

Water Markets in Asia and the Pacific: An Overview of Trends, Opportunities, Risks and Policies

Working Paper



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EXECUTIVE SUMMARY

Water security has become a very important challenge for the Asia Pacific region to be urgently addressed. How to most efficiently manage this scarce and finite resource, while catering to increasing demands related to industrial growth, agricultural production and rapid urbanization is a key challenge for the region. Erratic weather patterns are increasingly affecting water security and climate change may exacerbate the situation. As of 2015, 277 million people in the region lacked access to safe drinking water sources; approximately half of them, 138 million, living in South and South-West Asia. Only 65 per cent of the population has access to basic sanitation (2015).

Investments for improving water efficiency and reusability of water resources are in high demand and the 2030 Agenda for Sustainable Development is creating a push for moving financial flows in that direction. The purpose of this study is to provide an assessment of investment trends, and opportunities of water and sanitation markets in the Asia-Pacific region. It will also highlight risks and key policies that are important to stimulate water markets and investments in the region. The study is limited to an analysis of investments in the water purification and waste water management sectors which are very important for the region, where almost 90 per cent of the waste water is discharged untreated and the implementation of the sustainable development goal on improving water quality (SDG 6) is urgent due to the growing needs for fresh water resources in the region. In addition to a regional overview, selected countries, representing a range of countries to illustrate a variety of opportunities in the regional water and sanitation market were also examined.

The study indicates increased investments in water infrastructure, including 15 per cent growth in water and sanitation markets, with China emerging as the biggest market in 2025; and India as the fastest growing market. The main drivers are regulatory and legislative conditions, and environmental protection initiatives. Together with a number of Western countries, Japan and Korea are major players in the water and sanitation market of the region due to their significant investments in the sector in the form of overseas development aid (ODA). Institutional fragmentation, inadequate capacity (human and technical), lack of adequate information and information, absence of strong governance and monitoring, and the need to price water and waste water services are prevalent issues in the water and waste water sector in the region (UNESCAP).

United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) can play a crucial role in strengthening regional cooperation in the context of water and the SDGs by: (1) promoting regional scientific research cooperation, (2) establishing and promoting regional knowledge and information sharing mechanisms, (3) facilitating regional dialogue and agreements on trans-boundary river conventions using innovative means for conflict resolution, and (4) enhancing the development of sub-regional (for example at the ASEAN level)/regional water markets, water bonds, national water pricing schemes and reforms, and Payment of Ecosystems Services.

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CHAPTER 1

BACKGROUND AND SETTING THE SCENE

The recently adopted 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs) set the scene for a comprehensive response to a wide range of global challenges by addressing poverty eradication and the economic, social and environmental dimensions of sustainable development in an integrated manner. This new global framework builds on lessons learned from the review of the implementation of the Millennium Development Goals (MDGs), the outcomes of the Rio+20 UN Conference on Sustainable Development, and the Financing for Development Conferences.

In response, new powerful drivers for national action at the policy development and implementation levels to help eradicate poverty and achieve sustainable development by 2030 are emerging in the Asia-Pacific (AP) region.

The SDG 6 and its 8 targets, which are one set of the seventeen SDGs and 169 targets (Annex 1), are dedicated to water and sanitation to “ensure availability and sustainable management of water and sanitation for all. SDG 6 does not only have strong linkages to all of the other SDGs (1); it is one of the key prerequisites for achieving them.

Among the key challenges to be addressed in the region is the issue of how to most efficiently manage this scarce and finite resource, while catering to increasing demands for clean drinking water and sanitation, as well as sustaining rapid industrialization and ensuring adequate food production. As of 2015, 277 million people in Asia and the Pacific still lacked access to safe drinking water sources in 2015; 138 million of them living in South and South-West Asia . The percentage of the population with access to basic sanitation in the region was 65 per cent in 2015 (2). The Asia-Pacific region requires further investments of USD 59 billion for water supply and USD 71 billion to provide access for improved sanitation (3).

Through-out the Asia-Pacific region there is a need to revisit traditional water resources management and bring the water cycle at the core to “revolutionize” the water and sanitation management practices. Investments for improving water efficiency and reusability of water resources are in high demand and the new 2030 Agenda for Sustainable Development is creating a push to move financial flows in that direction.

For the purpose of this study, the water and waste water market constitutes monetary (financial) investments in the water industry. The scope of this study is focused on the analysis of growth (correlated with increase in investments) of the water markets in the sectors of water purification and waste water management investments in the Asia-Pacific region which is a pivotal and very important sector for the region, where close to 90 per cent of the waste water are discharged untreated.

This study provides a brief overview of the current situation of the water markets in Asia-Pacific region and some selected countries to highlight some of the positive trends and evolving opportunities. It will also highlight risks and key policies that are important to stimulate water markets and investments in the region. The study will provide information on the potential of some advanced technologies to attract more investments, and provide quick returns and why.

Various terminologies related to the acquisition of water resources as a commodity exist. Water trading is a concept which views water as a tradable commodity and is a voluntary exchange or transfer of a quantifiable water allocation between a willing buyer and seller. The water market on the other hand is a generalized term for the mechanisms used to acquire and redistribute water, and is the business encompassing research and technology consultation, planning, design, construction, management and maintenance, manufacturing, and information technology that relate to both public and private water sectors in damage mitigation, water supply, river environment improvement, diverse water supply sources, soil conservation, and groundwater protection projects. Virtual water which is the water required for the production of agricultural commodities and its corresponding virtual water trade - defined as the quantification of virtual water flows between nations in relation to international crop trade were not considered in this study.

The study presents historical demand data and forecasts by product (e.g., conventional filtration, membrane equipment, disinfection equipment), market (e.g., municipal, manufacturing, commercial and residential, power generation), and application (supply water, wastewater, process water, ultra-purification, desalination). A number of selected country case studies representing each sub region are presented to illustrate the increasing investments and opportunities available in water markets in the region. These include Kyrgyzstan, China, Bangladesh, India, Sri Lanka, Thailand, Vietnam, Fiji, Papua New Guinea, and Vanuatu.

CHAPTER 2

OVERVIEW OF CURRENT AND EMERGING WATER AND SANITATION MARKETS

The global water market is growing and recent estimates put the size of the global water market at about 591 - 625 billion USD in 2014. Market opportunities in the water sector are expected to reach 1 trillion USD by 2025. In most countries, government owned agencies or organizations are responsible for drinking water supply and wastewater treatment. In some countries, these services have been privatized and in recent years, the provision of drinking water and wastewater sanitation services by private companies has increased to about 14 per cent globally and is anticipated to rise to 21 per cent by 2025. Currently, 47 per cent of the population is served by the private sector in Western Europe, about 23 per cent in North America and in Southeast Asia 20 per cent (9). The increased participation of the private sector in the provision of water and waste water sanitation services has enhanced efficiency gains and provided technological improvements, contributing to the overall development of the sector. It is anticipated that the strongest growth in private sector participation will come from emerging market countries such as Egypt, Vietnam and India (Figure 1, Annex 2 and 3).

The primary drivers of growth in the water and waste water sector are due to:

- Increasing population and urbanization growth;
- Increasing demands for access to clean drinking water and food resources;
- Adaptation to climate change and impending shortages of clean water;

Among some of the key factors that are having negative impact on the growth of water markets, and need appropriate short-term and long-term policy responses are:

- Over-subsidized pricing causing mismanagement of water resources;
- Uncoordinated policy response to manage conflicting demands for water resources
- Lack of proper governance and the absence of ownership rights/permits for water resources use;
- Policy environment not-sufficiently stimulating public-private partnerships and regulating private sector involvement in developing the water and sanitation sectors;
- Insufficient policies stimulating innovation, and research and development
- Insufficient involvement of local communities in water resources management;

Overview of the global water and sanitation technologies and investment trends

Current annual global capital expenditures of utilities¹ on water infrastructure and wastewater infrastructure are an estimated USD 100 billion and USD 104 billion respectively. Overall there appears to be a correlation between global economic growth and the increase in investments in the water and waste water markets (Figure 1). For water and wastewater, the current operating expenditures amount to USD 191 billion and USD 125 billion respectively. An overview of the water utilities on a regional level is provided (Annex 2). Investments in the water sector in emerging markets are expected to grow faster than in developed markets, and progress will be slower in some European markets and Sub-Saharan Africa. Conversely, emerging Asia and the Middle East and North Africa (MENA) are anticipated to experience above-average growth rates. The vibrant economic performance in the Middle East is strongly correlated to the provision of additional water through desalination, triggering the strong growth rates for related technologies and services. The Capital Goods & Chemicals investment sector is currently experiencing strong growth globally as it includes equipment and systems used throughout the water value chain².

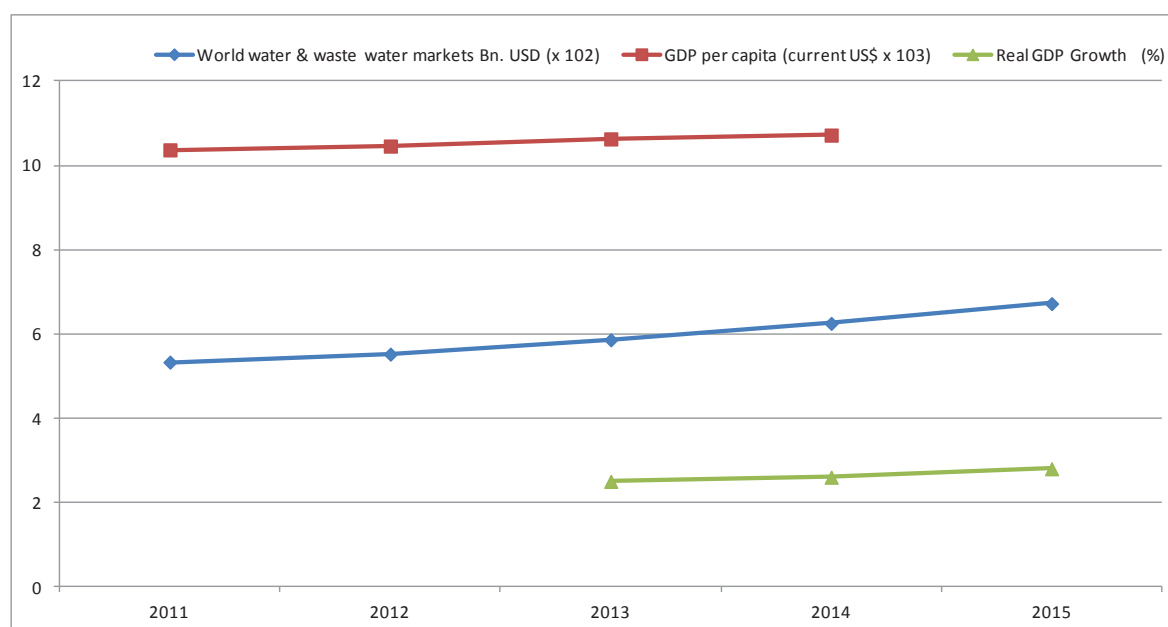


FIGURE 1. Global economic growth and increase in investments in the water and waste water markets. [Source: (10,11)]

An analysis of the available technologies within this sector indicates that the global demand for desalination and water reuse technologies is the strongest. This is being driven largely by the scarcity of fresh drinking water resources. About 1 per cent of all fresh water consumed globally was derived from desalination in 2014. Currently, over 17,000 desalination plants in 150 countries serve more than 300 million people globally. Global desalination capacity is projected to reach about 128 million m³ per day by 2018, with the biggest increase in the Middle East (Annex 3).

¹ utilities provide water supply and wastewater services to residential, commercial and industrial sectors

² The value chain spans from the original water source to pump stations, treatment systems and chemicals, distribution and collection, water reuse, and irrigation, ultimately returning water to the natural waterways.

Overview of the water market situation in the Asia-Pacific region

The Asia-Pacific region accounts for 36 per cent of the global surface water runoff, or the draining away of water. The highest absolute amounts of water resources are available in China, Indonesia and Bangladesh. However China (together with India and Pakistan) also ranks lowest among the countries in terms of annual water resources per capita. The key water issues facing the region are water scarcity and water pollution. Domestic sewage, industrial effluents, chemicals and solid waste are still discharged directly into existing water bodies of most cities of developing countries in the region. Recent data covering 94 per cent of the Asian population suggest that only 48 per cent have sanitation coverage, which could be the lowest share among all world regions (10).

The Asia-Pacific region possesses several of the world's largest rivers including the Ganges, Brahmaputra, Chang Jiang (Yangtze Kiang), Ob and Yenisej). In addition to these, several natural lakes e.g. the Dongting-hu in China, Tonle Sap in Cambodia and Kasumigaura in Japan can be found in the region. The main source of freshwater in the Pacific region is groundwater sources which are prominent throughout small island states, such as Maldives, Kiribati, Tuvalu and the Federated States of Micronesia.

Although the region is comparatively well endowed with water resources (Annex 4), per capita availability is substantially below the world average. Only about one third of the estimated renewable water resources generated by precipitation is available as run-off, another third is lost in deep percolation and the rest simply drains to the sea. Countries such as Afghanistan and the Islamic Republic of Iran suffer from chronic water shortages due to arid climate whereas parts of the People's Republic of China and India experience the same problem primarily due to high population density. Asia contains more than 60 per cent of the world population (including Japan) and is a promising water and sanitation market with great potential.

The competition for water between various economic sectors is increasing due to the continuing economic expansion in the region (12). Irrigation for food and agriculture is still consumes most water in the region, accounting for 60 - 90 per cent of annual water withdrawals in most countries. The Indian sub-continent in South Asia and islands of the South Pacific has the highest level of water withdrawals for agriculture accounting for 92 and 90 per cent of the total consumption, respectively. Together, these two areas account for 82 per cent of the total irrigated land in Asia.

Most countries in the region are able to meet more than 50 per cent of household water requirements within their water resources endowment. In the arid and semi-arid zones of the region and small islands where surface supply is deficient or unsuitable, groundwater is the only source of water. The demand for domestic water is anticipated to grow from 70 per cent in 1995 to 345 per cent by 2025. Many industrial processes require significant quantities of water which is eventually released back to the environment, however impure and untreated, and recycling would require additional treatment. Industrial water supply in the region is provided by both surface water and groundwater sources. An overview of the annual water withdrawal by sector in the Asia-Pacific region is provided in Annex 5 (13).

CHAPTER 3

EMERGING MARKETS IN WATER AND SANITATION SECTORS IN ASIA AND THE PACIFIC

Regional trends and types of investments per sector

The Asian water market covers 21 countries and is segmented into the wastewater, drinking water and process or industry water sectors. In 2012 Asian water markets grew to over 96 billion US Dollars. Several Asian countries like China, Japan, India, Taiwan, Korea and Vietnam have dramatically increased their investments in drinking water, waste water and water treatment in last years. Overall Asian countries experience water quality problems, and projections indicate a steady growth in the demand for water purification and disinfection technologies. This is an area for high priority action and investments (10).

The investments in market for waste water and drinking water in Asian reached over 50 billion US\$ in 2007 and is expected to reach 117.3 billion US\$ in 2015. Currently Japan dominates with a total market share of about 33 per cent (Figure 2). The market for drinking water treatment is led by drinking water distribution technologies and this trend is projected to continue into 2025. Japan is the leading country both for markets for drinking water treatment and also in investments in drinking water in Asia followed closely by China (Annex 6 and 7). A disaggregation of the market for waste water treatment in Asia by technologies indicates that the demand for mechanical treatment equipment is highest and will remain so in the future (Figure 3). The dominant countries in this sector in terms of markets and investments are Japan and China (10). Bangladesh and Thailand are experiencing and maintaining a steady growth in investments.

