Water Operational Framework 2011–2020

1. The Background

A. Strategy 2020 and ADB's Water Work

1. Through Strategy 2020[1] the Asian Development Bank (ADB) has established three strategic agendas to guide its work up to 2020—inclusive economic growth, environmentally sustainable growth, and regional integration. Water is common to each of these; in fact, it is central to their attainment. It is also integral to the strategy's five drivers of change—private sector development and private sector operations, good governance and capacity development, gender equity, knowledge solutions, and partnerships.

2. In implementing Strategy 2020, ADB will be challenged by the water stress that dominates large parts of Asia[2]. This stress, manifest most clearly in countries such as China, India, Pakistan, Viet Nam, Bangladesh, Nepal, Uzbekistan, and Cambodia, is currently impacting on the region's food and energy production, its ecological needs, and on the health and livelihoods of its populations. Climate change, evident in the current inter-annual variability of rainfall, will exacerbate matters. The poor are already suffering; their plight is likely to worsen.

3. Water shortages are expected to aggregate 40 percent in developing Asia by 2030. In some countries, such as India, demand will exceed supply by 50 percent. China is projected to be less short (25 percent) but the costs of making good the shortfall will be high[3]. Investments in energy, transport, urban, and water infrastructure will require a hitherto unseen attention to the risks posed by water. The availability and use of accessible freshwater will play a dominant role in the sustainable development of Asia's poor and emerging economies.

4. Asia is clearly at the crossroads with regard to the choices it makes for addressing the water crisis. This makes it an opportune moment for ADB to take stock of its water work from 2001 to 2010, identify the current and emerging water issues, and determine the best ways in which it can support the investments, knowledge, capacities, and technologies needed to resolve the issues to 2020. The water operational framework 2011-2020 (WOF) has been developed on this premise and takes into account comments and suggestions from a range of stakeholders within and outside ADB.

B. ADB's Water Policy

5. ADB's *Water for All* policy,[4] approved by the Board in 2001, was developed after a series of extensive and substantive stakeholder consultations. The seven key elements of the policy are: (i) promoting a national focus on water sector reform (policies, laws, institutional capacity building, information management, and sector coordination), (ii) fostering the integrated management of water resources especially in river basins, (iii) improving and expanding the delivery of water services (involving the private sector and emphasizing equity in access to water for the poor), (iv) fostering the conservation of water and increasing system efficiencies,

[1] ADB. 2008. *The Long-Term Strategic Framework of the Asian Development Bank 2008-2020*. Manila.
[2] A country with an annual per capita water endowment of less than 1,700 cubic meters is under water stress.
[3] Because of the high costs of cleaning up heavily polluted surface water sources, China is forecast to conservatively invest $25 billion annually for 20 years to cover the demand-supply gap.
[4] ADB. 2001. *Water for All (The Water Policy of the Asian Development Bank).* Manila

(v) promoting regional cooperation and increasing the mutual beneficial use of shared water resources within and between countries, (vi) facilitating the exchange of water sector information and experiences including public-private-community-nongovernmental organization (NGO) partnerships, and (vii) improving governance and promoting decentralization.

2. The Strategic Approach

A. Defining the Water Crisis

6. Asia is in a water crisis. Large parts of the continent, including India and the PRC, are under water stress. Annual per capita water endowments have been declining at alarming rates. India's endowment was 13,570 cubic meters in 1951; by 2009, it had dropped to 1,620 cubic meters and is forecast to drop further (large parts of the country are already below 1,000 cubic meters per capita per year). In the Philippines, the endowment has fallen to less than 1,700 cubic meters currently. The gap between demand and supply is widening. At an aggregate level, it is forecast to get steadily worse and be 40 percent across Asia in 2030[5]. India is forecast to have a gap of 50 percent (754 billion cubic meters); PRC's gap is estimated at 25 percent (201 billion cubic meters).

7. The crisis is multidimensional. Accessible freshwater in Asia has become scarce for several reasons. The rapid increase in population is a key factor, compounded by rapid urbanization where more consumers are not only demanding more water but where most of the treated water produced is lost. About 80 percent of Asia's freshwater is used by irrigated agriculture where efficiencies have remained low even though the cultivable command area has increased substantially. Food production in Asia has increased manifold but irrigation efficiencies have increased by less than 1 percent per year since 1990. In most parts of Asia, irrigation efficiencies have ranged from 18 percent (Philippines) to 58 percent (Nepal) with an average value of 37 percent.

