KPMG INTERNATIONAL

Issues Monitor

Potable water

Water-stressed countries' struggle for economic development

May 2012, Volume Five

kpmg.com

KPMG
cutting through complexity

Timothy A. A. Stiles
Global Head, International Development Assistance Services

Keeping up to date with the very latest and most pressing issues facing your organization can be a challenge. While there is no shortage of information in the public domain, filtering and prioritizing the knowledge you need can be time consuming and unrewarding. I hope that you find *Issues Monitor* useful and welcome the opportunity to further discuss the issues presented and their effect on your organization.

Welcome to the May edition of *Issues Monitor – International Development Assistance Services*. Each edition pulls together and shares industry knowledge to help you quickly and easily get briefed on the issues that affect your sector.

The information and insights contained in this report are extracted from a range of currently available public sources. Content is of a general nature and not intended to address the circumstances of any particular individual or entity.

Potable water

Water-stressed countries' struggle for economic development

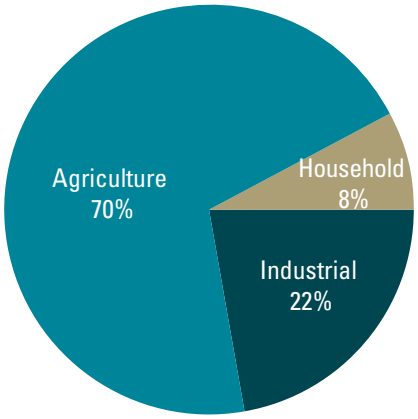
Access to safe and potable water is fundamental to sustaining health and achieving economic development. With rapid population growth, border disputes, inadequate management of water resources, and the effects of climate change, water scarcity has emerged as a key issue. This can in turn lead to food vulnerabilities as well as conflicts over resources. Political will, public and private investment, international cooperation and more effective and efficient systems of water management can help combat this issue. Various international organizations such as the World Bank and the United Nations have introduced programs to support the governments of developing and emerging nations to address water scarcity, but more needs to be done.

Water scarcity: A major hindrance to economic growth

Water is the world's most abundant natural resource. Nearly 75 percent of the earth's surface is covered with water. However, 97.5 percent of this water is saline and thus not potable; the remaining 2.5 percent is fresh water.[1] Less than one percent of this fresh water is readily accessible, with the rest being in the form of glaciers, permanent ice, underground water and soil moisture etc., which means that only 0.007 percent of the total water on earth is available for human use.[2]

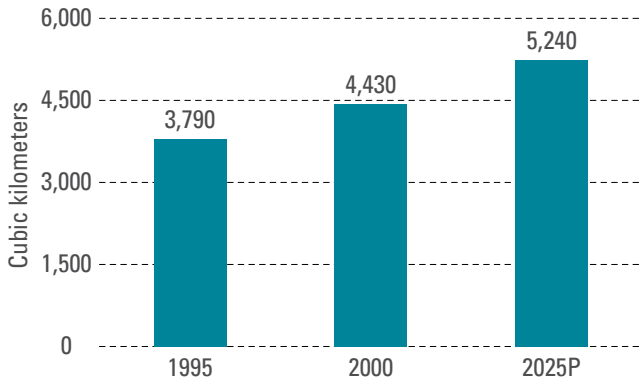
Freshwater is used for everything from daily drinking and household needs to agricultural, with industrial use consuming nearly one-fourth of available fresh water.[3] Figures 1 and 2 illustrate water consumption for various uses, and the increase in water withdrawal over 1995–2000 (projection until 2025), respectively.