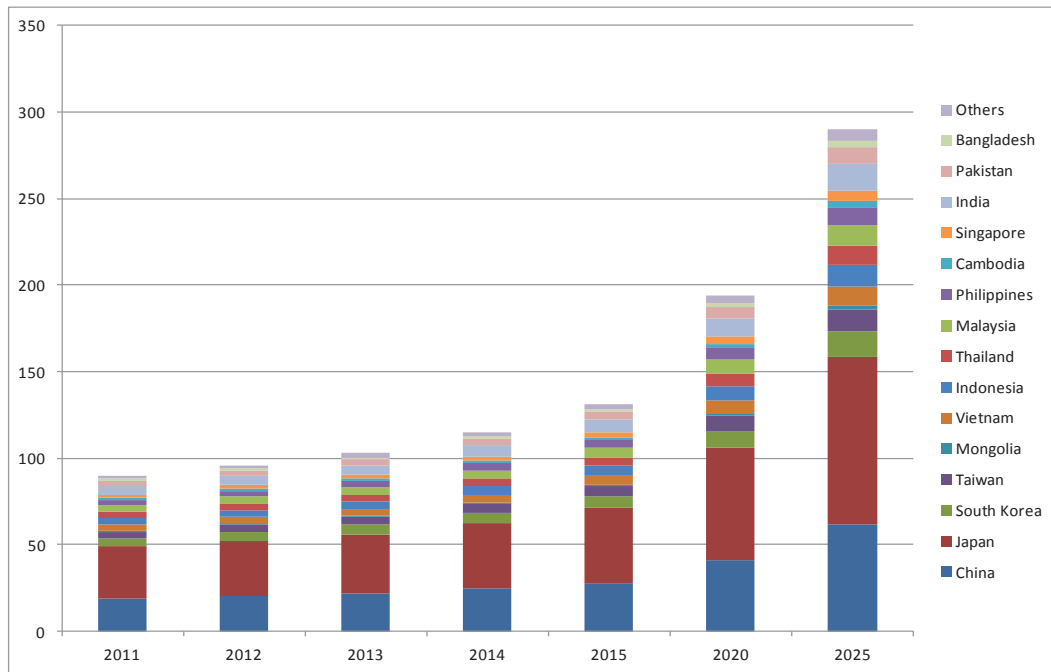


FIGURE 2. Water and waste water market in Asia (billion USD) [Source: (10)]

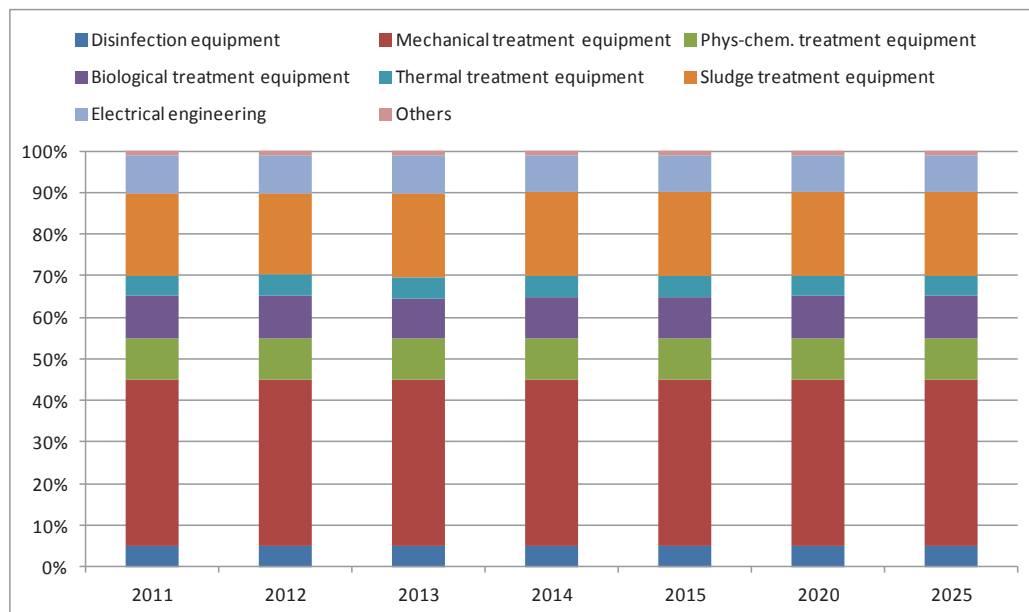


FIGURE 3. Waste water treatment market in Asia by technologies (USD) [Source: (10)]

Filtration technologies, followed closely by membrane methods dominate the market for process/industry water in Asia. The leading sectors demanding process/industry water technologies are chemical/pharmaceutical, and the food and semi-luxury.

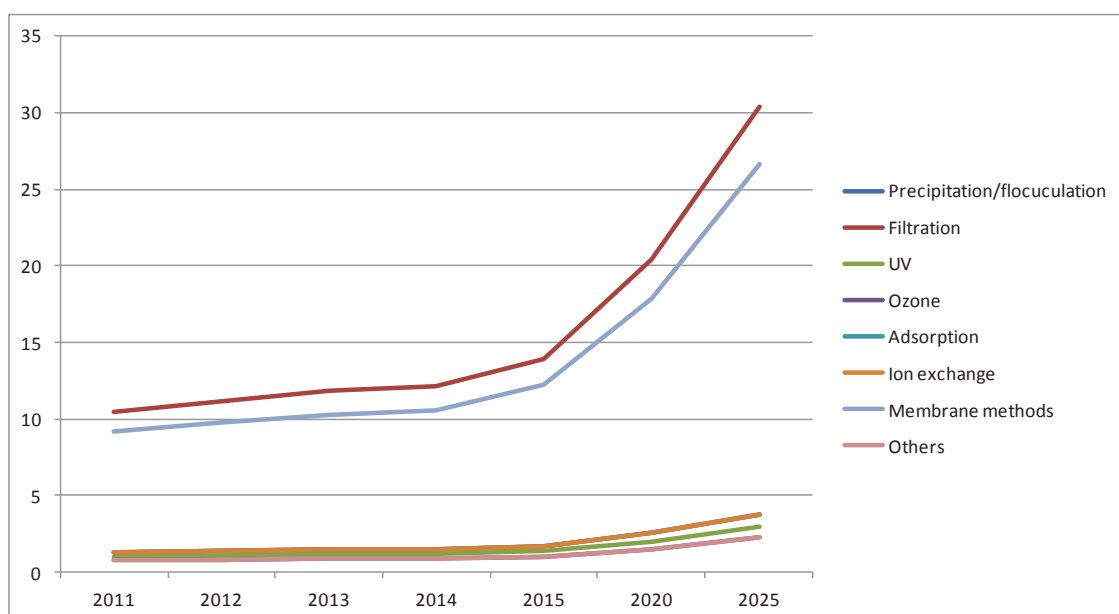


FIGURE 4. Market for process/industry water in Asia by process/technologies (billion USD)[Source: (10)]

Water filtration technology is the dominant technology for the domestic water market in Asia. This trend is not expected to change. Water treatment technologies such as filtration, membrane technology, desalination with global growth rates of 15 per cent to 20 per cent, have a 26 per cent annual growth forecast in China and 15 per cent to 20 per cent in India (14). Disinfection technologies are applicable across a whole range of sectors and market investments in disinfection technologies for water treatment in Asia has increased from 2.3 billion USD in 2011 to a projected 8.2 billion USD in 2025, with the leading technology being the UV disinfection technology (Figure 5). This has gained over chlorination because the process is relatively efficient and economical. The main countries demanding water disinfection technologies in Asia do not differ much with the top three countries being, China, India and Japan.

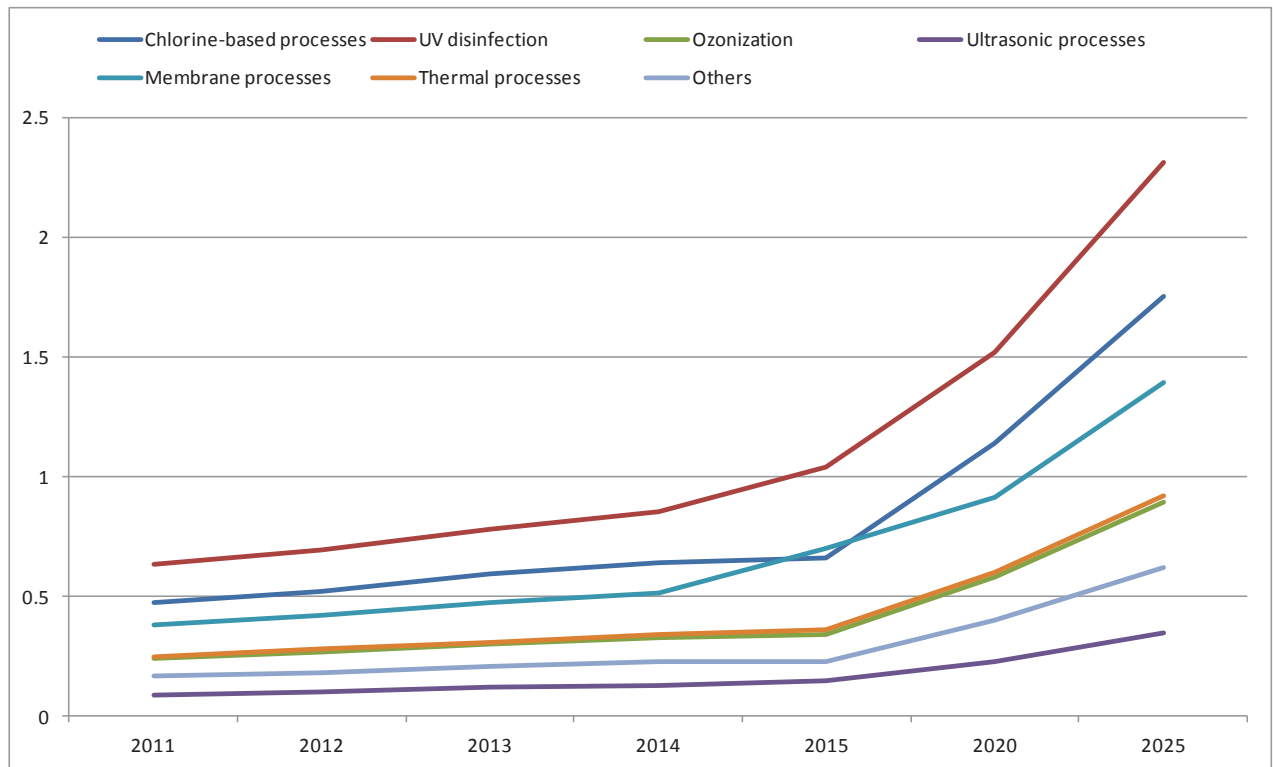


FIGURE 5. Total market for disinfection water treatment technologies in Asia 2011-2025 (billion USD)[Source: (10)]

About 350 companies control 60 per cent of the Asian markets. Asian countries are interested in purchasing innovations and new technologies. Joint venture and technology transfer is a booming business. Membrane technologies, intelligent sewage plans, water desalination are key technologies and Build Operate Transfer (BOT) models are the successful business models (10).

The highest levels of investment in the water and sanitation sector in the Asia-Pacific region currently come from the national government budget and official development assistance (ODA). Japan's water investment in Asia and other regions has been mostly in the form of ODA. In terms of the volume of water investment in recipient countries, Japan has accounted for 24.2 per cent (Figure 6), which is ranked as the highest among donor countries (15). Korea is also investing heavily in the water markets of the region through ODA (Figure 7) especially in water supply and sanitation large systems (16).

Ranking	Donor Nation	2008	2009	2010	2011	The Sum Total	Portion (per cent)
1	Japan	420.4	365.8	734.5	950.0	5,295.3	24.2 per cent
2	United States	150.4	104.7	177.9	173.6	3,235.2	14.8 per cent
3	Germany	265.1	292.9	288.2	244.4	3,144.1	14.4 per cent
4	Spain	397.0	421.5	185.9	77.1	1,545.4	7.1 per cent
5	Netherlands	147.1	160.4	152.7	205.7	1,461.1	6.7 per cent
6	France	88.9	99.5	78.2	71.6	1,186.5	5.4 per cent
7	United Kingdom	112.4	23.1	156.9	167.6	1,021.7	4.7 per cent
8	Australia	17.2	63.1	201.9	226.2	743.6	3.4 per cent
9	Denmark	79.7	81.1	80.2	66.0	639.9	2.9 per cent
10	Sweden	67.4	88.2	40.3	50.4	613.6	2.8 per cent
⋮	⋮						
20	Korea	30.0	13.9	16.6	52.5	125.7	0.6 per cent

FIGURE 6. The scale of investment in water industry by donor countries 2008-2011 (million USD) [source: (15)]

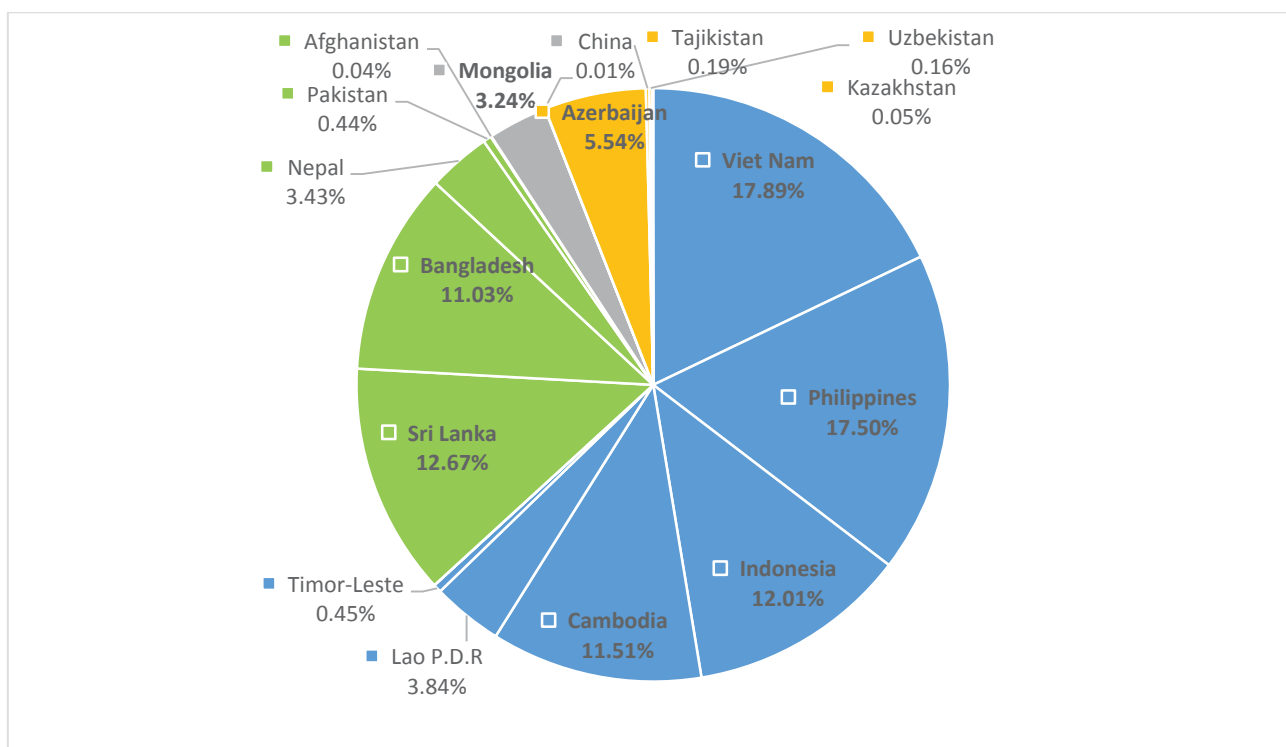


FIGURE 7. Distribution of Korea's water ODA by countries (2006-2014, commitments) [Source: (16)]

Case study countries

The Asia-Pacific region is generally divided into five sub regions, namely South Asia, Southeast Asia, Northeast Asia, Central Asia, and the Pacific. The countries within a sub region often share a natural and socio-cultural background, and experience similar environmental problems. The allocation of countries by sub region is shown in Table 1, following the practice in the State of the Environment in Asia and the Pacific Report (17).

