRW. Such assessments are necessarily fairly subjective and so to provide an overall indication the corruption perceptions index (CPI) produced by Transparency International will be used as a proxy indicator. In 2006, the CPI score for Cambodia was 2.1, making it 151st in the overall ranking and 23rd out of 25 in the regional ranking.[34] Cambodia's low CPI score indicates that it is perceived as being one of the most corrupt countries in the region and lacking the political will to strengthen anti-corruption institutions. Only Australia, People's Republic of China, Indonesia, Mongolia, and Sri Lanka in Asia and the Pacific region have ratified the United Nations Convention against Corruption, suggesting a lack of government determination in the region to tackle corruption.

Most institutions in Cambodia were barely functioning when the Government began its first mandate in 1993. Although important progress has been made in rebuilding institutions, Cambodia continues to operate far below its economic and social potential because of weak governance, especially with regard to reducing corruption, reform of the legal and judicial system, public finance management, public administration, and local governance. Reform has been included in key policy documents including the Governance Action Plan, NSDP, and the Rectangular Strategy which sets out the Government's reform agenda as a series of interlocking rectangles with governance at its core. The other rectangles focus on the necessary environment to implement the strategy, promoting economic growth through agriculture, infrastructure, private sector growth and employment, and human resource development. The Strategy will be delivered through action plans which will become the basis of the budget, the medium-term expenditure framework, and the public investment program. Implementation of these reforms, however, has been slow.[35] An Anti-Corruption Law is currently being prepared, with a subdecree on anti-corruption adopted on 22 August 2006.[36]

Utility Performance

The performance of PPWSA and the improvement trends in its efficiency are remarkable, in particular uninterrupted water supply for several years, 2006 NRW of 6%, a reasonable staffing-connections ratio, revenue collection efficiency of 99.9%, and full cost recovery achieved. However, connection fees are relatively high at nearly US$88.

Although staffing levels are slightly lower in private utilities, salaries are considerably higher than those for public utilities, typically by a factor of 4 or 5! However, service coverage for both is very low. Private utilities charge a fixed connection fee, whereas public utilities utilize a variety of charging mechanisms. Private utilities generally charge higher tariffs than public ones. Generally, customer satisfaction and technical performance are better with private utilities. Limited service area and high connection fees are the two most cited reasons for households not having piped water. [37]

The performance of PPWSA and the improvement trends in its efficiency are remarkable

Table 3 summarizes recent utility performance data.

Selected national indicators are summarized below:

Water availability (per capita)	32,880 m^3/year
Water quality	good
Improved water supply coverage	41%
Improved sanitation coverage	17%
Wastewater treatment	poor
Governance Transparency Index (CPI)	2.1

Table 3: Utility Performance

Indicator	*Phnom Penh*[38]	*Sihanoukville WSA*[39]	*Battambang*[40]	*Banteay Meanchey*
Public/private sector	Public	Public	Public	Private
Main water source	River	—	—	—
Population in area of responsibility	1,200,000	—	139,964	98,848
Coverage:				
Water (%)	83.3	—	6.33	7.74
Sewerage (%)	n/a			
No. of connections	106,000	2,658	3,812	1,500
No. of public taps	—	—	—	—
Supply Continuity (hours of supply)	24	—	8.2	24
Volume produced (m^3/year)	48.0 million	926,000	1,003,750	438,000
Per capita domestic consumption (liters/day)	68	—	—	—
Overall NRW (%)	17	26.3	—	—
Staffing ratio / thousand connections	5.06	—	36.81	17.33
Revenue collected (US$ million/month)	1.227	0.0282	0.1865	0.1388
Collection efficiency	100%	97.6%	—	—
O&M Expenditure (US$ million/month)	0.3636	0.0270	0.1635	0.1201
Connection fee (US$)	87.90[41]	53.15	93.01	
Typical domestic tariff based on 20 m^3/ month (US$)	3.55[42]	7.31	7.44	6.91
Annual capex US$ million)	—	—	—	—
Independent sector regulator?	No	No	No	No

Note: Exchange rate used, US$1 = riel (KR) 4,113.20 as at 1 May 2007.