Figure 1: Breakdown of freshwater use globally



Source: Water use, UN Water, accessed January 18, 2012

Figure 2: Annual global freshwater withdrawal



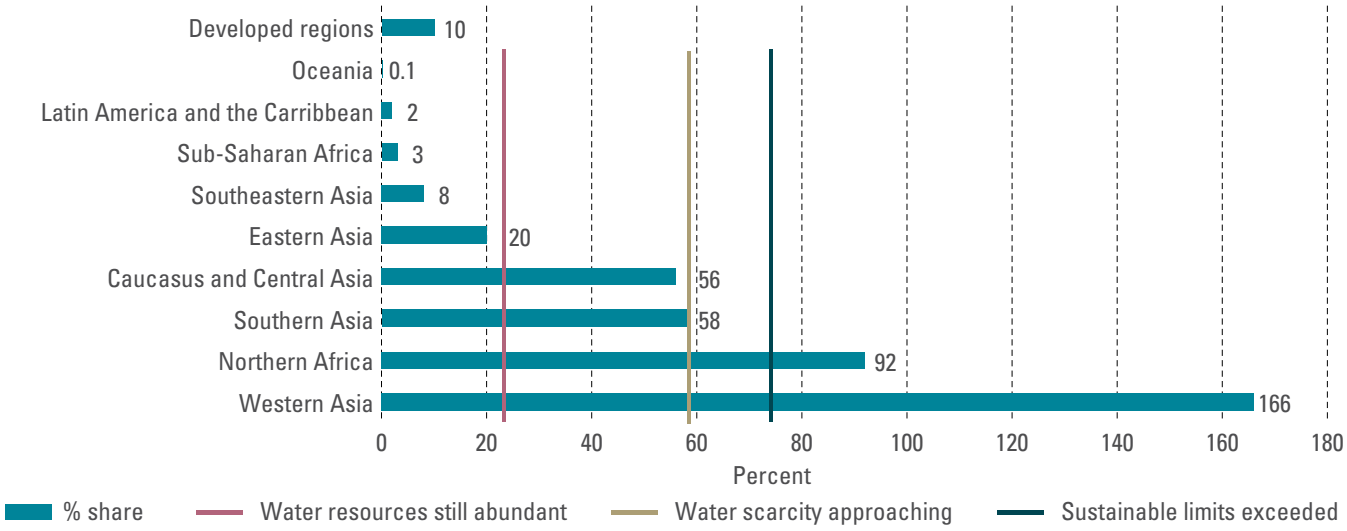
Source: Vital water graphics, UNEP, 2008

During the past century, water use increased more than twice the rate of population growth due to an increased level of agriculture, energy and industrial production. In comparison, the natural replenishment rate of water sources remained much lower. According to the Organization for Economic Cooperation and Development's (OECD) Environmental Outlook to 2050 report, the number of people living in river basins under severe water stress is projected to more than double between 2000 and 2050, reaching 3.9 billion.[4] In these areas, water use exceeds minimum replenishment rates. As a result, continuous water use is leading to depletion of groundwater levels, further intensifying the issue of water scarcity.[5] Figure 3 illustrates surface and groundwater withdrawals as a percentage of internal water resources. Although the data is from 2005, it already shows significant challenges which have only worsened since then.

CASE: Sinking Mexico City

Major ramifications of groundwater depletion can already be seen in places such as Mexico City, where the city itself is gradually sinking into vacant lakebeds due to receding water levels. In the past few decades, its large population has put stress on aquifers in the city, thereby leading to water depletion. A rapidly sinking city is now creating humps in drainage canals, reducing the city's drainage capacity by 30 percent from 1975 levels. According to the Mexican National Water Commission, the main agency responsible for management and administration of national waters, if even one key drainage tunnel (i.e. Central Emitter) were to be blocked, it would flood most of northeast Mexico City and two suburbs in the adjacent Mexico state.[6] In the past 100 years, parts of Mexico City have sunk nearly 42 feet. This sinking has caused considerable damage to buildings, roads and critical infrastructure.[7]

Figure 3: Surface and groundwater withdrawals as percentage of internal water resources, 2005



Source: The Millennium Development Goal Report 2011, UN, July 2011

As of 2005, sustainable limits of water withdrawal had already exceeded in Northern Africa and Western Asia, and consequently, these regions face one of the worst conditions of water stress. Rising population levels, urbanization and industrial growth have led to a heightened need for increased allocation of groundwater and surface water toward domestic, agricultural and industrial uses. By 2030, in China, industrial water demand is expected to dominate all water uses, and the country could account for 40 percent of extra industrial water demand globally.[8] Of all uses, access to safe drinking water has been a major challenge for all countries, particularly developing ones. By 2010, an estimated 780 million people lacked access to safe drinking water — 80 percent of them in rural areas. This deficit compels people to rely on water from dirty ponds or polluted rivers, leading to an increase in waterborne diseases such as diarrhea.[9, 10] In developing countries, nearly 3.5 million