TABLE 1. Sub regions and countries

Sub region	Countries
Central Asia	Armenia, Azerbaijan, Turkmenistan, Uzbekistan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan,
North East Asia	China, Japan, Democratic People's Republic of Korea, Republic of Korea, Russian Federation, Mongolia
South Asia	Afghanistan, Bangladesh, Bhutan, India, Islamic Republic of Iran, Maldives, Nepal, Pakistan, Sri Lanka, Turkey
South East Asia	Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Timor-Leste, Vietnam, Philippines, Singapore, Thailand

Pacific	Australia, Cook Islands, Fiji, French Polynesia, Guam, Kiribati, Marshall Islands, Federated States of Micronesia, Nauru, New Caledonia, New Zealand, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu
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Note: China includes Hong Kong and Macao Special Administrative Regions and Taiwan Province of China.

As it was not possible to assess the water and sanitation market in each country in the Asia-Pacific region, representative countries for each sub-region are presented in this study (Table 2). The availability of data relating to water and sanitation and related policies was the criteria for the selection of the countries profiled. Additionally, the high growth rates and huge amount of resources consumed by some countries such as China and India which manufacture large volume of the goods and services for consumption in industrialized countries (18) make these countries suitable candidates for inclusion in the study. While, in South-East Asia, in particular the ASEAN countries, clean water, sanitation and smaller scale distributed systems form an important area of opportunity. On the other hand, in South Asia, India is the country where such small scale distributed systems are the predominant choice.

TABLE 2. Selected case study countries

Sub region	Countries
Central Asia	Kyrgyzstan
North East Asia	China
South Asia	Bangladesh, India, Sri Lanka
South East Asia	Thailand, Vietnam
Pacific	Fiji, Papua New Guinea, Vanuatu

India case study

India is one of the ten countries globally with the most renewable freshwater (Figure 8). However, it is also suffering from water stress as its annual water supplies currently at 1,539 are well below 1,700m³ per person. Two of the world's top 10 mega cities are located in India (Table 3). Its rapid urbanization and industrialization has increased pressure on water resources and competition for water usage, and an acceleration of the decay of existing infrastructure. It is anticipated that the demand for water in India will increase by 58 per cent by 2030. Approximately 71 per cent of households are connected to piped water in urban areas. This proportion is about 31 per cent in rural areas. Contrasting this is the non-existence of wastewater treatment (19, 20). Inefficiencies in usage and supply of water exist across the country. Domestic and industrial usage of water is

inefficient and one of the key reasons for this is the lack of economic pricing of water. The government has largely resisted to price water at its real cost. Low prices encourage overuse and wastage. Unaccounted for water (UFW) is high due to several reasons including old water systems and poor maintenance, illegal connections, leakage, and lack of proper mapping of distribution system. Average unaccounted for water in India is pegged at almost 32 per cent although the municipal water utility has the potential to improve water pumping system efficiency by 25 per cent thereby increasing efficiency of supply.

Through the Eleventh Five-Year Plan (2007 - 2012), India planned for investment of US\$28.3bn in urban water supply and sanitation, including urban (storm water) drainage and solid waste management. This investment is aimed at improving the water infrastructure to cope with the population pressure and need for greater economic development. Several fast growing sectors and states provide increasing opportunities for exporters and investors in water and sanitation technologies. In 2007 the water market in India grew at the rate of 12 per cent per annum and is one of the biggest and most attractive markets in the world, related to water management (2).

India is investing heavily in desalination to meet demand and it is anticipated that by 2026, 20 per cent of water use in coastal cities (Mumbai, Gujarat and Chennai) will be provided by this technology. Investment is expected to be in the tune of up to 8 billion US dollars over 20 years and desalination capacity is due to expand by 12 - 15 per cent in the near future (21). In addition, projects promoting water efficiency projects and water reuse, including the agricultural sector, are major development areas by the state (Annex 9 - 11).

Conducive policies

The increased participation of the civil society organizations in decision-making at local government levels has contributed to positive gains in implementing government policies and programs. This can be leveraged by steering public funding towards stimulating demand for water and sanitation services. Investment in urban water supply and sanitation has increased during the first ten years of the 21st century, driven by increased central government grants and funding from development agencies like the ADB, and World Bank. The 11th Five-year plan has contributed to an increased access to water and sanitation services. This has been achieved through the formulation of a central policy and increasing collaboration between implementing agencies. However there is an urgent need to review the existing national water policy to:

- explore alternative technologies for sewage treatment like soil biotechnology based systems and reed-based systems
- lobby to increase water and sewerage tariffs to pay for capacity expansions
- deliver targeted subsidies where these can be demonstrated to be most effective
- eliminate revenue loss by eradicating leaks and monitoring water supply

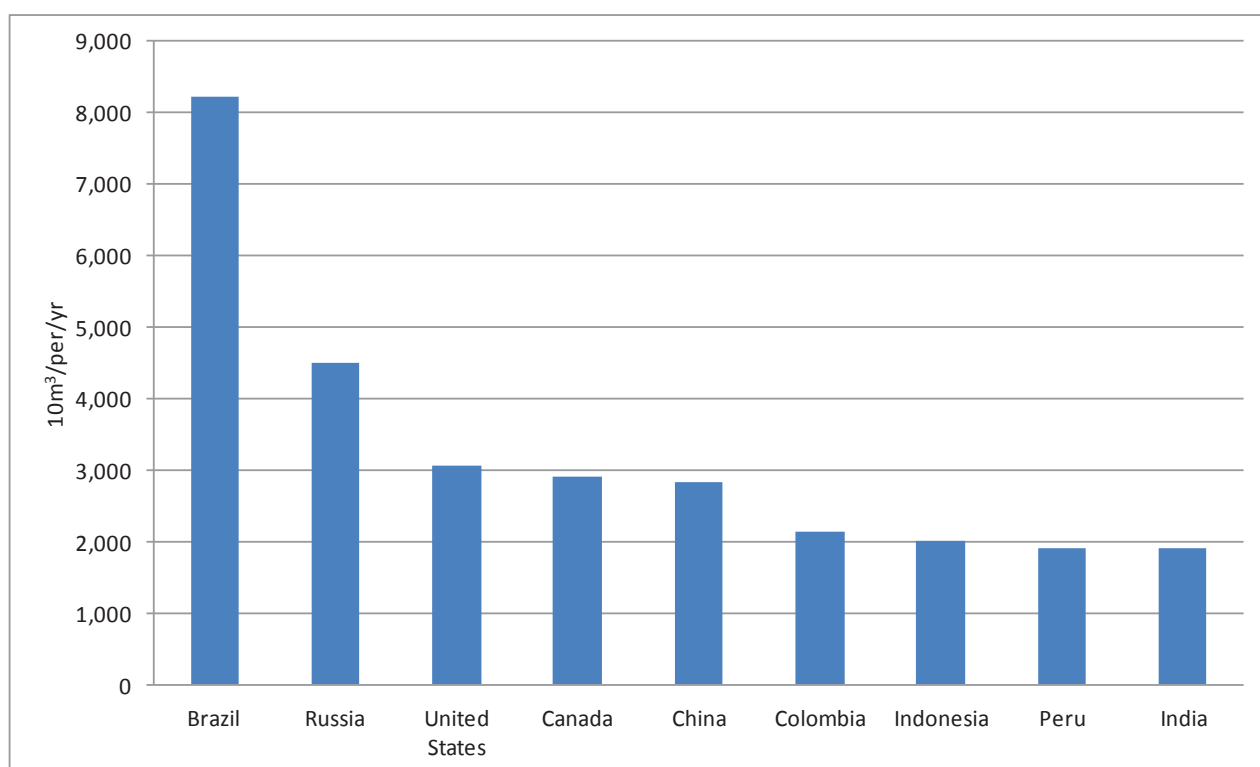


FIGURE 8. 10 countries with most renewable freshwater (10m³/person/yr) [Source: (19)]

TABLE 3. Top 10 megacities 2011-2025 (population in millions) [Source: (19)]

City	Country	Population – 2011	City	Country	Population - 2025
Tokyo	Japan	37.2	Tokyo	Japan	38.7
Delhi	India	22.7	Delhi	India	32.9
Mexico City	Mexico	20.4	Shanghai	China	28.4
NYC	USA	20.4	Mumbai	India	26.6
Shanghai	China	20.2	Mexico City	Mexico	24.6
São Paulo	Brazil	19.9	NYC	USA	23.6
Mumbai	India	19.7	São Paulo	Brazil	23.2
Beijing	China	15.6	Dhaka	Bangladesh	22.9
Dhaka	Bangladesh	15.4	Beijing	China	22.6
Kolkata	India	14.4	Karachi	Pakistan	20.2

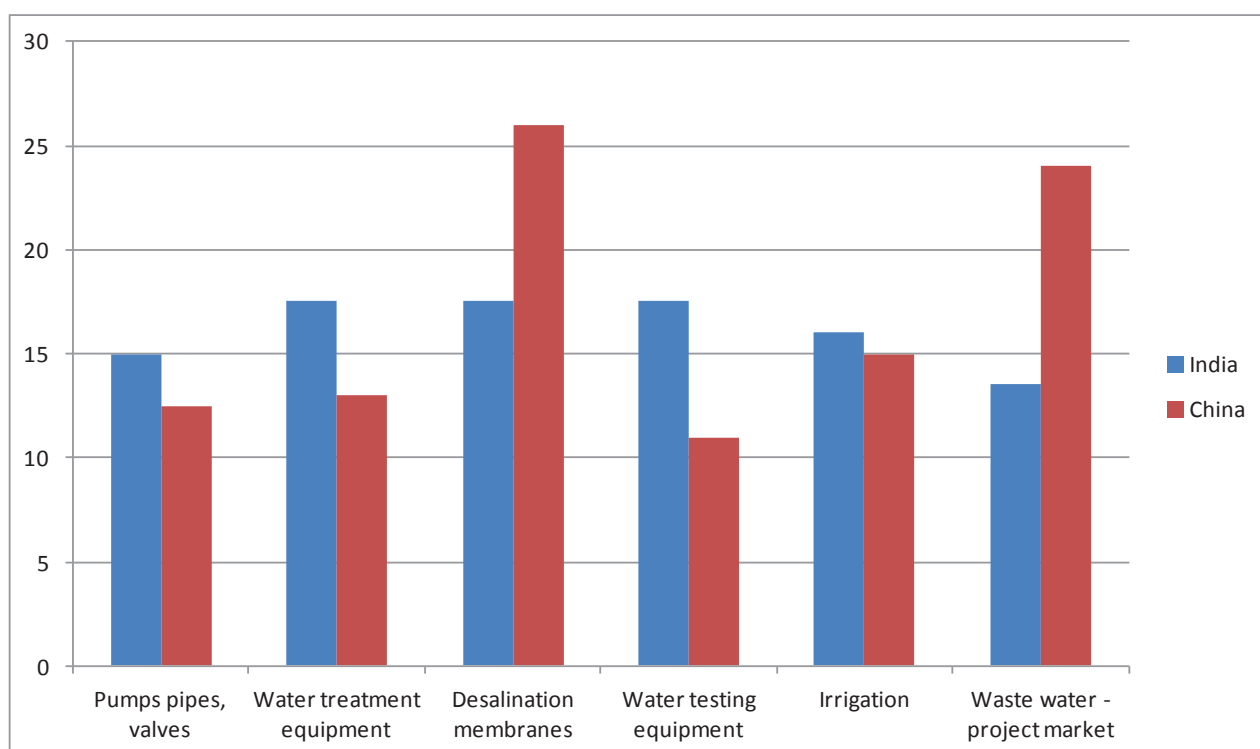


FIGURE 9. Growth rates (per cent) of selected water sectors in India [Source: (10)]

Market opportunities

- Agricultural irrigation technology is seen as a major opportunity.
- Extension support services to farmers
- Sanitation and environmental remediation services
- Opportunities also exist in the application of specialist technologies, such as water-reuse and sludge treatment, as well as monitoring and compliance technologies for existing plants.

China case study

The rate of urbanization in China has increased by an average of 2.9 per cent per year over the last decade and two of China's cities are mega cities (Table 3). Every percentage increase in urbanization could lead to an additional 1.6 billion m³ of water demand per annum (9). Its rapid industrialization driven largely through coal-fired electricity could account for 40 per cent of non-agricultural water use over the next decade. Coupled to the growing demand for water, the volume of wastewater discharge in China has contaminated ground water in some parts of the country (10, 19, 20). China is one of the ten countries globally with the most renewable freshwater (Figure 8). Low water tariffs hinder water conservation and investment in the sector, and wastewater treatment barriers are some of the issues limiting safe and secure access to water in China.

Conducive policies

The increased investments and developments in the water and sanitation sector in China is largely due to the government's 12th Five-Year Plan which is helping to deregulate the water sector with the objective of opening up the water sector for non-state investment; investing and building up the water supply infrastructure and wastewater treatment facilities; implementing measures to increase investment and participation in the sector; and increasing water resources fees, water tariffs and wastewater treatment charges (9, 10). China's current 12th Five-Year Plan seeks to reduce water usage by 30 per cent for every new dollar of industrial output, and towards the end of the 12th Five-Year period treat 85 per cent of its urban wastewater. The government is investing 161.3 billion US dollars to achieve this target. China easily met its previous goal of reducing water consumption by almost 37 per cent between 2005 and 2010. The water-conserving measures have helped constrain the growth in water usage to around 1 per cent annually (10). This is anticipated to trigger new investments in water efficiency and wastewater treatment. Technologies whose market share will benefit from these regulations include industrial wastewater treatment technologies (such as micro and ultra-filtration, reverse osmosis, desalination and zero liquid discharge systems (Figure 9 - 10, Annex 12 - 14). Currently, the desalination water market is extremely viable in China with a forecasted 26 per cent annual growth rate (19, 21).

The water market in China is significant, estimated at US\$42.3 billion in 2007. Given the size of the market, population and the general economy, there are significant opportunities within this market. China is a priority market for medium to large sized companies, who are able to contribute funding to assist development of the market and significant opportunities are available (2).