Future Action Plan

Although important progress has been made in rebuilding institutions that were barely functioning when the government began its first mandate in 1993, Cambodia continues to operate far below its economic and social potential because of weak governance. The water sector also suffers from fragmentation, with some 8 ministries having responsibility for water sector issues, in addition to provincial governments and municipalities.

Villagers of the Tonle Sap live on the water during the rainy season.

Key environmental issues facing Cambodia are inadequate legislation, uncoordinated institutions, and unsustainable extractive practices, together with weak land and water resource management. Chemical pollution of surface waters and the low coverage of wastewater treatment in urban areas are issues that need to be addressed urgently, in addition to the increasing occurrence of arsenic in groundwater used for public water supply due to the increasing use of tubewell technology. Open defecation in rural areas is widespread due to lack of awareness of hygiene and the relatively high cost of latrines, as well as because sanitation facilities are generally considered a lower priority than water supply systems.

PPWSA is a beacon of what can be achieved given determination and motivation to improve a water utility. The success of PPWSA now needs to be replicated in other utilities which are characterized by human resource problems (high staffing levels), lack of effective control of NRW, and poor financial performance. Tariffs levied by public utilities are significantly lower than those for private utilities.

Progress in achieving the water sector MDG targets has been clouded by the absence of an auditable baseline, as well as changes in definitions of urban and rural areas, and what constitutes safe water supply and improved sanitation. By current definitions dramatic improvements in urban services and especially rural sanitation should be top priority in the government's agenda. It is noteworthy that the private sector is to play an important role in the Government's strategy for water sector service delivery, reflecting the extensive experience of the private sector and its local capacity and willingness to support a traditionally public sector service.

The main issues and key challenges may be summarized as follows (key messages raised in the main AWDO text are highlighted in bold):

- Weak and fragmented institutional and regulatory framework as a result of inadequate legislation, duplication and lack of clarity between the various government entities involved, and uncoordinated development.
- **Low tariffs and poor cost recovery due to low willingness to pay. This is a core constraint, leading to under-investment and undermining development of the whole sector. For many service providers, apart from PPWSA, revenue does not even cover recurrent costs let alone contribute to the accumulation of sufficient reserves to fund new capital investment. The situation is even worse in the sanitation sector.**
- **The practice of open defecation must cease.**
- Poor utility performance due to lack of institutional capacity and investment.
- Increasing pollution of water resources due to lack of wastewater and industrial waste treatment, as well as naturally occurring arsenic in groundwater.
- **Need to increase sewerage interception and treat all raw sewage.**
- **The Government has recognized in its sector strategy the important role that the private sector can play in service delivery, but this now needs to be translated into actions.**
- **Connect the urban poor (no connection fee or subsidized fee).**
- **Technical performance and service levels are poor in many utilities** (NRW, low coverage, intermittent supplies, etc.) and need to be progressively improved.

Cambodia continues to operate far below its economic and social potential because of weak governance

The experience of PPWSA has been heralded as exemplary in Asia and the Pacific of what can be achieved with a public water utility. Determination and the motivation of senior staff were key factors in the turn round of the utility. In 2006, the PPWSA Manager Mr. Ek Sonn Chan received the Ramon Magsaysay Award from ADB for Government Service for his role in renewal of the PPWSA. The role of controlling NRW played an important part in improving PPWSA operational efficiency as summarized in Box 1.