8. The economic growth in Asia, particularly during the past decade, has also led to changes in dietary preferences. The protein demand of the fast urbanizing economies (by 2050, 73 percent of PRC's population and 55 percent of India's is expected to be urban) will center on meat-based products. The demand for meat in Asia grew by 700 percent between 1960 and 2000. In the PRC alone, meat consumption doubled in the last two decades, and is forecast to double again by 2030. A kilogram of meat takes between 30,000 and 70,000 liters of water to produce. A kilogram of rice, however, requires about 10,000 liters. The shift to diets whose food elements essentially require more water to produce, without a corresponding, or better, increase in the rate of water use efficiency, puts more pressure on rapidly dwindling accessible freshwater resources. India's example is apt. A kilogram of chicken requires 7,700 liters of water compared to a world average figure of 3,900 liters.

9. While the increase in population, especially Asia's urban population, and the change in its food preferences has meant an accelerating pressure on irrigated agriculture, the rapid industrialization, coupled with weak enforcement of legislation, has brought widespread degradation of water quality in its wake. In east and south Asia, the volume of untreated wastewater that leaches into accessible fresh, or coastal, waters is 80 and 89 percent respectively. In the PRC and India, groundwater depletion is at dangerously high levels. A recent report of the Central Groundwater Board of India has said that 30 percent of the country's groundwater reserves have been permanently damaged, i.e. not susceptible to artificial or

[5] Water Resources Group 2030: *Charting our Water Future, November 2009*

natural recharge. In addition, surface water sources are being rapidly polluted, often irreparably. In the PRC's Hai River basin, the share of surface water classified as non-usable exceeds 50 percent. The Philippines has 412 rivers; of these, 50 are classified as dead. The waters of both the Ganges River in India, and the Yellow River in the PRC, are unusable for agriculture for more than 50 per cent of their stretches. In short, Asia is witnessing a despoliation of its freshwater resources with disastrous consequences for ecological balance and environmental sustainability.

10. Asia's water governance has been seriously fragmented. Multiple agencies, mainly public, at multiple levels have responsibility for water allocation and its use. Coordination has been nonexistent to weak, and integrated planning has been generally absent. This has led to water being seen in isolation in respect of its allocation and use; the relationship between water, energy, and food, and their crucial interdependence has been mainly missed. Sugar, for instance, a key ingredient in the food and beverage industry, and heavily dependent on water, is in current short supply thanks to a failed monsoon in India in 2009, and a surfeit of rain in Brazil (Brazil and India are the world's largest sugar producers). Prices are at 30 year highs and likely to go higher still – climate change impacts on precipitation are expected to be severe and unpredictable in India and the PRC. Both countries are in the sugar import market for a combined total of 10.3 million tons in 2010 at a cost of several billion dollars that have high opportunity costs.

11. In regard to water and energy, the case of bio-fuels is instructive. While data for Asia is not separately available, the Earth Institute estimates that world demand for bio-fuels is likely to be 376 billion liters by 2030 or about 5 percent of the global land fuel transport demand. The International Water Management Institute has estimated that production of bio-fuels at this level is likely to evaporate between 20 and 100 percent of all water currently used by world agriculture. Given Asia's share in world agriculture, this is a prospect that bodes ill for its water security.

12. The International Energy Agency has forecast a 40 percent increase in energy demand by 2030. The PRC and India are seeing the fastest growth in such demand. Estimates produced by Columbia University's Water Institute for Asia show a 65, 30, and 5 percent increase respectively in water for industrial, domestic, and agriculture use by 2030. Clearly, the percentage change in demand for water for industrial and domestic use will crowd out growth in agricultural water use.

13. Finally, the business of securing water, including its access, treatment, and delivery for both industrial and municipal use is energy intensive. Energy remains the single most expensive input. Urban water supply systems typically incur costs in excess of 50-60 percent on account of electricity to deliver treated water. Technologies to reduce energy intensities in water production and delivery have not changed in decades, but physical and commercial losses of the large majority of urban systems in Asia have not improved either. It is conservatively estimated that Asia’s urban centers lose 29 billion cubic meters of treated water annually valued at $9 billion. South Asia’s share is alone about $2.4 billion. The energy costs of this waste, not forgetting its carbon footprint, are significant.