Market opportunities

- Agricultural irrigation development
- Sanitation projects
- Advanced and low-cost wastewater treatment processes
- Information systems for water utility management
- Household water saving technology
- Industrial water efficiency including effluent reuse and recycling
- Water research collaboration
- Ground water technology
- River and lake management
- Non-point pollution source control
- Water resource monitoring systems
- Regional (river basin) water resource management planning

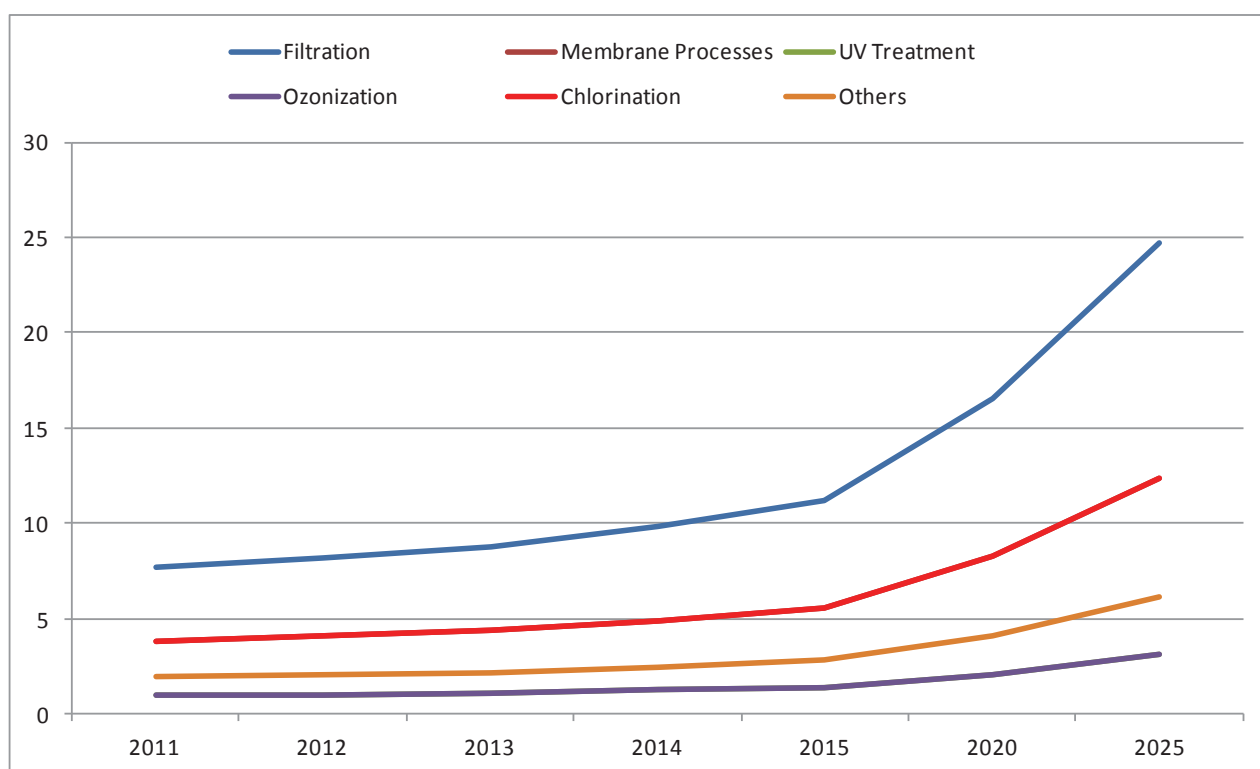


FIGURE 10. Water market in China by technologies (billion USD) [Source: (10)]

Thailand case study

In 2007 about 90 per cent of the total water withdrawal in Thailand was for the agriculture sector, 5 per cent for municipal and 5 per cent for industry. Wastewater treatment is not common, and when carried out, reuse is not practiced. Industrial wastewater is generally discharged into rivers and canals. Currently, to tackle this, numerous wastewater treatment projects are being developed in Bangkok.

Several ministries and government agencies are involved in water resources development and the National Water Resources Committee (NWRC) is responsible for setting policies for developing water resources at the national level. Most laws related to water management are outdated, are focused on individual aspects of water management without a holistic view, or Integrated Water Resource Management (IWRM) view. There is no law specifying water rights (23).

The water technology demands of Thailand include equipment to increase and manage raw water sources (i.e. conjunctive water use), technologies to improve the efficiency of water treatment supply and distribution and water use efficiency. As Thailand is prone to water risk disasters, technologies for better watershed and waterway protection and rehabilitation, improved drainage and diversion and flood protection system technologies as well as those that improve land use management are needed (24). The waste water sector requires technologies which can improve the efficiency of wastewater collection and treatment, as well as technologies for monitoring point sources and wastewater discharge.

The Thai Government is committed to addressing environmental problems and is pursuing

privatization aggressively. World Bank and Asian Development Bank (ADB) projects drive opportunities with an emphasis on build-own-operate (BOO) and build-operate-transfer (BOT) projects. The government is also encouraging water and wastewater treatment technologies which has opened the market wide open to foreign imports of products and services (Figure 11). A recent evaluation of SE Asia water and water sanitation markets indicate that Thailand has the largest potential for new water projects (25).

Approximately 80 per cent of the waste water treatment equipment in Thailand is imported from Japan, the United States, and Europe (26). These initiatives and the socio-economic growth of the country have resulted in a steady growth in the water and wastewater treatment market in Thailand. The market is growing, with demands primarily driven by the municipal need for providing water and sanitary services, as well as industry verticals such as food and beverage, power, automotive, and palm oil. In Thailand, the food and beverage, electrical and electronics sectors are the main manufacturing entities. All these industries have high requirement for water quality, with intensive water usage, and discharge polluted effluents requiring wastewater treatment resulting in the growth of the filtration equipment market (Figure 12). Over the long term, the industrial vertical market is expected to lead the way in the uptake of membrane technologies as membranes prices continue to become more competitive. Membrane technologies in Thailand are expected to continue to grow favorably as the country looks to increase its level of sanitation and water supply as membrane technologies are among the most efficient and best technologies in the market. Forecasts indicate further long-term commercial opportunities for the environmental sector, including water and wastewater.

Conducive policies

The increased investments and developments in the water and sanitation sector in Thailand can be attributed to the systematic inclusion of the Sanitation Program in National Economic and Social Development Plans which has adopted a comprehensive vision for water supply, excreta disposal, and refuse disposal. The wide-ranging participation by all key stakeholders and capacity building of key people involved has also catalyzed the markets. To harmonize the activities of the various agencies implementing water and sanitation policies, an independent agency – the water regulatory commission is planned.

Market opportunities

- Privatization projects, which will create opportunities in engineering, management consultants, contractors, and operators with build-own-operate (BOO) and build-operate-transfer (BOT) concessions;
- Pumps (submersible, centrifugal, aerator/mixer, dosing and vacuum), sludge dewatering equipment (filter presses, belt press, and small dewatering systems) and screening machines (bar screens, shredding screens);
- Groundwater, water resources management;
- Municipal and industrial wastewater treatment plant management and operations;
- Consultants and contractors, operators, equipment manufacturers and financiers in supply, and operational training.

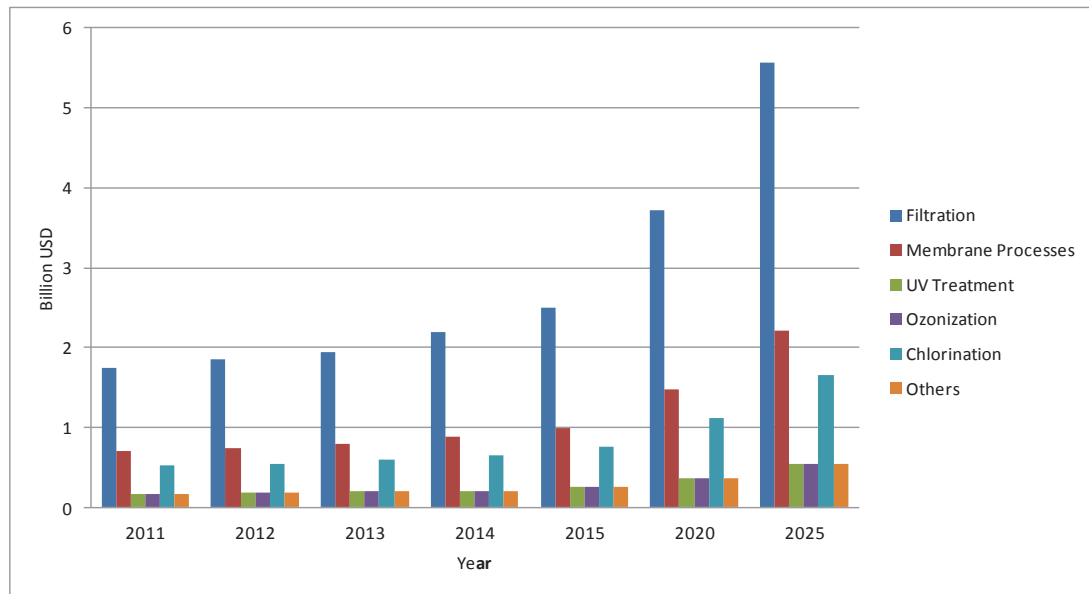


FIGURE 11. Water market in Thailand by technologies (billion USD) [Source: (10)]

Bangladesh case study

Bangladesh is a southern Asian country covering 144 000 km², and Dhaka, its capital city, is one of the world's mega cities (Table 3). The country is one of the poorest countries in the world and is highly vulnerable to water-related disasters. In recent years, it has experienced an annual average growth of 6 per cent. Clean water is one of the many barriers to economic growth. Surface water (30 per cent) and ground water (69 per cent) are the main sources of water for economic and household activities, and virtually no recycling or reuse of water occurs. Most of the water used in the country is consumed by the agricultural sector (96 per cent), 3 per cent for domestic use, and the remaining 1 per cent for industrial use. Water pollution, particularly arsenic pollution of the ground water is a threat to more than 80 million people living in Bangladesh. More than 20 million people are exposed to excessive levels of arsenic pollution (27, 28).

Conducive policies

Despite these huge challenges, Bangladesh has made significant progress in increasing coverage of water and sanitation facilities, and the water markets in the country are growing. In 2012, open defecation has been reduced to 3 per cent of the population while improved water supply is being provided to 85 per cent of the population. This growth and achievements can be linked to implementation of water and sanitation policies being implemented in the country. Bangladesh has formulated a set of comprehensive policies and strategies (including the 2014 National Water Supply and Sanitation Strategy) covering almost all of the issues facing the sector. The National Water Supply and Sanitation Strategy is aimed at improving the quality and coverage of water and sanitation facilities, while prioritizing hygiene practices and the critical role of the health and education sectors in ensuring effective implementation of water, sanitation, and hygiene interventions.

Market opportunities

The water markets in Bangladesh have solid growth potentials and need expansion in order to contribute and support economic growth in Bangladesh (Figure 12). In Bangladesh a significant market exists for providing energy efficient irrigation solution including high quality pumps, filters for making boiled water odor free, implementation of different measures like conservation of rain water, installing deep tube-wells and hand pumps to ensure safe drinking water. These technologies should also include those for the treatment of arsenic contaminated water (i.e. oxidation and sedimentation, coagulation and filtration and absorptive filtration). Water treatment plants in rural areas should also be set up complement the existing but inadequate water treatment plants. An overview of opportunities is presented in Table 4.

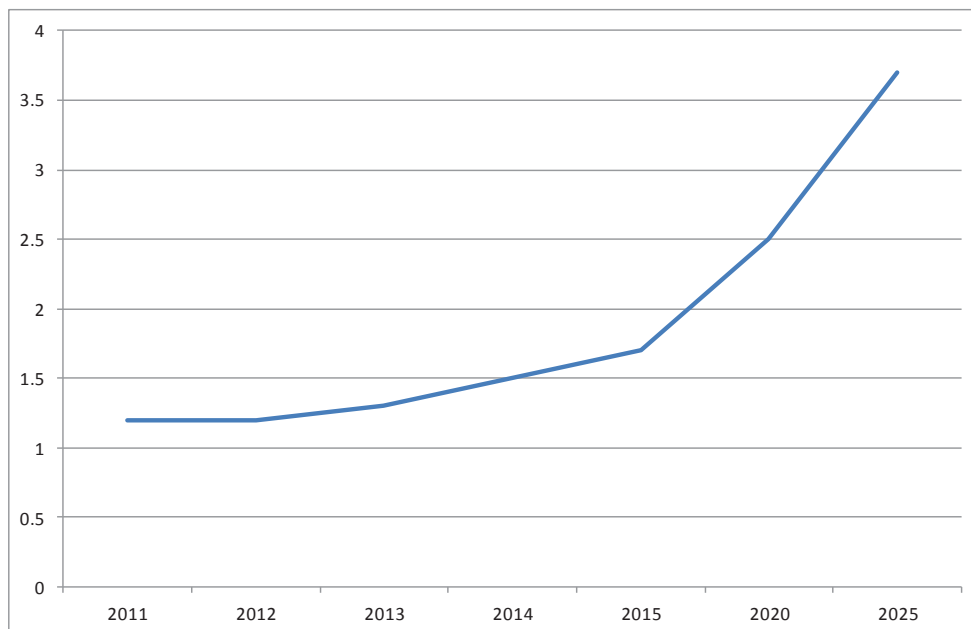


FIGURE 12. Water and waste water market in Bangladesh (billion USD)

TABLE 4. Overview of water market opportunities in Bangladesh [Source: (29)]

Water Chain	Market Segment	Services (Consultancy)	Works	Supplies/goods
Water Resource	Surface water	Spatial planning	Erosion control	Coastal Zone Protection
		Water resource planning	Data management	Flood Protection
		Water governance reform		Management Information Systems
		Remote sensing		
		Climate proofing/adaptation		
	Ground water	(Geo-) Hydrology services		Purification/filtration
		· Ground water management		· Extraction
		· Pump technology		· Pumps
		· Contamination		
	Water harvesting	· Option engineering		Harvesting technology
				Desalination
Water Use (consumption)	Urban Drinking water	Planning and feasibility	Management contracts	Distribution and supply
		· Operational Management	· Treatment plant	· Metering
		· Water supply & Sanitation	management	· Treatment and purification
	Rural Drinking water	· Groundwater management	· Arsenic reduction	· Extraction and purification
		· (Geo-) Hydrology services		· Distribution and supply
		· Extraction/ Recharge		· Treatment
		· Water Supply & Sanitation		· Water security
				· Pump technology (electric; manual)
	Industrial water	· Policy and Regulatory	· Treatment plant	· Treatment plants

			management	· Recycling and re-use
	Agricultural water	· Irrigation management	· Erosion control	· Dams & canals
		· O & M organisation	· O&M management	· Pumping
		· Ground water management		· Second/tertiary
		· Water management organisations		· Drainage
Water Use (non-consumption)	River and Sea transport	· Port development	· River shipping services	· Navigation
			· Dredging and land	· Ship- and yacht building
			reclamation	· Ferry terminals
			· Water civil	· Port infrastructure
			constructions	· Maritime suppliers
			· Port exploitation	
	Fisheries	· Policy and regulatory	· Aquaculture	· River fishing
		· Aquaculture know how	production/fish	· Pond fisheries
			processing	· Sea fishing
			management	· Aquaculture
	Tourism	· Nature preservation in delta's and wetlands	· Infrastructure investments	· Water based tourism supplies
		· Eco-tourism development		
	Energy/Oil & Gas		· Inspection services	· Hydropower installations
			· Marine contracting	
			· Logistical services	
Discharge	Sewerage	· Water supply & sanitation		· Latrines

		· Municipal infra planning		· Solid waste
		· Local governance		· Sludge
	Drainage	· Drainage and salinity	· Drainage infra	· Drainage supplies
	Waste water	· Policy and Regulatory	· Treatment plant management	· Waste water treatment
				· Process water recycling
				· Re-use

Sri Lanka case study

Sri Lanka possesses a satisfactory amount of fresh water resources. A total of some 15 billion m³ of water is available for drinking, agricultural irrigation and industrial use. Like other developing countries, Sri Lanka faces the same challenges of fresh water scarcity and contamination of fresh water with industrial wastes and untreated sewage. Water sanitation and water borne diseases is a particular concern in this country. This coupled with increasing levels of pollution and contamination in surface and ground water resource has created a need for innovative and sustainable solutions to meet the needs of an increasing demand for water projected to increase from 1.7 to 1.8 billion m³ by 2018 (30, 31). This increase in demand is correlated to its impressive Gross Domestic Product (GDP) growth, which has also spurred the demand for water and investments in the water and sanitation sector. Investment in the drinking water and sewerage sector has increased over the years from SLRs. 17,100 m in 2006 to SLRs. 29,340m in 2011 (Figure 13).