Health authorities in most countries in Asia and the Pacific region do not have direct responsibility for developing water supply and sanitation systems, focusing primarily on hygiene promotion and water quality surveillance, although the benefits of such development accrue to the health sector in terms of health gains. To optimize such gains, health authorities can play a key role in relation to water, sanitation, and hygiene, including: (i) establishment of sci-

During the dry season, Tonle Sap villagers live on land.

ence-based evidence, (ii) advocacy to non-health sectors, (iii) normative guidance role to legislative and policy planners, (iv) hygiene promotion, (v) monitoring and surveillance, and (vi) emergencies and natural disasters. Consideration should be given to health authorities taking a more active role in sector development and management to maximize such benefits.

Key Sector Players

Due to space constraints, this list is not exhaustive but merely seeks to provide contact details of a few selected key organizations. Omission from this list should not be taken as a reflection on the importance of the organization.

- Ministry of Water Resources and Meteorology (MOWRAM)
  #47, Norodom Boulevard,
  Phnom Penh
  T: (855) 23 724289 / 724327 F: (855) 23 426345
  E: mowram@cambodia.gov.kh
  W: www.mowram.gov.kh
- Ministry of Industry, Mines and Energy (MIME)
  No. 45, Preah Norodom Boulevard,
  Phnom Penh
  T: (855) 23 211 141 F: (855) 23 428 263
  E: info@mime.gov.kh
- Ministry of Rural Development (MRD)
  Corner Street # 169 and Russian Boulevard,
  Phnom Penh
  T: (855) 23 880 007 F: (855) 23 880 007
  E: mrd@cambodia.gov.kh / Skong@online.com.kh
  W: www.mrd.gov.kh
- Ministry of Health
  No 151-153 Kampuchea Krom Boulevard,
  Phnom Penh
  T: 023 722873 / 880261 / 881405 / 881409
  F: 023 426841 / 722873 / 880261 / 366186
  W: www.moh.gov.kh
- Phnom Penh Water Supply Authority
  12201 Phnom Penh
  Cambodia
  T: +855 11 779 779, +855 23 724 046
  F: +855 23 724 046
  E: eksonnchan@ppwsa.com.kh

Donors active in the sector are summarized in Table 4, which also provides an indication of the current status of key projects funded by ADB.

Future Vision

Progress toward achieving MDG targets in Asia and the Pacific region has been less rapid than anticipated, such that, at current rates of progress, the sanitation MDGs will not be met in many Asian countries. As a result, the 'Vision 2020' document on "Delivery of the MDGs for water and sanitation in the Asia-Pacific Region" was prepared to point the way forward, and was unanimously endorsed by Ministers from 38 countries at the Asia Pacific Ministerial Conference in December 2006 held in New Delhi. The overarching framework is principled governance, together with a move from policy as intention to policy as practice. To achieve the objectives, partnerships will be essential. The 2020 vision can be achieved by:

Box 1: Effective Control of Nonrevenue Water

In 1993, NRW in the PPWSA was incredibly high at 72% of total supply. By 2007, however, NRW was reduced to 6%, of which 2–3% was estimated to be due to unauthorized consumption and commercial losses, and the rest due to physical losses mainly from leakages caused by road, drainage, and cable-laying construction. In 2004, road construction caused 75% of leaks, rising to 81% in 2005 and to 83% by 2006.

Commercial losses were addressed by metering all consumers and tackling the high incidence of illegal connections, which had been widespread due to the high connection charge of US$1,000. Illegal consumption was reduced by running a public awareness campaign, giving incentives to anyone providing information on illegal connections, heavily penalizing those connected illegally, and paying special attention to the removal and punishment of any PPWSA staff found associated with illegal connections. Physical losses were reduced by replacing old pipes, creating 41 leakage control zones based on district metering areas, and establishing NRW control teams in 2003. In 2005 0.4% of revenue was spent on repairing leaks and controlling the 41 zones.

There were three key factors in the success achieved: (i) the role of the PPWSA staff who were offered incentives to become champions in themselves, (ii) active public support, and (iii) managing the 41 zones to control leakage.