By 2010, an estimated 780 million people lacked access to safe drinking water — 80 percent of them in rural areas.[11]

people die annually due to waterborne diseases that stem from lack of access to safe drinking water.[12] In fact, diarrhea is the second most common cause of death among children under the age of five.[13]

Another major concern arising from water scarcity is its impact on the empowerment of women and their subsequent place in society. In most developing and underdeveloped countries, lack of access to safe water directly results in an increased workload for women, as women are assigned the responsibility for collecting water and they spend considerable time in this task. Sub-Saharan women spend 40 billion hours per year collecting water — equal to France's annual labor output.[14] Many women even suffer from physical deformity from carrying heavy loads of water over long distances from a young age.[15] On average, globally, women and children travel 10–15 kilometers per day to collect water, and carrying up to 20 kilos or 15 liters per trip.[16] This leaves little time for income generating activities. In addition, the water inaccessibility poses an economic burden on the rural populace. The poor in some developing countries spend nearly 25 percent of their household income on their water and sanitation needs. This in turn forces them to seek money from local lenders to meet other daily needs, creating a vicious cycle of the debt-trap and perpetuates poverty.[17] Moreover, the water these women collect is mostly contaminated, making them vulnerable to water-related diseases.[18] Traveling longer distances to collect water and fuel can also place women and girls at risk of violence. In West and South Darfur, 82 percent of the close to 500 women treated for rape were attacked while undertaking daily activities such as gathering water, firewood or thatch.[19]

Freshwater scarcity is likely to affect the prospect of sustainable global growth in the future, particularly if women and children are amongst those most negatively affected. By 2050, in a 'business-as-usual' scenario, 52 percent of the global population (4.8 billion people), 49 percent of global grain production and 45 percent of the global gross domestic product (GDP) are likely to be at risk due to water stress. This, in turn, is likely to influence investment decisions and affect the competitiveness of certain regions.[20]

UN MDG 7: Targeting water accessibility

In 2000, the UN, along with major developed economies and multilateral organizations, committed to the Millennium Development Goals (MDGs) — with specific focus on economic development and poverty alleviation. Part of the MDG 7 mandate of ensuring environmental sustainability is halving, by 2015, the proportion of global population without sustainable access to safe drinking water and basic sanitation.[21]

Over the past two decades, many regions have witnessed a rapid increase in piped water connections on premises, as well as access to other improved sources such as protected wells, boreholes, rainwater collection and standpipes. In Latin America, Eastern Asia, Western Asia and Northern Africa, most of the population now has access to piped water. In 2010, 54 percent of the global population used piped water sources, while nearly 1.3 billion people used boreholes (mostly hand pump-operated) water sources.[22] Figures 4 and 5 present a contrast between proportion of population using various sources of water in 1990 and 2010.

Between1990–2010, the proportion of the global population with access to improved drinking water sources increased from 76 percent to 89 percent.[23] According to the latest World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) estimates, in 2010, the

> In fact, all MDGs — from goals related to eradicating poverty to achieving educational milestones to improving health and well-being of women and children — are influenced by water scarcity and are all inextricably linked with achieving success in water-scarcity related goals. Water security is therefore critical to global development.
>
> *— Trevor Davies, Partner at KPMG*

Figure 4: Proportion of population using different sources of water, 1990 (%)