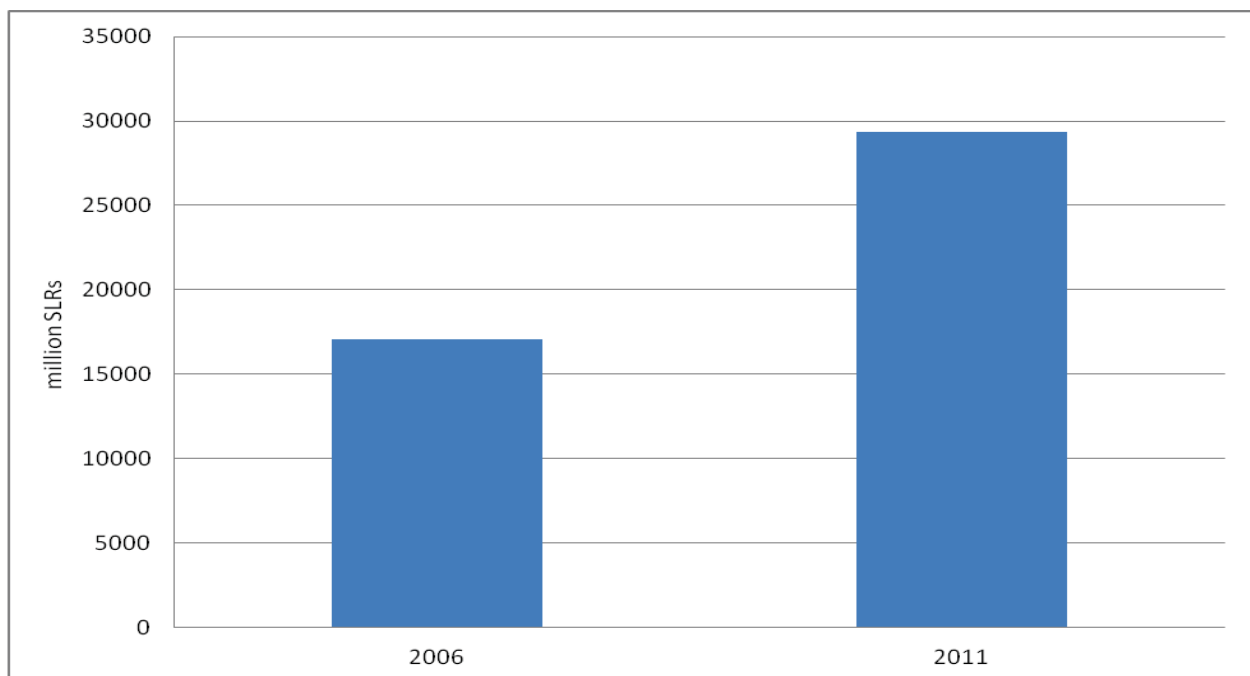


FIGURE 13. Investment in the drinking water and sewerage sector

Conducive policies

The Government of Sri Lanka has set a high priority to water supply and sanitation sector development, by setting a target for providing access to safe drinking water and improved sanitation to all citizens by the year 2020 (Annex 15). The government has also invested finances for the realization of the plan which would require support from the private sector (Annex 16). To maintain the momentum the plan could provide an appropriate framework of policies and practices for effective sector management, attach an economic value to water, and promote private sector participation.

Filtration (slow sand and rapid sand) is the main water treatment technology used in Sri Lanka. There is a need for more advanced water treatment technologies as the level of pollution continues to increase. Proper discharging methods are required to minimize the adverse impact caused on the environment by the improper discharge of sewage, and this represents a huge market potential for infrastructure related to wastewater discharging. The demand for water by the industrial sector can also be mitigated through the introduction and promotion of recycling technologies. Technologies alone will not revamp the water and waste water sector in Sri Lanka. Institutional and regulatory reforms are also needed. For example, in order to attract more active participation of the private sector to invest in O&M, BOO and BOT contracts, a revision of the current water tariff rates is needed. The current rates are twice as low as that of regional peers (e.g. Indonesia and Thailand).

Water irrigation and the livestock sector account for about 90 per cent of water withdrawal in Sri Lanka. Given the high level of water development for irrigation, increasing irrigation efficiency could help meet the growth in water demand. If irrigation efficiency is increased to 45 per cent from the currently assumed level of 35 per cent, the irrigation demand shall decrease by 22 per cent. The major irrigated areas will contribute to 78 per cent of the reduction in demand through this level of efficiency increase (33).

Market opportunities

- Exist for suppliers engaged in design and construction phase, suppliers of water saving and advanced irrigation technologies and equipment
- There is potential opportunity for suppliers of water and wastewater treatment plants, owing to capacity additions planned for increasing piped borne water and sewer coverage.
- Another area of potential opportunity includes engineering design and construction, supply of equipment related to water and sanitation and consulting firms
- The ADB in Sri Lanka has also adopted a water supply and sanitation strategy aimed at introducing integrated approaches that promote sustainable management of water resources. Management and consulting firms with expertise in this area will become increasingly important as environmental and climate change is anticipated to be given increasing importance during planning future projects.

Vietnam case study

Vietnam with a population of about 91 million people is tagged as one of the 'Next Eleven' countries for having a high potential of becoming the world's largest economies in the 21st century (27). The population with access to improved water sources is high (98 per cent) with about 59 per cent possessing house connection but less than 10 per cent of urban wastewater is treated. In 2005, agriculture accounted for 86 per cent, industrial use for 10 per cent and municipal use for 4 per cent of total annual water withdrawal in the country. Many factors are making the Vietnamese water and

wastewater sector a very attractive market for the private sector including the country's rapid urbanization and industrialization, a projected GDP growth rate of over 8 per cent, government support for private sector participation and major funding from official development assistance donors. Taking all these factors into account, capital expenditure is set to triple from 300 million US dollars in 2011 to 830 million US dollars by 2018 (34 - 36). The market for waste water treatment is growing, however it is anticipated to be overtaken by the waste water sector due to investments in waste water treatment equipment such as water filtration, water / wastewater purification, pumps, valves, flow measurement (Figure 14 – 16).

Conducive policies

Vietnam increased its investments in drinking water, waste water and water treatment in the last years dramatically (10) and revenues from its water market in increasing. Investments in water supply and sanitation for large systems have progressively declined, while those in basic water drinking supply and basic sanitation have progressively increased. The government plan is to achieve 100 per cent urban water supply coverage in 2020. This can be attained through adopting an integrated river basin approach, greater and more sufficient adaptation to the water-related vulnerability and susceptibility, expanded and more efficient services for irrigation and domestic water supply, and curbing water pollution and its health impacts on the poor. Addressing the following challenges is important:

- Strengthening the policy and institutional framework for IWRM;
- Expanding and diversifying investment in infrastructure for the water sector, while paying more attention to financing for the management side through for example, increasing tariffs (37);
- Improving compliance and enforcement;
- Deepening public participation and involvement.

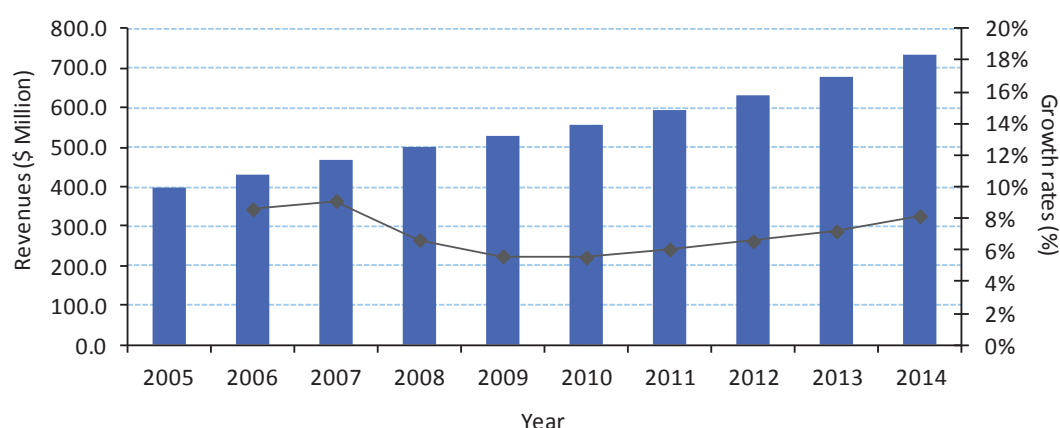


FIGURE 14. Water and wastewater infrastructure market: revenue forecasts (Vietnam) [Source: (38)]

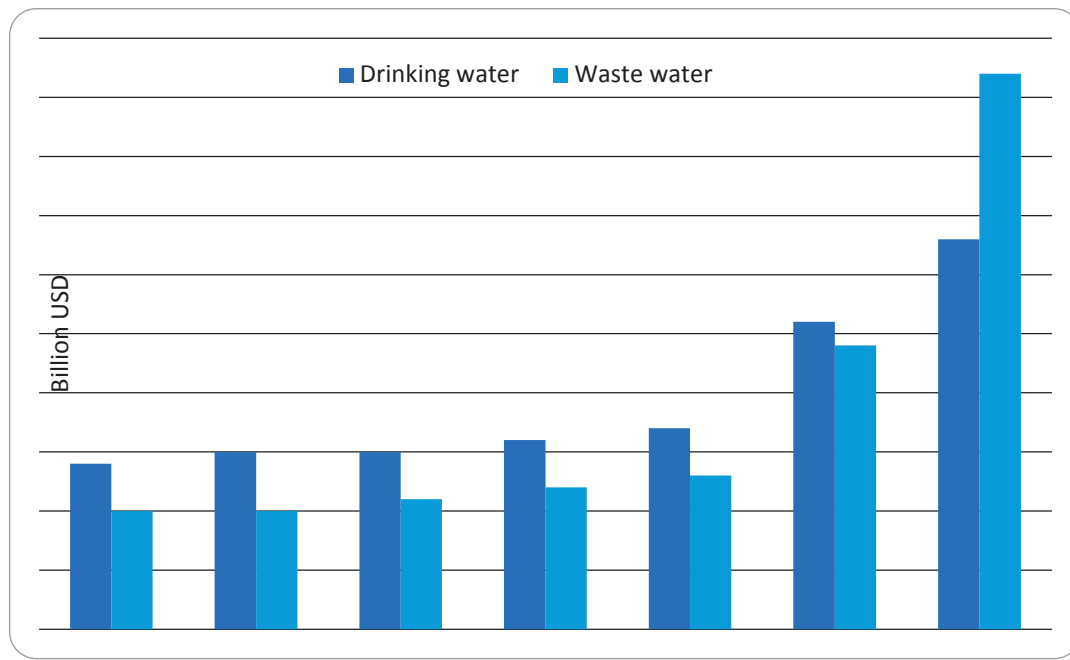


FIGURE 15. Water markets in Vietnam (billion USD) [Source: (10)]

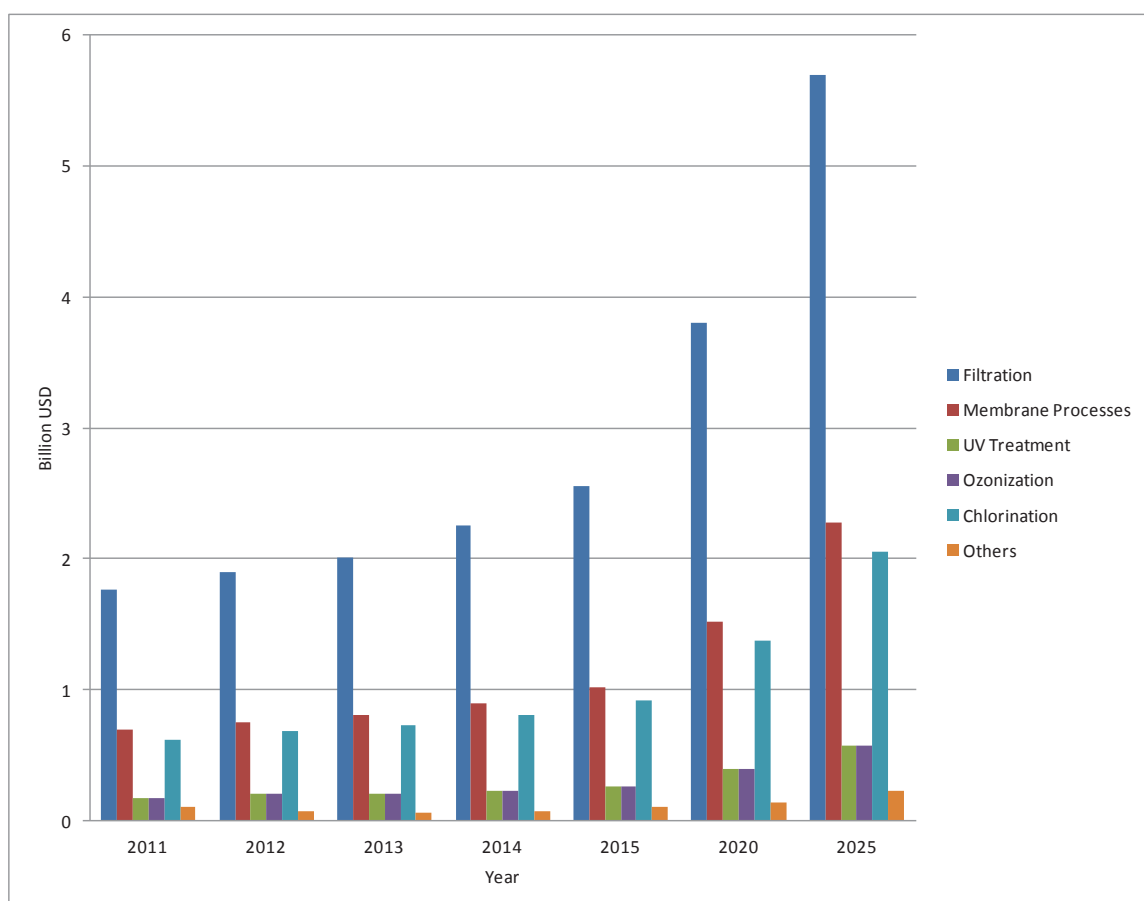


FIGURE 16. Water market in Vietnam by technologies (billion USD) [Source: (10)]

Market opportunities

- Urban and industrial water: system design, asset management sustainable cities, recycling water and wastewater especially in emerging industrial zones
- Agriculture: irrigation technology, surface and groundwater management, leakage control, smart systems, water accounting and flow management
- Mining: mine planning, aquifer management, mine water quality, wastewater treatment and monitoring and testing
- Improvement of municipal water and wastewater treatment facilities through new constructions and by retrofitting treatment plants.

Papua New Guinea (PNG) case study

Papua New Guinea (PNG) with a population of 6.9 million people is the largest and most populated Pacific nation. Its rapid population growth - expected to double between 2010 and 2030 - has

contributed to a lack of water and sanitation coverage. The rapid population growth will continue to increase the demand for water services, which poses a challenge for water and sanitation infrastructure. 87 per cent of the population lives in rural environments. As of 2010 only 40 per cent of the population had access to improved water supply and 45 per cent to improved sanitation with significant rural - urban variation. The situation has not improved. In 2013 these percentages decreased - for sanitation – to 19 per cent nationally, with only 13 per cent access in rural areas. The use of basic and inadequate sanitation facilities, lack of adequate sewerage systems has resulted in the pollution of water table for drinking water and negatively impacted the nation’s health statistics due to the high mortality rate from diarrhea and cholera resulting from water pollution. The inability of the country to meet the water and sanitation needs of its populace – despite positive economic growth – is attributed to poor sectoral leadership, unclear roles and responsibilities, a lack of organizational capacity and very limited government funding (39 – 41). The main investments and funding for the water and sanitation sector comes from Australia and New Zealand which also supply water related technologies and equipment. Bottled water is the main water market in the country and is experiencing a high growth (Figure 17).