14. The interdependence of water, food, and energy is incomplete if not seen in the context of climate change. Science has not yet been able to determine the precise impacts of

disruptions in the hydrologic cycle. The Intergovernmental Panel on Climate Change (IPCC)[6] Studies indicate that about 1.2 billion people could face freshwater shortages by 2020 and crop yields in central and south Asia could drop by 30 percent by 2050. Coastal cities, including the megacities of Bangkok, Jakarta, Karachi, Manila, Mumbai, and Shanghai, will not only be subject to freshwater disruption because of salinity issues, but will also be increasingly vulnerable to flood damage from unpredictable weather patterns. Both irrigated and rain-fed agriculture will sustain impacts. The inter-annual rainfall variability, including the concentration of precipitation in fewer days in a year and in different locations, will further degrade the operability of surface irrigation systems. Droughts will occur with new and varied intensities.

15. The cumulative impact of these factors will exacerbate an already worsening situation. The forecast aggregate water shortfall of 40 percent by 2030 assumes a business-as-usual scenario where water use efficiency in irrigated agriculture and industry improves at no better than 1 percent a year, its historical rate from 1990 to 2008.

B. Identifying Solutions

16. While the scale of the issues is challenging, a range of solutions is possible. Among these, demand-side measures are likely to yield the best results at lower costs than supply-side solutions. Asia's reality is that it has been an inefficient user of its water resources. Water development has almost always been a case of creating additional supply capacities regardless of whether the use was for agriculture, industry, energy, or municipal purpose. Bringing additional cultivable areas under irrigation command was generally the preferred option to improving irrigation efficiency. Profligate use of groundwater through subsidized provision of electric power to farmers, as in India, was preferred to licensing and regulation. Municipal water shortages were almost always addressed through development of new water sources. All of this will have to change. A menu of solutions that focuses on (i) water use efficiencies across the range of users, (ii) expanded wastewater management, (iii) wastewater reuse, (iv) flood and drought mitigation, (v) embedded integrated water resources management, (vi) expanded knowledge development that uses technology and innovation more directly, and (vii) enhanced partnerships with the private sector, will be the operational solutions of the next 20 years. Most importantly, water will no longer be addressed in isolation from the sectors that it relates to most closely – the water-energy-food nexus, coupled with the climate change impacts, will be foremost in the design of transformational water agendas across Asia.

17. Efficiency in water use will have to be the new paradigm. Asia will have to aggressively adopt policies that dramatically improve water use efficiencies. Since about 80 percent of Asia's freshwater resources go to irrigated agriculture, it is there that the greatest benefits can be secured. Recent studies[7] have determined that a variety of measures is possible ranging from the widespread use of improved germplasm, to integrated plant and pest management, improved fertilizer use, extensive use of micro-irrigation, laser leveling, no-till farming, and completing last-mile infrastructure. These and other measures will have political, social, and economic trade-offs and it is for communities to judge those that would be best suited to each.

18. In the energy sector, higher water use efficiencies will have to come from dry cooling, and other water reducing means including recycling. Regulators will have to set standards of water use by thermal power stations and associated facilities, and monitor their performance

[6] IPCC, 4th Assessment Report - Working Group II Report "Impacts, Adaptation and Vulnerability" (Asia)

closely. Already, investors in thermal power projects are factoring in the risks associated with uncertain or inadequate water supplies into both investment decisions and the costs of covering those risks.

19. Municipal water will have to dramatically shrink the extent of non-revenue water and reduce dependence on continuous new source development. Currently, most urban centers in Asia have non-revenue water figures ranging from 30 to 65 percent. Investments will have to be made in rehabilitating the networks to prevent physical and commercial losses, and to introduce a strong culture of non-revenue water management. The costs of making these investments have been demonstrated to be far lower than the costs of developing new water sources, often at great, and growing, distances from urban centers.

20. Industry will similarly have to reduce its water footprint. Increasingly, corporate social responsibility will have to transition to returning as much clean water to the hydrologic cycle as is taken from it. Cleaner production systems will have to be employed to reduce water consumption. These efficiency gains are possible. Australia's continued growth is sustained with only 30 percent of the water it had ten years ago, and where irrigation efficiencies are 85-90 percent. In Phnom Penh, non-revenue water has been reduced from 72 percent to less than 6 percent. Micro-irrigation is already a $1 billion a year industry in India; it is forecast to grow to $53 billion annually by 2030.