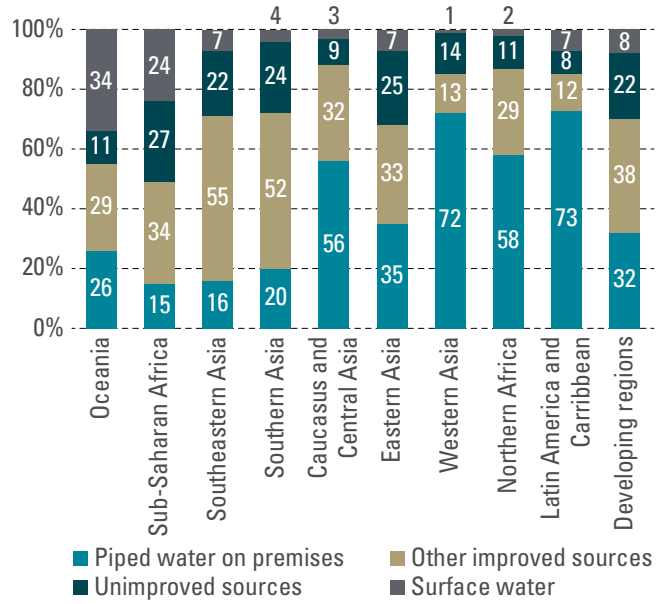
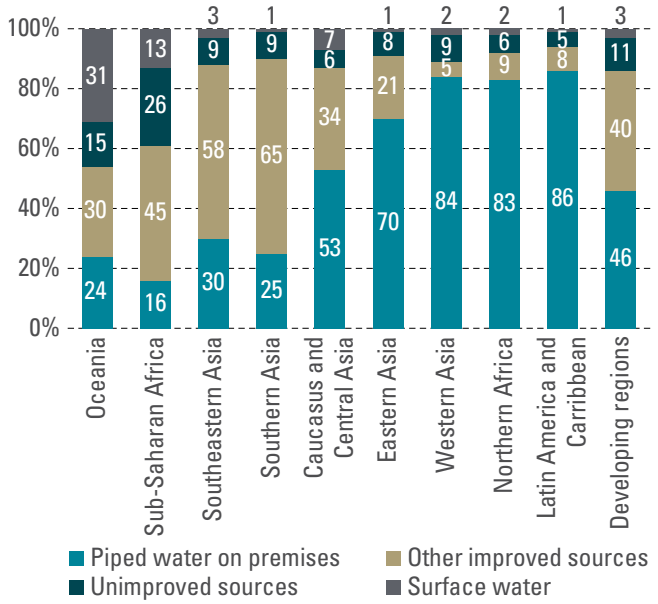


Figure 5: Proportion of population using different sources of water, 2010 (%)



Source: Progress on drinking water and sanitation: Update 2012, UNICEF, March 2012

> "The good news is that almost 1.8 billion more people now have access to drinking water compared to the start of the 1990s. The bad news is that the poorest and most marginalized are being left behind."
>
> *— Sanjay Wijesekera, Associate Director and Water and Sanitation Chief, UNICEF, within a press release of the article 'Drinking Water Equity, Safety and Sustainability,' December 2011*[27]

world met the target of access to safe drinking water, making it one of the first MDG targets to be achieved.[24] Of the 112 countries covered under the UN MDG framework, 103 countries recorded improvement in water accessibility. In China and India, nearly 1 billion people gained access to safe drinking water sources between 1990 and 2010.[25] However, under the MDG 7 goal of 'ensuring environmental sustainability,' three more targets are yet to be met, and there are significant challenges in achieving them. The MDG target for sanitation, for example, is far from being met, even by its target date of 2015. Moreover, there were disparities in improved access to drinking water sources. While more than 90 percent of people in Latin American countries had access to improved drinking water in 2010, nearly 40 percent of the people in the least developed countries still lacked such access, thus the benefits of improved water access are not necessarily reaching the 'poorest of the poor.' More than one tenth of the global population still relied on unimproved drinking water sources in 2010.[26] Ensuring an equitable success of improved water access around the world is a crucial challenge, and is important to address.

Ensuring sustainable water supply: Major challenges

According to the US Agency for International Development (USAID), 2.8 billion people live in water-scarce areas. Of these, up to 1.2 billion, or about 16 percent, of the world population live in areas characterized by absolute water scarcity, while another 1.6 billion live in areas of economic water scarcity, caused by insufficient human, institutional and financial investments to help access and better utilize natural water resources.[28] The population living in absolute water scarcity is expected to grow by around 50 percent to reach 1.8 billion by 2025. In the next decade, water shortage is likely to be the world's most critical problem, compounded by a growing global population, according to Sir John Beddington, Chief Scientific Advisor to the UK Government.[29] Further, a lack of governance and policy measures can exacerbate the problem of inequitable distribution among the poor. In addition, climate change and poor water quality will also contribute to water scarcity.