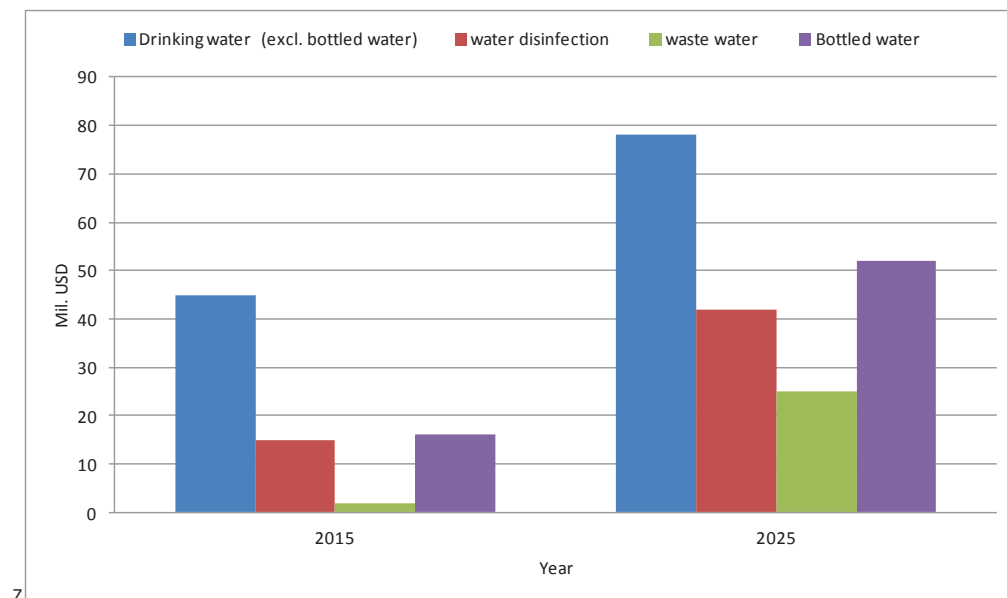


FIGURE 17. The water markets in Papua New Guinea (million USD) [Source (10)]

Vanuatu case study

Vanuatu has a population of about 250, 000 people and enjoys better water and sanitation coverage than some countries in the south Pacific. However, about 80 per cent of it’s population consisting of rural households have no access to improved water and sanitation facilities. In addition to traditional sources of human contamination, rural communities’ water supply quality is impacted by exposure to potential contaminants from volcanic ash and gas emissions. These issues have made Vanuatu the country with the third highest incidence of diarrhea compared to other Pacific Island Countries (PICs) (42, 43). Vanatu is a at risk country for natural disasters and water related disasters such as the

recent Tropical Cyclone Pam reversed the minimal gains made as it damaged water and sanitation infrastructure, which in turn has affected health, protection, and education. An overview water and sanitation related issues are provided in Table 5 and Table 6.

Conducive policies

- Although water and sanitation was excluded from the more recent Budget Priorities for 2011, institutional restructuring of the water sector is being carried out to re-locate water sector responsibilities from the Department of Geology, Mines & Water Resources (DGMWR) to a distinct Department of Water (DoW). The DoW should be granted legal status to enable it function effectively
- The lack of leadership and governance (i.e. no specific legislation, overall coordination or global plan) for sanitation in Vanuatu should be addressed to facilitate the provision of water and sanitation services to the populace
- Expanding and diversifying investment in infrastructure for the water sector, while paying more attention to financing for the management side
- Disaster risk recovery plans should be incorporated into water and sanitation policies to enhance swift response to natural disasters which affect water and sanitation infrastructure
- Lack of water and sanitation data in Vanatu hinders proper planning. A system could be developed to enhance the inventory of water resources by watershed

TABLE 5. Demographic, health and coverage estimates [Source: (44)]

		DEMOGRAPHIC, HEALTH AND COVERAGE ESTIMATES ¹		
		Population (millions) ²	Diarrhoea deaths attributable to inadequate WASH ³	Use of improved sanitation facilities (per cent) ⁴
COUNTRY	National	National	National	National
Bangladesh	154.70	8,950	57	85
Fiji	0.87	25	87	96
India	1,236.69	334,778	36	93
Indonesia	246.86	8,815	59	85
Sri Lanka	21.10	705	92	94
Thailand	66.79	1,241	93	96
Togo	6.64	2,377	11	61
Tonga	0.10	5	91	99
Vanuatu	0.25	17	58	91
Vietnam	90.80	1,772	75	95

¹Estimates are for the year 2012, the most recent year with available estimates for all demographic and health indicators.

²World Population Prospects: The 2012 Revision, UNDESA 2013. ³Preventing diarrhoea through better water, sanitation and hygiene, WHO 2014. ⁴Progress on Drinking-Water and Sanitation – 2014 Update, WHO/UNICEF 2014. N/A: Not available

TABLE 6. Governance issues [Source: (44)]

COUNTRY	GOVERNANCE ¹															
	Human right to water and sanitation recognized in legislation		Status of national policy development and implementation					Coverage targets (per cent of population) ²								
	Sanitation	Drinking-water	Sanitation		Drinking-water		Hygiene promotion	Sanitation				Drinking-water				
			Urban	Rural	Urban	Rural		National	Urban		Rural		Urban		Rural	
									Coverage target	Target year	Coverage target	Target year	Coverage target	Target year	Coverage target	Target year
Cook Islands	✓	✓	●	●	✗	✗	●	100		100		100		100		
Fiji	✓	✓	✓	●	✓	●	✓	*	Progressive	*	2015	*	2013	*	2015	
Gabon	✗	✗	●	●	●	●	●	100	2020	100	2020	100	2020	100	2020	
India ³	✗	✗		✓		✓	✓			100	2022			*	2022	
Indonesia	✓	✓	✓	✓	✓	✓	✓	76.82	2015	55.5	2015	75.29	2015	65.81	2015	
Sri Lanka	✓	✓	●	●	✓	✓	●	100	2020	100	2020	85	2015	85	2015	
Thailand	✓	✓	✓	✓	●	●	●	100	2015	100	2015	100	2016	100	2016	
Vanuatu	✗	✗	●	●	●	●	●	80	2016	80	2016	90	2016	85	2014	
Vietnam	✓	✓	✓	✓	✓	✓	✗	*	2025	100	2020	100	2025	100	2020	
	✓ Yes. ✗ No.		✓ Policy approved; plan being fully implemented, with funding and regularly reviewed. ● Policy approved; plan not being fully implemented. ✗ No national policy or policy is under development.					³ Definition of coverage targets for Kazakhstan pending clarification. Target year for Tonga pending clarification. [*] Target is not specified in terms of percentage of population with access to improved services. For example, the target may refer to number of new water/sanitation facilities constructed, number of connections to sewerage or wastewater treatment capacity. ⁺ Given the regulatory scheme and achieved coverage figures, there are currently no targets in the urban drinking-water and sanitation sectors for Chile. ⁺⁺ Coverage targets under revision at time of response to survey.								

Market opportunities

- The supply of technologies which can be used for increasing water supply (e.g. by using groundwater, building reservoirs, improving or stabilizing watershed management, desalination), decreasing water demand through conservation measures, leakage reduction, dual water supply systems and economic development)
- The provision of technologies which incorporate flexibility into the water provisioning systems to address potential climate change and disaster risks
- Improvement of municipal water and wastewater treatment facilities through new constructions and by retrofitting treatment plants. This can be achieved with significant financial investments in the water and sanitation sectors.

Fiji case study

In Fiji, coverage and quality of water supply and sanitation suffer from low investment rates, many small supply systems, a fragmented sector structure, and increasing pollution of water resources.

Fiji has a national plan and policy for the water and sanitation sector. However this plan has not been approved and thus remains un-implemented. An overview of water and sanitation related issues are provided in Tables 5 to 6 (10, 44).

Water supply tariffs are significantly below the cost of production (covering raw water extraction, treatment, and conveyance to consumers), and the Water Authority of Fiji (WAF) is highly dependent on grants from the government to finance its capital and recurrent costs. This coupled with additional barriers such as inadequate measurement (metering) of the treated water and wastewater volumes, losses from the water supply networks due to leakage and illegal connections etc have stretched the resources of the underfinanced WAF.

Conducive policies

- A national water and sanitation policy should be approved and implemented to provide a framework for addressing water and sanitation issues in the country
- The lack of leadership and governance (i.e. no legitimate legislation, overall coordination or global plan) for sanitation in Fiji should be addressed to facilitate the provision of water and sanitation services to the populace
- Expanding and diversifying investment in infrastructure for the water sector, while paying more attention to financing for the management side by putting technical regulations into place that establish key performance indicators, and adjustment of tariff levels to reflect the actual costs of service delivery

Market opportunities

- Despite substantial challenges in delivery of potable water and sanitation, the existing financial gap presents an enormous potential for investors interested in public-private-partnership (PPP) arrangements such as performance-based operations and maintenance contracts to improve the operational efficiency of urban water supply and sewerage services (45)
- Another area of potential opportunity includes engineering design and construction, supply of equipment related to water and sanitation and consulting firms

Kyrgyzstan case study

From 2005 to 2010, the government expended US\$ 32.71 million (in constant 2010 US\$) on average per year on water-related infrastructure and programs. This amount accounted for an estimated 0.1 per cent of total government expenditures in the same period. More than half of the government's expenditures were channeled into the agricultural water resources (35.1 per cent) and hydroelectric power plants (20.3 per cent). Within the same period, overseas development assistance (ODA) gross disbursements amounted to US\$ 11.66 million on average per year, channeling around three quarters of its disbursements into: water supply and sanitation of large systems (43.1 per cent) and agricultural water resources (31.7 per cent).

Kyrgyzstan is a disaster-prone country due to its geographical location in an active seismic zone and its mountainous landscape. Natural disasters (e.g. earthquakes, landslides, mudflows, etc) occur regularly and reverse the gains made in the development and implementation of water and sanitation policies and infrastructure.

Basic drinking water supply and basic sanitation disbursements have been decreasing since 2005. As a landlocked nation, Kyrgyzstan shares borders and water run-off obligations with several countries, which requires national, regional and local level coordination of water resources management activities, together with domestic and international stakeholders.

Conducive policies

- Kyrgyzstan requires a national water strategy as the sector continues to be fragmented with water issues embedded in a number of other national strategies and plans, sometimes with competing objectives, and therefore there is no holistic and coherent strategy for water resource management
- Expanding and diversifying investment in infrastructure for the water sector, while paying more attention to financing for the management side by adjusting tariff levels to reflect the actual costs of service delivery, and reducing the high water loss rate

- Negotiations with downstream countries on the sharing of the trans boundary water resources
- There is inadequate monitoring capacity in Kyrgyzstan to provide reliable data both on water quantity and quality. This situation adversely affects the proper management of water resources, e.g. prioritization of actions and investments, and could complicate the introduction of integrated water management principles

Market opportunities

- The supply of technologies which can be used for increasing water supply (e.g. by using groundwater, building reservoirs, improving or stabilizing watershed management, desalination), decreasing water demand through conservation measures, leakage reduction, dual water supply systems and economic development)
- The provision of technologies which incorporate flexibility into the water provisioning systems to address potential climate change and disaster risks
- Another area of potential opportunity includes engineering design and construction, supply of equipment related to water and sanitation and consulting firms
- Investment in coordinated data collection, collation, analysis and dissemination is vital to demonstrate the benefits of water-related investments to governments, donors and ultimately private capital investors.
- Opportunities exist for investors to provide support to mitigate water-related disasters, as Kyrgyzstan is a disaster-prone country.

Risks

The majority of countries in the Asia-Pacific region have recently adopted new environmental regulations which should encourage the development of the water and sanitation sector. Risk of adverse environmental outcomes is a strong driver for environmental regulation; other risks also affect welfare outcomes. Economic instruments could help to reduce environmental risk while maintaining the flexibility that helps manage other risks. However regulation not only mitigates risks, it also creates risks and has uncertain outcomes.

- Water stress is already on the rise and there is a risk /potential for related political conflicts between individual states over shared water resources will also grow. International agreements governing rights on water use need to be renewed to avoid such risks.
- Risks could be exacerbated or created by regulation, and could be political, behavioral, compliance, social, economic and environmental risks that could be created or exacerbated by the economic instrument. Investment risk that is exacerbated by dealing both with potentially unfamiliar technologies and the need to respond to an uncertain regulatory

environment

- Given the rising demand for food due to increasing population and economic empowerment resulting in water intensive diets, the sector faces significant long-term challenges in the form of water scarcity and rising food needs.
- Monetizing water and sanitation services to generate resources for the maintenance of existing infrastructure could also create a human right risk as it could remove access of the poor to safe drinking water and sanitation services
- Environmental markets with strong caps and limited banking/borrowing can also create economic risks by removing flexibility to respond to shocks.
- Government monopoly of the capital market in most Asian countries is another risk as often leads to a lack of private sector involvement which may hold back public sector investment due to the limited technical expertise of the latter (10, 14).
- Other risks are lack of operating capital, uncertainty of the investing environment, and the complexity of multinational cooperation for huge projects.

Overview of supporting policies with potential to create demand and to stimulate water and sanitation markets development

Majority of the countries in the Asia-Pacific region have developed or have drafted national water and sanitation policies. An analysis of the countries presented indicates that not all have specific sanitation policies which deals adequately with the full range of issues and choices associated with sanitation activities. Policies provide the framework within which resources are allocated for their implementation and can be implemented through various instruments:

2.1.1 Economic instruments (pricing of environmental goods)

Water has traditionally been provided free because it is a basic human need. This has resulted in very low tariffs which are unable to support maintenance and expansion requirements of increasing water demand and water infrastructure. The introduction of cost recovery policies, removal of subsidies granted to other economic sectors (petroleum, coal and natural gas), economic valuation of water for all (47).

The deployment of demand management techniques should be encouraged through incentives for

2.1.2 Strengthened institutional arrangements

The responsibilities for water resources management is fragmented within most governments in the AP resulting in overlapping of functions and conflicting policies. There is a need to overhaul this traditional system of developing water resources by sectors through the centralization of water and

sanitation policies to a dedicated agency. Additionally, introducing intra-country and more importantly regional cooperation in shared river basins will result in a more efficient management of water supply.

Managing the risk between government and investors

The water and sanitation infrastructure requires flexible mechanism for investments that will include private sources due to financial constraints facing governments in the Asia Pacific region and reduced ability to maintain ongoing services and meeting increased demand. Multinational institutions have helped. However, due to the restriction on bank lending for infrastructure, it has become important to explore non-banking financing options. International financial markets offer a huge potential of untapped capital pools, and institutional investors such as pension funds, insurance companies, mutual funds, and sovereign wealth funds are a source of capital for water and water-related infrastructure. As the World Bank has noted, institutional investors in OECD countries alone possessed over US\$70 trillion as of the end of 2011 (48).

Given the capital requirements for expansion and maintenance of these systems, governments are finding it more and more difficult to meet the water requirements of a growing population for domestic and industrial use, and for food security. Public-private partnerships which could be in form of industry-government partnership or private philanthropy could fill this gap. Significant opportunities exist to develop private and public partnerships for non-state-owned and foreign participants in the water supply and wastewater treatment infrastructure sector. In Asia lucrative opportunities exist as government commitments to invest heavily in water infrastructure continues due to emerging market growth expectations of between 12 per cent and 24 per cent.

Strengthening governance and inclusive policies

The water and sanitation issues in the AP can also be attributed to both the lack of strong sector leadership and political will to implement the much needed reforms in the water sector. Achievement of political will and building of capacities play a vital role in the attainment of sustainable water resources development and management. Coupled to this is the need to improve governance through committed leadership and empowering constituencies (49). Multiple stakeholder participation in water resources development and management should be encouraged through mass-based information, education and communication campaigns, and water-related curricula.

Improving the availability of data

Data on water and sanitation is widely unavailable in most countries in the AP. Decision support systems based on the collection, management, and dissemination of basin-wide data on land and water resources, their allocation and multiple uses should be developed. These decision support systems will assist management in decision-making on planning, design, implementation, and operations of water-resources and other basin-development programs and projects. The river basins are also anticipated to promote equitable sharing among conflicting water users and the

environment, because the various users - water supply, irrigation, flood control, hydropower, and environment - must share water within the same river basin.

productivity.

There is a need to rethink water consumption. The virtual footprint needs to be accounted for and to be tangibly linked to economic activity. Policy levers to increase economic water security should incorporate a life cycle-based approach. International systems which promote the growth of water intensive crops in more water-rich areas and exports to relatively drier countries would help free up water in the drier country for other more critical uses. This might help to create a more stable political situation in the process (7).