21. The cleaning up of polluted freshwater resources will be a major area of concentration for rapidly industrializing countries such as the PRC, India, Viet Nam, and Indonesia. These are capital intensive and will require sustained efforts. In parallel, tough pollution control regimes will have to be established to prevent the experience of the past two decades from repeating itself. The lessons of this experience will need to be factored into the water management policies of emerging economies. In parallel, countries will need to exponentially extend wastewater reuse as a means of mitigating water scarcities. There are a variety of options for collection, conveyance, treatment and disposal of waste and for reuse of treated waste for different uses. Different standards, treatment levels and technologies apply to meet different needs. Countries need to start with available infrastructure and technology, and upgrade it over time. Installations in new cities and retrofitting of older systems can adopt the cascading, modular system. This involves clean water for drinking and personal use, cascading down to grey water which can be ‘cleaned enough’ for agricultural, urban, and industrial use, which can be ‘cleaned enough’ for recycling or environmental recharge etc. Sewage can either be harvested for energy and/or nutrients then ‘cleaned enough’ for agricultural or environmental use. Appropriate technology to meet differentiated end needs at costs that attract investments will be the recommended solution.

22. Asia requires storages to be built to cater to the uncertainties of water supply, made worse by climate change. These need not necessarily be large storages (although some of those will clearly be needed and will be expensive); community-level storages are already proving efficacious in several parts of Asia, as is rainwater harvesting in urban areas. Creating these storages will be a necessary part of any drought mitigation strategy.

23. Increasingly, dwindling freshwater endowments are leading to the spotlight being turned on trans-boundary water management. The Mekong, Indus, Brahmaputra, Syr, and Amur Darya basins have been particularly in the news. While ADB's Water Policy states that ADB will only

[7] Water Resources Group: *Charting our Water Future 2030, Washington D.C. 2009*
International Water Management Institute: *Trends in Asian Irrigation and Drainage, Sri Lanka 2009*

work in this area if requested by all riparian countries, it will be helpful for ADB to either review independently, or in partnership with other agency or institution, the issues involved and the best ways of partnership in intergovernmental management of shared river resources. Such public service would be appropriate in the context of water scarcity.

24. The role of technology and innovation in managing demand, expanding supply, and ensuring water quality will be significantly expanded. In agriculture, the use of drip and sprinkler irrigation systems will be upscaled to reduce water loss and increase productivity. "More crop per drop" will no longer be a slogan but a central plank of irrigation management. Likewise, improved germplasms for both irrigated and rainfed areas, integrated plant stress management, and local wisdom in rainwater harvesting and management of check dams are just examples of the kinds of technological investments that will be forthcoming. Membrane technology in wastewater treatment and reuse, and the ability to offset energy consumption by using micro-turbines in city water networks to generate power, are further examples of innovation that will sustain the new water management regime.

25. At a broader level, a superior, coordinated knowledge base will be required to drive the new set of water reform measures. Establishing an Asian Water Information System that embodies the complete body of updated knowledge for the entire range of water stakeholders should be a priority for Asia's water managers. The system should incorporate arrangements for thinking outside the water box. For instance, solutions to reducing the demand for water for food can lie outside the production process. It is estimated that between 40 and 50 percent of food produced is lost between production and consumption. Losses in the field may be between 20 and 40 percent, and losses on account of processing, transport, and storage between 10 and 15 percent. Eliminating as much of this waste as possible would help reduce the draw on water significantly.

26. Integrated water resources management (IWRM) will have to be taken a lot more seriously than it currently is. The accurate assessment of a river basin's water resources, their efficient allocation, and usage, will have to be the basis for competence in water management. The simplistic notion that efficiency is merely a matter of good management will have to give way to the reality that water has an economic value and its efficient use is a function of both sensible government regulation and tradability. Establishing rights in water and enabling water markets to develop will ensure that the right price signals for efficiency are sent. Australia's water reforms in the past decade are a useful guide to how public-private partnerships in water have managed the resource with efficiency.

27. A full adaptation of IWRM principles will also enable communities to establish the right frameworks for water governance that respond to and guide the efficient allocation and use of water. It will avoid a multiplicity of agencies, often working at cross purposes, and will quickly build capacities to maintain and manage the quality aspects demanded by IWRM. The protection and management of watersheds, the monitoring of water quality, and the distributional efficiencies of the basin's water managers will then be qualitatively enhanced.

28. In summary, across Asia, governments will need to adopt water-related policies and regulatory measures that manage demand to extraordinarily high standards – supply-side options are not only limited but very much more expensive. Water will be need to be priced more universally and explicitly as an economic good, and its physical use will need to be governed by water markets and regulators who will ensure the right balance between competing uses. Water quality measures and wastewater management, including reuse, will require addressing through exacting and rigorous standards. Capacities in water resources

management will need to be developed more rapidly than previously envisaged. Leveraging the private sector's participation manifold in water management will be critical – governments cannot risk waiting for water investments to happen, or technological and managerial expertise to be secured only from within their own resources. The entire business of water management will require a collaborative approach between the public and private sectors, and within the different levels of government from central to local administrations. A complete governance makeover will require urgent engineering. Finally, knowledge, technology and innovation will play a central role in driving efficiencies all round, and in keeping costs low.