CASE: Sana'a, Yemen, facing challenges of depleted water resources

In Sana'a, Yemen, water levels are shrinking in the wells, most of which have dropped to depths of 800–1,000 meters below the surface. As a result, sophisticated oil-drilling equipment is required to extract water, of which nearly 90 percent is used for agriculture. Further, due to the receding water levels, people are migrating to urban areas, further increasing the demand for this natural resource. In fact, Sana'a is anticipated to be one of the first cities in the world to run dry over the next 10 years.[30]

Climate change affecting water resources

Climate change is expected to increasingly affect available water resources for agriculture and irrigation. Over the past few decades, the global temperature has been rising, increasing 0.76 degrees Celsius between 1850–1899 and 2001–05.[31] Consequently, mountain glaciers and snow covers are gradually melting, and sea levels are rising. Evaporation from land water is also on the rise, leading to changes in the hydrological cycle. As a result, while rainfall may gradually increase in the tropics and at relatively high latitudes, it will likely decrease in the already dry semi-arid to mid-arid latitudes.[32, 33]

In addition, the frequency of floods and droughts is expected to increase, leading to heightened pressure on groundwater levels.[34] Moreover, the rates of abstraction and the quality of aquifer recharges can further reduce groundwater availability for different uses.[35] The drying and shrinking of glaciers may directly affect rivers that feed on melting ice. For instance, in India, nearly 70 percent of discharge to the Ganges, one of the country's major rivers, comes from Nepalese snow-fed rivers. If the Himalayan glaciers dry up, so will the Ganges.[36] The Ganges River Basin is one of the most populous river basins in the world, with approximately 400 million people residing within 750,000 square kilometers.[37] Experts estimate that many of the planet's glaciers could disappear by the middle of 21st century. This is likely to impact more than 2 billion people who rely on this water.[38]

Growing population and urbanization increasing demand for water

An estimated 80 percent of global water scarcity challenges can be attributed to population growth and the need for economic development, according to the Food and Agricultural Organization (FAO). As the global population grows, the demand for food and water is also on the increase. By 2025, rising consumption growth is likely to result in the demand for water surpassing its supply by 56 percent, while 1.8 billion people are expected to live in water-scarce areas.[39] Similarly, by 2030, the global demand for food is expected to increase 50 percent. Currently, an estimated 2,000–3,000 liters of water per day is needed to produce food for a single individual and a growing demand for food will further significantly stress the available water resources.[40]

The demographics of the global population are expected to change markedly by 2025 — from the current 55 percent rural and 45 percent urban constitution to a 41 percent rural and 59 percent urban composition. Environmentally induced migration could be a major factor behind future growth.[41] Countries around the world are expected to witness increased stress on water supply. This trend will be more visible and severe in developing countries, as their urban population continues to grow, increasing demand for water while generating more wastewater and affecting the water availability for agricultural use.[42] Moreover, most low- to middle-income countries are also struggling with under developed water-management systems, leading to increased inefficiency in the use of already depleting resources. Between 2007 and 2025, water withdrawals are predicted to increase by 50 percent in developing countries and 18 percent in developed nations.[43, 44] Replenishment of water resources depends on natural factors such as precipitation, which are now more uncertain given potential climate change. As a result, the rate of groundwater replenishment rate exceeds and will continue to do so, pushing many countries to water-stress levels.

By 2025, rising consumption growth is likely to result in the demand for water surpassing its supply by 56 percent.

> "The demand for drinking water goes up, but that's trivial. The demand for water to produce food is the big one. It takes a thousand tons of water to produce 1 ton of food. So, when we look at the water issue, it's really a food issue."
>
> *— Lester Brown, author and founder of the Earth Policy Institute, October 2011*[45]

CASE: People in Nairobi, Kenya struggling with water scarcity caused by urbanization

Over the last century, the city of Nairobi in Kenya grew from a small railway station to become one of the largest cities in Africa. The city now has nearly 3.5 million inhabitants and the population is growing at an average rate of 2.8 percent per year. However, Nairobi has a high percentage of informal settlements, posing a major challenge for city authorities to provide safe and sustainable drinking water.