CHAPTER 4

OPTIMIZING EXISTING POLICIES, STRENGTHENING INSTITUTIONAL CAPACITIES AND STIMULATING INVESTMENT DECISIONS

Challenges in existing water and sanitation policies, the need for integration at the policy and institutional levels

The challenge of providing clean water and sanitation services cannot be considered without other challenges facing our region: climate change, food security, health and economic growth. Numerous water and water sanitation related policies exist in the Asia-Pacific region. To optimize water and sanitation related SDGs in the push towards Agenda 2030, several issues need to be addressed. These include:

- Strengthened institutional arrangements

National governments must make sustainable advancements in water, wastewater, and sanitation management a high level policy priority as essential prerequisites for sustainable development (48). Institutional fragmentation should be overcome through the formulation of integrated national water and sanitation policy with adequate financial commitment. Concepts such as water requirements for ecological and ecosystem services could be integrated into impact assessments. National strategies should be tailored to local priorities and should be coordinated by a defined lead agency and mechanisms for coordination at the country level (50). This is already being done in some AP countries.

Water footprints could also be embedded in national policies as a requirement to derive information on the water efficiencies of sectors as well as opportunities for improvement.

- Skill development and inclusive policies

There is a need to ensure that capacity planning and realization is sufficient to fulfill the capacity deficits (technical, human and otherwise) that exist in planning, design, implementation, and the challenge of meeting the water-related sustainable development targets.


- Information and monitoring

A data revolution at the regional and country level that supports sustainable development and can facilitate evidence-informed decision making is needed. Such data will not only help determine information and policy gaps, appropriate action, but also bolster political commitment through financial and budgetary prioritization at national, provincial and local levels (48).

- Water and sanitation regulations

Water and sanitation policies could include a requirement to balance supply and demand at the sub-basin level to minimize sustainability and disaster risk reduction. Establishing a cap on/for water demand that can be consumed from each water source (river, lake or aquifer) greatly reduces the risk of over-allocation and could help minimize the risk of ecological collapse while providing water users with a clear line of sight to their future water availability (51). Other demand regulation approaches (e.g. pricing; education and outreach; smart meters; incentivizing water efficient technologies including low flush toilets and low flow showers) could also be applied.

- Fiscal/economic instruments (pricing of environmental goods)


Water and sanitation needs to be monetized so it is viewed as a true economic commodity. Ending  resources to facilitate the execution of new water and sanitation projects (48).

Higher tariffs could be introduced for water intensive industries to encourage the adoption of water efficient technologies and encourage the use of recycled water.

Innovative financing mechanisms such as of cost sharing, micro-financing and crowd sourcing could be explored to provide incentives for communities and cities to invest in and develop water and sanitation infrastructure (52).

Water trading could be introduced to limit the impacts of water scarcity as it would encourage users to understand the economic value of water and to use it more efficiently. This is already being practiced in Australia with great success as well as in the western states of the US, Chile, South Africa, and Spain's Canary Islands. However water trading is limited by a lack of incentive to buy or sell water, complexity in the process of agreeing a bulk supply, and the lack of a clear pricing model around marginal costs (19).

- Good governance and management

Corruption must be eliminated through the practice of good governance to unlock the potential of 

The agriculture sector and water markets

Investment in the agriculture in the Asia-Pacific region is continuing an upward trend that looks set to continue. The water challenge is therefore closely tied to food provision and trade.

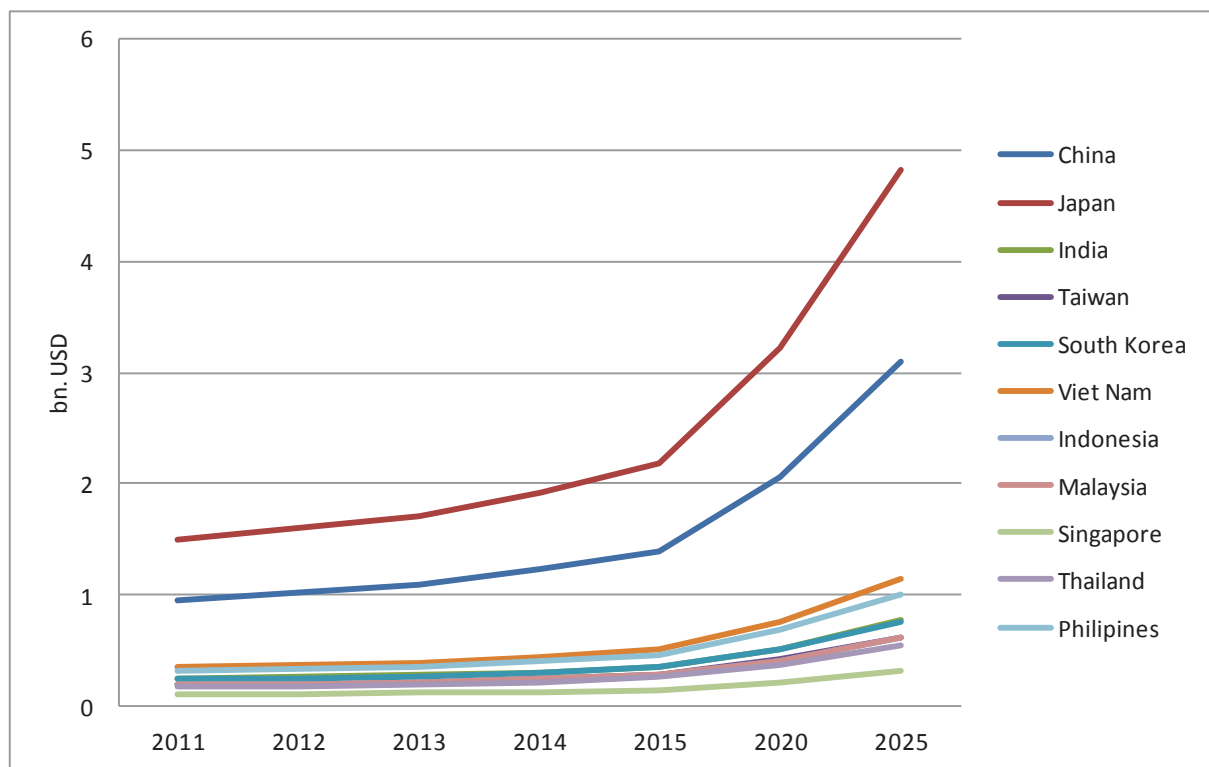


FIGURE 18. Agriculture water market (billion USD) [Source: (10)]

There is an urgent need to adopt better water management practices with the appropriate infrastructure to develop solutions that produce crops with greater water efficiency. To improve the efficiency of water use in agriculture, the following measures are necessary (20):

- Improving agricultural productivity through practices such as improving soil structure, increasing surface water storage, and deploying weed control through sustainable agricultural mechanization practices.
- Raising water prices for farmers or at least phasing out subsidies in order to curb the amount of water wasted
- Deploying more efficient irrigation technologies to reduce water consumption and avoid **rebound effects** (soil salinization)
- Converting agricultural production in arid countries to products requiring little water;
- Encouraging trade in agricultural products
- Employing waste water for agricultural processes

The issue of water resources management should be addressed in a coordinated manner by examining the interactions between competing water uses. This analysis lies beyond the scope of this report, which focuses primarily on advancing understanding of the development of water markets in the Asia-Pacific region without an explicit focus on any economic subsector. However, given the

employment and economic impact of the agriculture sector coupled with its huge demand for water resources (mostly applied for irrigation), a cursory look at the water market vis-à-vis the sector is provided. Future work should provide a more detailed assessment of the sector, particularly their financing and pricing aspects

Recommendations for the role of ESCAP at the regional level

The water and wastewater market is growing in the Asia-Pacific region and huge opportunities exist for investment in the sector for all stakeholders, and it is anticipated to be moderately easy to penetrate. UNESCAP provides the intergovernmental platform for member States in the Asia-Pacific region and promotes the deepening of economic integration and cooperation which is mutually beneficial to all countries and instrumental in the achievement of key developmental goals including the SDGs. The case studies have identified institutional fragmentation, inadequate capacity (human and technical), lack of adequate information and information, absence of strong governance and monitoring, and the need to price water and waste water services as common issues in the water and waste water sector in the region relevant for the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP).

The UNESCAP could address these issues through the development of mechanisms and programs which support innovative delivery models and approaches with the potential to expand access to safe water and sanitation products and services in the Asia-Pacific region. These mechanisms and programs could be in a variety of forms such as (53):

- Lobbying governments in the Asia-Pacific region to maintain the momentum of investments in the water and sanitation through facilitating high-level meetings involving governments and stakeholders of trans boundary river basins involving different stakeholders, including data sharing
 - The development of regional knowledge and information sharing mechanisms can help to address governance issues in the water and sanitation sector, through facilitating the promotion of the rule of law and good governance through developing methods for regional data collection and sharing of best practices
- UNESCAP should work with responsible government agencies at the country level in the region to emphasize and promote the formulation of integrated water and sanitation policies which addresses sanitation issues with the same level of priority as the provision of safe water services. These knowledge and information sharing mechanisms would enhance collaboration between local governments, service providers, and community-based organizations to create a policy and regulatory environment that encourages the deployment of new sanitation products and delivery methods. This could be in the form of providing capacity development and a knowledge platform to support effective integrated water resource management (including a comprehensive water and sanitation policy), which requires shared knowledge of river basins and resilience, as well as efficient and cost

effective water and sanitation technologies as well as technologies for monitoring and early warning systems

- Trans-boundary river issues manifested in conflicting uses of shared river basin water resources are most effectively dealt with through regional cooperation and dialogue, which can lead to regional agreements and trans boundary river conventions.
- Finance is crucial to the actualization and realization of policies, and regional cooperation can be very instrumental for the establishment of regional financial mechanisms to support investments in the water and sanitation access and infrastructure through, among others, regional water capital markets and water and sanitation bonds. UNESCAP could in addition to facilitating the development of sub regional /regional water markets, water bonds, national water pricing schemes and reforms, and Payment of Ecosystems Services, also assist relevant government agencies in the mobilization of funding for country based water and sanitation projects through fostering public-public and public-private partnerships
- Water and sanitation programs can be impacted by weak governance. Building strong community involvement in water and sanitation services delivery can strengthen the commitment of all stakeholders to the project. UNESCAP could look for opportunities to organize and build capacity of communities together with partner organizations. This could be achieved through the promotion of the rule of law and good governance through developing methods for regional data collection and sharing of best practices [\[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\] \[34\] \[35\] \[36\] \[37\] \[38\] \[39\] \[40\] \[41\] \[42\] \[43\] \[44\] \[45\] \[46\] \[47\] \[48\] \[49\] \[50\] \[51\] \[52\] \[53\] \[54\] \[55\] \[56\] \[57\] \[58\] \[59\] \[60\] \[61\] \[62\] \[63\] \[64\] \[65\] \[66\] \[67\] \[68\] \[69\] \[70\] \[71\] \[72\] \[73\] \[74\] \[75\] \[76\] \[77\] \[78\] \[79\] \[80\] \[81\] \[82\] \[83\] \[84\] \[85\] \[86\] \[87\] \[88\] \[89\] \[90\] \[91\] \[92\] \[93\] \[94\] \[95\] \[96\] \[97\] \[98\] \[99\] \[100\]](#) Sharing for better Law [\[101\] \[102\] \[103\] \[104\] \[105\] \[106\] \[107\] \[108\] \[109\] \[110\] \[111\] \[112\] \[113\] \[114\] \[115\] \[116\] \[117\] \[118\] \[119\] \[120\] \[121\] \[122\] \[123\] \[124\] \[125\] \[126\] \[127\] \[128\] \[129\] \[130\] \[131\] \[132\] \[133\] \[134\] \[135\] \[136\] \[137\] \[138\] \[139\] \[140\] \[141\] \[142\] \[143\] \[144\] \[145\] \[146\] \[147\] \[148\] \[149\] \[150\] \[151\] \[152\] \[153\] \[154\] \[155\] \[156\] \[157\] \[158\] \[159\] \[160\] \[161\] \[162\] \[163\] \[164\] \[165\] \[166\] \[167\] \[168\] \[169\] \[170\] \[171\] \[172\] \[173\] \[174\] \[175\] \[176\] \[177\] \[178\] \[179\] \[180\] \[181\] \[182\] \[183\] \[184\] \[185\] \[186\] \[187\] \[188\] \[189\] \[190\] \[191\] \[192\] \[193\] \[194\] \[195\] \[196\] \[197\] \[198\] \[199\] \[200\]](#)
- One entry point could be the development of regional scientific partnerships with relevant organizations in order to link those focused on the delivery of community-scale water supply and sanitation hardware with those working to improve water quality, water resources planning, water supply governance, and community capacity. Such partnerships could be in the form of supporting an integrated and holistic research agenda in the context of water security which considers climate change and water security in synergy within the water-energy-food nexus concept including impact of persistent organic and plastic pollutants; - systems thinking application in IWRM decision-making on water resources accounting and auditing as well as the interrelated nature of water-related targets across the SDGs, including at household level. Innovative approaches for developing water as a resource from its point of origin to its end use and reuse, while taking into account the water cycle should be examined in addition to currently prevailing water resources management strategies. A systems based approach would assist countries in the region to prioritize their work on the SDGs, attract investments and to identify more effective long-term leverage points for sustainable outcomes in a regional roadmap.

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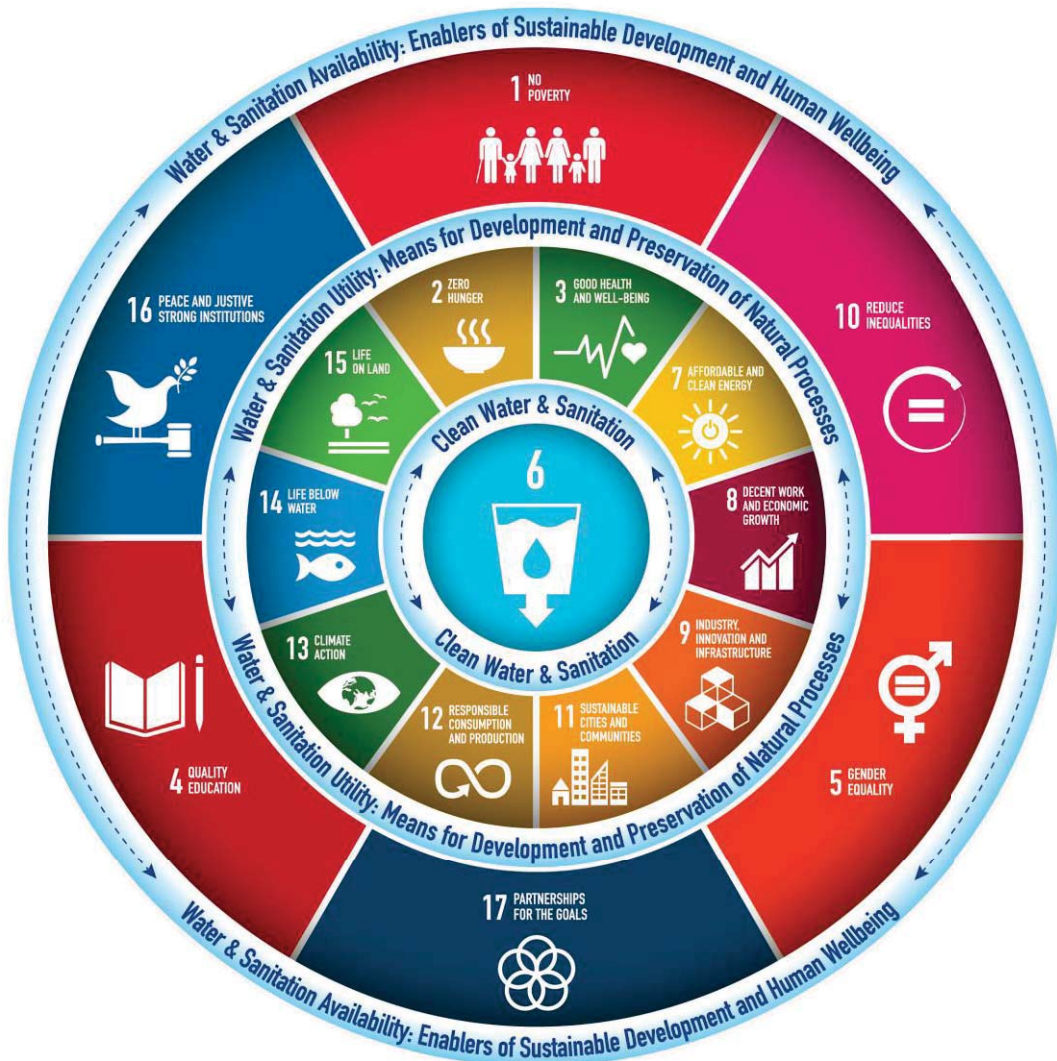
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ANNEXES