Ek Sonn Chan, General Director of the Phnom Penh Water Supply Authority

Table 4: Donors Active in Cambodia's Water Sector

Donor	*Sector/Area of Support*	*Sample ADB Projects*	*Status*
Asian Development Bank (ADB)	Urban, Rural and Basin Water Development and Management	Tonle Sap Rural Water Supply and Sanitation Sector Project	Grant approved in 2005, closing date in 2011.
	Water Resources Management (Sector) Project	Technical Assistance (TA) approved in 2006. Loan proposed.	
	Northwest Irrigation Sector Project	Loan approved in 2003. Loan closing date in 2010.	
	Stung Chinit Irrigation and Rural Infrastructure Project	Loan approved in 2007	
	Assistance to establish the Tonle Sap Basin Management Organization		
World Bank	Peri-urban water supply and sanitation	—	Active/ongoing water supply project
Japan International Cooperation Agency	Social infrastructure, agriculture and rural development and management of environmental resources	—	—
Australian Agency for International Development	Agricultural development	—	—
United States Agency for International Development	Environment (including water supply and sanitation)	—	—
United Nations Development Programme	Environment	—	—
United Nations Children's Fund	Water, Environment, and Sanitation	—	—

- a concerted campaign over the next five years to raise awareness and generate momentum to change polices and governance practices and build sector capacity,
- multi-stakeholder approach in each country to achieve synergies and a united effort, and
- active sharing of information and experience across the region as part of a region-wide initiative.

The future vision for the water sector in Cambodia should include the following:

- Make rural sanitation top priority to increase coverage dramatically and eliminate the practice of open defecation.
- Find and effectively support more champions in the Government to replicate the success of PPWSA in other utilities.

A floating shop on Tonle Sap

Tonle Sap

- Prioritize the WSS sector in terms of investment and human resource development.
- Act on the important role of the private sector in government strategy to deliver water sector services.
- Strengthen the institutional and regulatory framework, and reduce the number of government organizations with responsibilities in the sector.
- Treat all wastewater discharges to at least primary level within 5 years.
- Set sustainable and affordable tariffs to progressively move towards full cost recovery.
- Progressively improve service standards (NRW, hours of supply, etc.).

Cambodia needs to increase water sector investments to at least 1% of gross domestic product

The cost of achieving the water sector MDGs worldwide has been estimated at US$10 billion/year, a seemingly large sum but one that only equates to 5 days' worth of global military spending or less than half of what rich countries spend on mineral water.[43] In reality, it is a small price to pay for improved quality of life, millions of young lives saved, increased productivity, and for generating an economic return to boost prosperity. Governments should aim for a minimum of 1% GDP spending on the water sector.

Table 5: The Index of Drinking Water Adequacy (IDWA) value for Cambodia

Resource	Access	Capacity	Use	Quality	IDWA
77	24	37	-56	14	19

Cambodia needs to increase water sector investments to at least 1% of GDP and also must focus on tariff reform, increased wastewater treatment capacity, strengthening the fragmented institutional and regulatory framework, and giving top priority to improving progress in urban and rural sanitation coverage.

The Index of Drinking Water Adequacy (IDWA) value for Cambodia (see Table 5) is only 19, the lowest of all the 23 countries evaluated in the IDWA background paper for AWDO.44 Although the "resource" (77) value is good, and the "capacity" (37) value relatively poor, the main factors contributing to the very low overall rating are the very poor "access" (24), "quality" (14), and "use" (-56) values used to derive the overall IDWA value.

It is anticipated that the Government's increased focus on rural water and sanitation services will increase coverage and improve the "access" and "use" values. However, to improve the "quality" rating will require a real effort to minimize pollution of raw water resources and improve the coverage of wastewater treatment. The Government should aim for an IDWA value of between 40 and 50 by 2015, although even this achievement will only rank the country in the third quartile of current IDWA value estimates.