With a rapidly increasing population in the city, water demand now exceeds supply by 200,000 cubic meters per day. While only 50 percent of households have access to piped drinking water, other sources including surface water are either highly polluted or suffer from outdated infrastructure. People from informal and illegal settlements are at high risk, as they often end up using unimproved water sources or buying water from kiosks at a much higher rate.[46]

Deteriorating water quality

Although close to 87 percent of the global population has access to drinking water, the quality of potable water remains a major concern. In most developing countries, water pollution is a result of industrialization, increasing urbanization and poor sanitation. In developing countries, 70 percent of industrial waste is dumped untreated into water bodies.[47, 48] In the Middle East and North Africa, the cost of environmental degradation from water pollution and excessive withdrawal is estimated at 2.0–7.4 percent of the GDP.[49]

> "Access to safe water is essential in order for a child to survive and successfully develop the ability to learn, earn and thrive."
>
> *— Clarissa Brocklehurst, UNICEF Chief of the Water, Sanitation and Hygiene Initiative, World Water Day 2010*[53]

Further, poor quality of drinking water sources causes major health problems and diseases, affecting the overall growth and sustainability of the global economy and, as noted previously, affects most heavily women and children.[50] Most Asian countries face the challenge of arsenic poisoning of groundwater, with nearly 12 countries having reported high arsenic contamination of their groundwater resources in 2006. Bangladesh had the highest percentage of contaminated shallow tube wells — used for drinking water and irrigation — with an estimated 35.7 million people dependent on those wells for domestic purposes.[51] In a recent study, in 2010, up to 77 million people in Bangladesh are being exposed to toxic levels of arsenic, which could take years or decades off their lives.[52]

Agriculture water footprint

Agriculture consumes most of the available groundwater, and therefore, inefficient water use in agricultural activities can further affect the supply of groundwater. During 1996–2005, the global water footprint* of crop production was 7,404 billion cubic meters per year, according to research by M.M. Mekonnen from the University of Twente and A.Y. Hoekstra from the UNESCO- International Institute for Hydraulic and Environmental Engineering (IHE). Of this global footprint, wheat production accounted for the largest share, followed by rice and maize.[54] Nonetheless, if production is carried out in an area where water is abundant and well-managed, a large water footprint does not necessarily present a threat. The water used for crops and food production is returned to the water cycle in the form of evaporation or runoff. However, the used water remains temporarily unavailable for other uses, and may not be directly fed into the aquifers, lakes, or rivers. In water-scarce areas, this can become a threat to groundwater levels.[55]

Further, runoff from farms contains high level of pollutants in the form of residuals from synthetic fertilizers. To improve production, farmers often use nutrients such as phosphorus, nitrogen, and potassium in the form of chemical fertilizers. These fertilizers may drain into aquatic ecosystems with rain, contaminating them. Drinking water contaminated with high nitrogen levels can cause methemoglobinemia, a fatal disease among infants.[56, 57]

* *Water footprint shows the total volume of water that is used to production. The term was coined by A.Y. Hoekstra from UNESCO-IHE as an alternative indicator of water use.*