3. The Operational Framework

29. Given the range and complexity of Asia's water issues, it would be useful to consider a set of responses from ADB that (i) undertakes expanded and rigorous analytical work to determine the best set of measures for individual governments and communities to adopt, (ii) identifies the policy reforms that will optimally support new and transformed water agendas in countries, and (iii) outlines the kind of project and program interventions that will constitute pilot or expanded measures to support the physical closure of the water gap in the countries, as also the building of capacities at various levels of the water management chain.

A. Underpinning Analytical Work

30. It will be critically important for ADB to understand the current water crisis and emerging trends and solutions as thoroughly as possible. To this end, ADB will undertake a 12-18 month study titled *Asia's Water Future: Issues and Options*. This will comprise a macro view of the availability of accessible fresh water over the next 20 years, forecasts of the impact of water use policies and practices on food and energy production as well as industrial growth and domestic use particularly in light of climate change-imposed uncertainties, a clear description of the economic value of these impacts on growth and development, issues of water governance including the missing roles of the private sector and farm communities in policy formulation and regulation, solutions for demand-side management including the role of science and technology in maximizing efficiencies, business models for private investment and management, and effective inter-governmental collaboration for managing trans-boundary water resources.

B. Policy Reforms

31. The measures that ADB should support will vary by country in terms of their nature and range; they will be spelt out in some detail in the country water assessments. In India's case, for instance, the policy reforms will focus on securing efficiencies in irrigated agriculture through reduced water use; in seeing urban water supply as a business, providing a higher quality of urban water service through a radical drop in water losses, a restructuring of the urban water authorities towards corporate status, and a widespread use of public-private partnerships; an exponential growth in the volume of wastewater treatment and reuse, together with establishment of a regulatory regime; the rehabilitation of ground water resources; and the introduction of basin-wide IWRM on a phased basis. On the other hand, in the PRC's case, the reforms will zero in on industrial and municipal water use efficiencies; pollution control and water quality management; and water capture and storage. In Viet Nam, the reforms are likely to cover expanded IWRM at full basin level including, particularly, climate change adaptation measures; enhanced water use efficiencies in irrigation, energy, and domestic areas; wastewater management and reuse; and unified water governance, including regulatory systems.

C. Project and Program Support

32. The central design feature in ADB's future genre of water projects and programs will be efficiency gains. Unless sustainable water use efficiency is clearly demonstrated as the principal outcome of a set of investments, or policy measures, ADB should critically examine the justification of proposed support. Typically, an Irrigation Productivity Enhancement Project would include components such as genetic crop development, irrigated germplasm improvement, systems of rice (or other crop) intensification, introduction of micro-irrigation, and integrated plant stress management. Similarly, an Irrigation Infrastructure Development Project would include components on land leveling, drainage improvements, small infrastructure development, artificial recharge, and no-till farming. Watershed Development and Rehabilitation Projects would ensure the physical restoration of watersheds, coupled with sustainable management systems, to protect and conserve water resources in efficient ways. In all cases, efficiency gains would be the watchword.

33. Projects for supporting investments in urban water supply would include non-revenue water reduction, improved asset management, network rehabilitation, and corporate restructuring. New source development and associated treatment and distribution facilities will be supported only when performance improvement and efficiency gains are secured and deficits demonstrated to persist. Projects to reduce food waste, e.g. post-harvest losses, transportation and processing losses, etc., and projects to repair or better manage groundwater sources, or wastewater management and reuse will constitute some of the new genre of interventions. Supply-side measures, including the development of new water sources, building storages, and completing other infrastructure to augment water supplies, will be supported but only when coupled with efficiency gains elsewhere in the basin.

4. Next Steps

34. This WOF represents a first step in ADB's understanding the scale of the water crisis in Asia and in articulating new ways of supporting its DMCs in formulating strategies to counter it. A series of actions will now be put in place to:

(i) undertake the Future of Water in Asia (FoWA) study, together with selected country water assessments;

(ii) prepare and carry out a resource mobilization campaign to replenish the Water Financing Partnership Facility based on an interim justification pending completion of the FoWA study;

(iii) review the status and quality of water partnerships and establish a program of renewal based on an interim assessment of the broad areas of ADB's water work to 2020; and

(iv) examine the feasibility of setting up specialist water teams in the resident missions of water-stressed countries where ADB is likely to engage substantively in addressing water issues.