This AWDO country chapter is a dynamic document that should be updated and expanded periodically to reflect changes, issues, and proposed remedial strategies in the national water sector. It is recommended that in the next update there should be a specific focus on (i) water resources and environmental management, (ii) sanitation and wastewater treatment, (iii) sector sustainability (tariffs, cost recovery, etc.), and (iv) water utility performance and benchmarking.

Endnotes

1 The contribution of Raikhan Sabirova, Alain Goffeau, and Paulin Van Im of the ADB Cambodia Resident Mission who reviewed the draft document is gratefully acknowledged.

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38 Data on Phnom Penh abstracted from SEAWUN 2004 benchmarking database (reference year 2003), http://seawun.org/benchmarking as it is more comprehensive and complete than the data from the table above for the incomplete 2006 year, which shows that the following improvements have been made: water coverage is now 90%, number of connections is 147,000, NRW is 6%, staff/1,000 connections is now 4, total revenue has reduced to KHR34 billion (US$8.266 million), and the collection ratio is 99.9%.
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41 KHR338,400.
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Ek Sonn Chan is proud to talk about the safe water supply in Phnom Penh

Asian Water Development Outlook (AWDO) 2007

AWDO is a new publication commissioned by the Asian Development Bank (ADB) in view of the increasing importance of water in the future development scenarios of the Asia and Pacific region. In recent years, water has steadily gravitated toward the top of the national agendas of ADB's developing member countries. This is a desirable development because water is an essential requirement for human and ecosystems survival. In addition, water is a critical component for most development needs. Without adequate quantity and quality of water, it will not be possible to ensure food, energy, or environmental security of nations.

AWDO is aimed at Asian and Pacific leaders and policy makers and those interested in understanding the complexities and dimensions of the current and the future water problems, and how these can be addressed successfully in policy terms. Its main objective is to raise awareness of water-related issues and to stimulate an informed debate on how best to manage Asia's water future. These are important and complex issues, and their timely management can contribute to the achievement of all the water-associated Millennium Development Goals and beyond.

AWDO 2007 is ADB's first attempt to make a forward-looking assessment of the possible water future for the most populous region of the world. It is now increasingly being recognized that water is likely to be a major critical resource issue of the world, and that the social, economic, and environmental future of Asia is likely to depend on how efficiently and equitably this resource will be managed in the coming years.

About the Asian Development Bank

ADB aims to improve the welfare of the people in the Asia and Pacific region, particularly the nearly 1.9 billion who live on less than $2 a day. Despite many success stories, the region remains home to two thirds of the world's poor. ADB is a multilateral development finance institution owned by 67 members, 48 from the region and 19 from other parts of the globe. ADB's vision is a region free of poverty. Its mission is to help its developing member countries reduce poverty and improve their quality of life.

ADB's main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance. ADB's annual lending volume is typically about $6 billion, with technical assistance usually totaling about $180 million a year.

ADB's headquarters is in Manila. It has 26 offices around the world and more than 2,000 employees from over 50 countries.

About the Asia-Pacific Water Forum

The Asia-Pacific Water Forum (APWF) provides countries and organisations in the region with a common platform and voice to accelerate the process of effective integration of water resource management into the socioeconomic development process of Asia and the Pacific. The APWF is an independent, not-for-profit, non-partisan, non-political network.

The APWF's goal is to contribute to sustainable water management in order to achieve the targets of the MDGs in Asia and the Pacific by capitalizing on the region's diversity and rich history of experience in dealing with water as a fundamental part of human existence. Specifically, the APWF seeks to champion efforts aimed at boosting investments, building capacity, and enhancing cooperation in the water sector at the regional level and beyond.

Asian Development Bank
6 ADB Avenue, Mandaluyong City
1550 Metro Manila, Philippines
www.adb.org/water

Asia-Pacific Water Forum
Secretariat: Japan Water Forum (JWF)
6th FI,1-8-1 Kojima Chiyoda-ku
Tokyo, Japan APAN 102-0083
Tel +81 3 5212 1645
Fax +81 3 5212 1649
office@apwf.org
www.apwf.org/