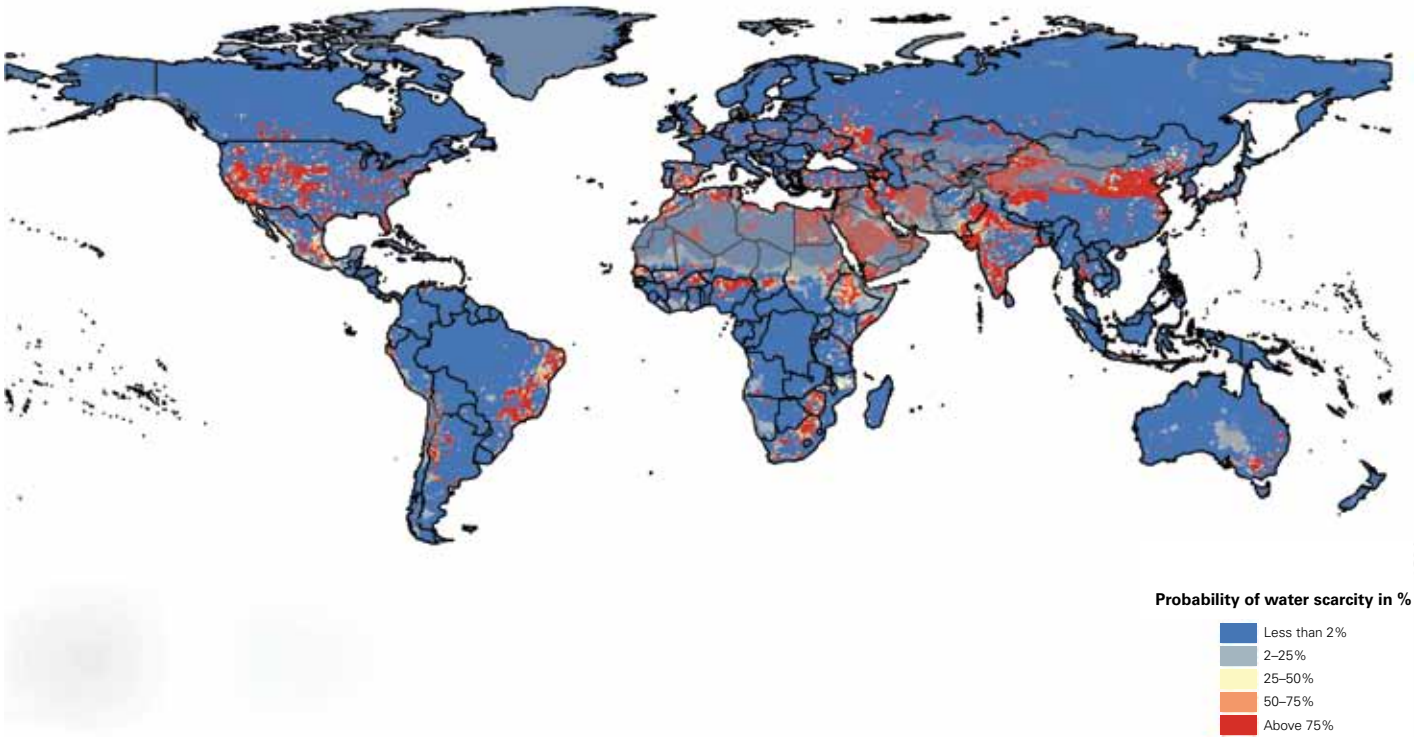
Food vulnerabilities in water-stressed economies

With populations growing and the consequent high demand for food, countries will need to increase food production in future. This is particularly true for developing nations, where food production will have to double over the next 40 years.[58] The situation may worsen with people migrating from drought-affected areas to urban locations, which, in turn, will likely reduce agricultural output.[59]

Vulnerability to water-stress conditions is more prominent in developing countries. In the Middle East and North Africa, for example, a number of countries are vulnerable to water stress as a result of high population growth, coupled with rising food and energy demands. A population of 2.8 billion that will face water-stress conditions by 2050 is spread across 48 countries. More than 80 percent of these countries are concentrated in West Asia, North Africa or Sub-Saharan Africa.[60] In Africa, nearly 50 percent of yields from rain-fed agriculture will be lost due to the increase in water-stressed areas.[61]

In Africa, nearly 50 percent of yields from rain-fed agriculture will be lost due to the increase in water-stressed areas.[62]

Figure 6: Sub-national map of the Water Stress Index, 2011



Source: Maplecroft index identifies Bahrain, Qatar, Kuwait and Saudi Arabia as world's most water stressed countries, Maplecroft, May 25, 2011

Many regions experience disparate seasonal shifts, witnessing significant rainy seasons followed by dry seasons. Although annual average rainfall in these regions is sufficient to sustain crops through the dry seasons as well, most areas lack infrastructure to effectively capture and store rain water to irrigate crops during dry seasons. This inefficiency can lead to periods of severe food and water shortage during drought.