ANNEX 1. Central role of SDG 6 in the 2030 agenda for sustainable development [Source: UNESCAP, un-water regional expert consultation on water security, November 2015]



ANNEX 2. Water utilities regional overview [Source: (9)]

Regional overview	Anticipated annual growth rate CAGR 2014 – 2018 (per cent)
Asia ex. Japan	10.1
Central, South America & Caribbean	5.7
USA & Canada	4.4
Eastern Europe	5.5
Western Europe	2.7
Middle East / Africa	13.2

ANNEX 3. Overview of selected areas [Source: (9)]

	Expected annual growth CAGR 2014-2018
Pumps	6.6 per cent
Valves / fittings	6.9 per cent
Screening / grit removal	5.6 per cent
Agitation / mixing / settling	6.1 per cent
Aeration	6.9 per cent
Non membrane filtration	6.4 per cent
Disinfection systems	6.1 per cent
Chemical feed systems	6.4 per cent
Ion exchange	7.9 per cent
Sludge thickening / dewatering	6.0 per cent
Anaerobic digestion	10.2 per cent
Sludge drying / thermal processes / other sludge stabilization	6.2 per cent
Microfiltration / ultra-filtration	13.6 per cent
Reverse osmosis / nano filtration	15.1 per cent
Desalination	12.0 per cent
Micro-irrigation	10.0 per cent

ANNEX 4. Asia-Pacific: water resources and use, selected countries [Source: (10)]

Country	Population (million mid 2001)	Area (km ²)	Resources (km ³ /year)	Consumption (km ³ /year)	Consumption (per cent of resources)
Afghanistan	22.4	652,09	60	26	43
Australia	19.5	7,682,64	398	24	6
Bangladesh	126.9	144,000	115	23	20
Cambodia	12.3	181,035	88	1	1
China	1250	9,596,960	2812	500	18
Fiji	0.8	18,272	29	<1	3
India	1080	3,287,260	1142	552	48
Indonesia	209	1,811,570	2986	49	2
Iran	163.6	1,636,000	130	75	58
Japan	126.5	377,800	435	90	21
Malaysia	22.7	32,850	556	12	2
Mongolia	2.9	1,566,500	25	<1	4
Nepal	22.5	147,181	207	12	6
New Zealand	3.82	270,530	397	2	<1
Pakistan	142	796,000	247	180	73
Philippines	78	298,170	356	105	30
South Korea	52	99,390	70	30	42
Solomon Islands	45	27,990	45	<1	2
Sri Lanka	19.3	65,610	47	10	21
Thailand	65.9	511,000	210	33	16
Vietnam	81.2	330,000	318	65	20

ANNEX 5. Annual water withdrawal by sector in the Asia-Pacific region [Source: (13)]

	Annual withdrawal by sector									
	Agriculture		Municipalities			Industry		Total		
Sub-region	Million m ³	per cent of total	Million m ³	per cent of total	m ³ per capita	Million m ³	per cent of total	Million m ³	per cent of region	m ³ per capita
East Asia	380 657	65	75 175	13	54	132 907	23	588 739	30	417
South Asia	913 113	91	70 225	7	44	20 034	2	1 003 372	51	640
Mainland SE Asia*	165 125	92	7 496	4	34	6 386	4	179 007	9	832
Maritime SE Asia*	165 421	79	23 588	11	71	20 610	10	209 711	11	619
Total region	1 624 316	82	176 484	9	50	179 937	9	1 980 829	100	561

*SE Asia = South-East Asia

ANNEX 6. Water and waste water market in Asia (billion USD) [Source: (10)]

	2011	2012	2013	2014	2015	2020	2025
China	19.2	20.5	21.9	24.5	27.9	41.3	61.8
Japan	29.9	31.9	34.2	38.2	43.6	64.5	96.4
South Korea	4.7	5.0	5.4	6.0	6.8	10.1	15.1
Taiwan	3.8	4.1	4.4	4.9	5.6	8.3	12.4
Mongolia	0.7	0.7	0.8	0.9	1.0	1.5	2.2
Vietnam	3.5	3.8	4.0	4.5	5.1	7.6	11.4
Indonesia	3.8	4.0	4.3	4.8	5.5	8.1	12.1
Thailand	3.5	3.7	3.9	4.4	5.0	7.4	11.1
Malaysia	3.8	4.0	4.3	4.8	5.5	8.1	12.1
Philippines	3.1	3.4	3.6	4.0	4.6	6.8	10.1
Cambodia	1.2	1.2	1.3	1.5	1.7	2.5	3.7
Singapore	1.9	2.0	2.2	2.5	2.8	4.1	6.2
India	4.8	5.2	5.5	6.2	7.0	10.4	15.6
Pakistan	3.0	3.2	3.4	3.8	4.4	6.4	9.6
Bangladesh	1.2	1.2	1.3	1.5	1.7	2.5	3.7
Others	2.0	2.1	2.3	2.5	2.9	4.3	6.4
<i>Total</i>	90	96	103	115	131	194	290

ANNEX 7. Investments in drinking water in Asia (billion USD) [Source: (10)]

	2011	2012	2013	2014	2015	2020	2025
China	5.5	5.7	6.1	6.4	6.6	10.1	12.8
Japan	8.5	8.9	9.4	10.1	10.3	15.8	20.0
South Korea	1.3	1.4	1.5	1.6	1.6	2.5	3.1
Taiwan	1.1	1.1	1.2	1.3	1.3	2.0	2.6
Vietnam	1.0	1.1	1.1	1.2	1.2	1.9	2.4
India	1.4	1.4	1.5	1.6	1.7	2.5	3.2
Others	6.9	7.1	7.6	8.1	8.2	12.7	16.1
<i>Total</i>	25.7	26.7	28.4	30.3	30.8	47.4	60.3

ANNEX 8. Market for waste water treatment in Asia by technologies [Source: (10)]

	2011	2012	2013	2014	2015	2020	2025
Disinfection equipment	1.2	1.3	1.4	1.5	1.7	3.1	6.0
Mechanical treatment equipment	9.9	10.3	10.9	11.9	13.3	25.0	48.0
Phys-chem. treatment equipment	2.5	2.6	2.7	3.0	3.3	6.3	12.0
Biological treatment equipment	2.5	2.6	2.7	3.0	3.3	6.3	12.0
Thermal treatment equipment	1.2	1.3	1.4	1.5	1.7	3.1	6.0
Sludge treatment equipment	4.9	5.1	5.5	6.0	6.7	12.5	24.0
Electrical engineering	2.2	2.3	2.5	2.7	3.0	5.6	10.8
Others	0.3	0.3	0.3	0.3	0.3	0.6	1.2
<i>Total</i>	24.8	25.7	27.3	29.8	33.3	62.5	119.9

ANNEX 9. Water market in India by technologies (billion USD) [Source: (10)]

	2011	2012	2013	2014	2015	2020	2025
Filtration	2.64	2.85	3.03	3.41	3.86	5.72	8.58
Membrane Processes	0.48	0.53	0.55	0.63	0.70	1.05	1.56
UV Treatment	0.14	0.15	0.16	0.18	0.21	0.31	0.47
Ozonization	0.14	0.15	0.16	0.18	0.21	0.31	0.47
Chlorination	1.14	1.24	1.33	1.48	1.68	2.50	3.75
Others	0.26	0.27	0.28	0.32	0.34	0.52	0.77
<i>Total</i>	4.8	5.2	5.5	6.2	7	10.4	15.6

ANNEX 10. Water market in India by segments (billion USD) [Source: 10]

	2011	2012	2013	2014	2015	2020	2025
Waste Water Community	0.83	0.97	1.19	1.64	1.73	3.50	5.27
Drinking Water	2.35	2.63	2.81	3.13	3.41	4.16	6.24
Process /Industry Water	1.62	1.59	1.50	1.41	1.86	2.74	4.09
<i>Total</i>	4.8	5.2	5.5	6.2	7	10.4	15.6

ANNEX 11. Water market in India by segments (billion USD) [Source: (10)]

	2011	2012	2013	2014	2015	2020	2025
Industry Water	1.62	1.59	1.50	1.41	1.86	2.74	4.09
Domestic Water	0.38	0.38	0.36	0.36	0.33	0.48	0.89
Community Water	2.80	3.23	3.64	4.43	4.81	7.18	10.62
<i>Total</i>	4.80	5.20	5.50	6.20	7.00	10.40	15.60

ANNEX 12. Water market in china by technologies (billion USD) [Source: (10)]

	2011	2012	2013	2014	2015	2020	2025
Filtration	7.68	8.20	8.75	9.81	11.16	16.52	24.72
Membrane Processes	3.84	4.09	4.38	4.90	5.58	8.26	12.36
UV Treatment	0.96	1.03	1.09	1.23	1.40	2.07	3.10
Ozonization	0.96	1.03	1.09	1.23	1.40	2.07	3.10
Chlorination	3.84	4.09	4.38	4.90	5.58	8.26	12.36
Others	1.92	2.05	2.19	2.45	2.79	4.13	6.18
<i>Total</i>	19.20	20.50	21.90	24.50	27.90	41.30	61.80

ANNEX 13. Water market in china by segments (billion USD) [Source: (10)]

	2011	2012	2013	2014	2015	2020	2025
Waste Water Community	3.36	3.85	4.73	6.52	6.90	13.92	20.87
Drinking Water	9.38	10.38	11.20	12.38	13.60	16.52	24.72
Process /Industry Water	6.46	6.27	5.97	5.60	7.40	10.87	16.21
<i>Total</i>	19.20	20.50	21.90	24.50	27.90	41.30	61.80

ANNEX 14. Water market in china by segments (billion USD) [Source: (10)]

	2011	2012	2013	2014	2015	2020	2025
Industry Water	6.46	6.27	5.97	5.60	7.40	10.87	16.21
Domestic Water	1.51	1.50	1.43	1.42	1.31	1.93	3.51
Community Water	11.23	12.71	14.48	17.48	19.20	28.51	42.08
<i>Total</i>	19.20	20.50	21.90	24.50	27.90	41.30	61.80

ANNEX 15. Sri Lanka government water sector targets [Source: (32)]

Year	2005	2009	2015	2020 ^a
Safe water coverage (per cent)	80	85	94	100
Pipe-borne water availability	29	37	44	60
අපනයන සහ අනෙකුත් ප්‍රදේශවල පිටින ලද ජලයේ ප්‍රතිශතය	907	1,267	1,600	3,000
Pipe borne sewerage coverage (per cent)	2.0	2.5	3.0	7.0

NSWDB = National Water Supply and Drainage Board, ^a Projected

ANNEX 16. Sri Lanka government water sector investment requirements by the year 2020

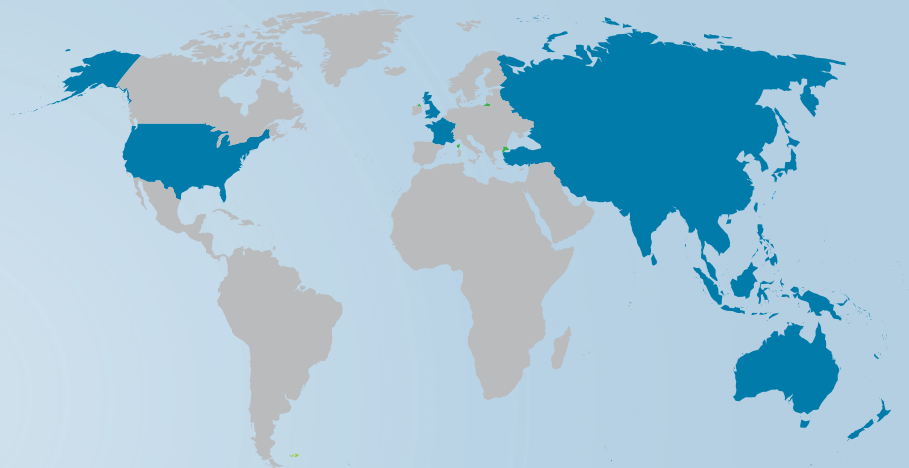
		Investment Needs	
	Category	SLRs Billion	\$ Million
a.	Priority water supply projects to commence between 2013–2015	330	2,540
b.	Projects to be funded by local banks	33	250
c.	Projects identified other than (a) in 2014 estimate	105	800

Sustainable and efficient water resources management is central to realizing green growth, and to address many water-related challenges specific to Asia-Pacific region (4)

- Sustainable economic growth and water resources management strategies must be context-specific not only to address water-related challenges unique to the adopting state but should consider its political and socio-economic particularities and needs.
- Enhance understanding on water cycle (for all sectors), research and development investment in water re-use and to increase water use efficiency
- Preventative, adaptive resilience planning for water-related challenges, such as for disasters (75 per cent of global disasters occur in the Asia-Pacific region imposing major costs to societies and industries)
- A need for adequate urban water resources planning from initial stages in response to rapid urbanization and population growth (urban population expected to exceed 50 per cent by 2026) in different cities of the AP
- Strong leadership and political commitment is essential to Water and Green Growth, with indicative planning to legalize and institutionalize related policies for consistency and successful completion of Water and Green Growth projects
- Implementing sound and innovative water accounting and auditing to support decision-making and management
- To build flood resilience, greater focus should be placed on emerging technologies and strengthened [water governance](#) to [improve water security](#) and [water quality](#) to [support sustainable economic growth](#) and [social well-being](#) in the Asia-Pacific region.
- It is anticipated that climate change will make water shortages more serious. Adaptation to the effects of climate change should be considered in order to secure limited [water resources](#) for further investments in the water sector remain high.

Rapid population growth in the Asia-Pacific region over the past decade has led to ever-increasing demands for water and sanitation services, which require greater investments in water projects. Investments to provide people with improved access to safe drinking water and decent sanitation facilities, allocate and preserve water resources, manage wastewater properly, and construct flood control and irrigation facilities, have fallen seriously behind demands (5).

Decisions for managing water at all scales must be evidence informed, accounting for the multiple roles, uses, and demands on water and disposal of human waste and wastewater, as well as the way in which the distribution of water resources is changing, and expected to continue to change over time and space. To make informed decisions based on solid evidence, governments need accurate and timely data. The work of the United Nations Statistics Division which has examined the extent to which countries are likely to be able to report on the SDGs has shown that data are weak on a number of important subjects including water and sanitation (Goal 6) as well as several other SDG goals (6).



The dark blue areas of the map represent the members and associate members of ESCAP

ESCAP is the regional development arm of the United Nations and serves as the main economic and social development centre for the United Nations in Asia and the Pacific. Its mandate is to foster cooperation between its 53 members and 9 associate members. ESCAP provides the strategic link between global and country-level programmes and issues. It supports Governments of the region in consolidating regional positions and advocates regional approaches to meeting the region's unique socio-economic challenges in a globalizing world. The ESCAP office is located in Bangkok, Thailand. Please visit our website at <www.unescap.org> and <<https://sustdev.unescap.org>> for further information.



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