To offset water shortages and the consequent impact on food security, countries such as India, China and South Korea, along with Gulf countries including Bahrain, Qatar, Kuwait and Saudi Arabia are acquiring water-rich land for agricultural purposes in developing countries to offset water shortage and its impact on food security. This is leading to the issue of the 'land grab.' Cash-rich countries are increasingly exploring and acquiring water-rich lands in developing or underdeveloped African countries to ensure supplies of natural resources. Although these foreign investments are mostly cited as funding toward improving food security in the host countries, the control allowed to these investors over local resources can negatively affect the human rights of local communities. These include the right to water, food and adequate housing and the right to earn a living through agricultural activity.[63] In many developing countries and particularly in Sub-Saharan Africa, the rights of land users are not properly secured. This implies that land users will not have access to legal remedies, and will not receive adequate compensation, if they are evicted from the land they cultivate, after foreign investors take possession.[64] Farmers in Uganda and Philippines have been evicted from their farming lands without proper procedures and compensation, leading to loss of livelihood.[65, 66]

Conflicts involving water sources

Poor management of water resources, increasing demand for water and a history of geopolitical tensions leads to conflicts over sharing water resources. Worldwide, 263 river basins (home to 40 percent of the world's population) are shared by two or more countries. In many West African countries, for example, water conflicts have emerged as a major concern. Apart from Cape Verde, all countries in the region share about 25 trans-boundary watercourses. These resources are of great importance for multiple reasons, including their use for trade, agriculture and industry. Their strategic importance, coupled with factors such as desertification and government policies, make them a source of potential conflict. The following are some of the conflicts that have arisen in the continent:[67]

- Nigeria–Chad: Military fire was exchanged over the use of Lake Chad, including the fishing rights of communities in the area.
- Nigeria–Mali: Nigeria expressed anxiety over Mali's attempts to tap the River Niger (Taoussa Dam) for rice irrigation and other agricultural purposes.
- Ghana–Burkina Faso: Tension arose over Burkina Faso's decision to build a dam, which was blamed for water deficits at Akosombo and disruptions of electricity supply in Ghana.
- India–China: Tensions over the use of Tsangpo/Brahmaputra water with China blocking India's attempts to dam the river on Indian territory.[68]

Government efforts and public policy for water management can play a very important role in mitigating water conflicts and promoting inter-regional cooperation, as noted within the following:

- Nigeria co-founded the Nigeria–Chad Joint Commission to promote the peaceful and beneficial use of Lake Chad.
- The Government of India's recently created Draft National Water Policy, which includes establishing a permanent water disputes tribunal to settle water disputes in an equitable and speedy manner. It also suggests a water tariff system in every state to fix the criteria for water charges.[69]

Water conflicts become progressively serious in the absence of an integrated approach to sharing resources and addressing water problems. There is a lack of basin-wide management and long-term usage strategies of land and water worldwide. Poor or little environmental management has reduced the resiliency and sustainability of water resources. This, combined with the dual problem of population growth and the consequent increase in demand for water, creates pressures and potential for increased tension. India and Pakistan, for example, are faced with this twin challenge, which will require

cooperation to resolve. However, the political climate between the two countries makes this a substantial challenge. In Pakistan, per capita water availability has declined nearly 75 percent over the past 60 years, due largely to its population growth. Moreover, the country also has few dams and reservoirs to hold water supplies.[70] India is also grappling with increasing population and depleting groundwater levels which are some of the factors contributing to water scarcity in the country. According to a study conducted in 2009, groundwater depletion in India was nearly double the capacity of the country's largest surface-water reservoir.[71]

International collaboration and good governance — making water accessible to all

To make water accessible to all, it is necessary to consider it both a 'public good' and an 'economic good.' While treating water as a public good, or a basic human right, ensures that governments focus on equal distribution of the resource among its people; treating it as an economic good can promote more efficient allocation and conservation.

In all, the private sector, governments and international donors — along with contributions from local programs — could help overcome water scarcity. According to Dr. Jacques Diouf, former Director General of the FAO, "Political will and investment can help bring available water to the millions of small farmers around the world by supporting locally-based programs that directly involve those farmers and their neighbors in conserving rainfall, using water more efficiently and protecting water resources." The FAO is responsible for organizing and supporting pilot programs for small-scale irrigation or community-based systems for harvesting rainfall in South Africa, Turkey and Mexico.[72] In Mexico, as of 2008, farmer associations managed more than 99 percent of the irrigated area held in public irrigation districts. Transferring the responsibility of managing water systems to local authorities can shift the cost burden from the central government and may result in more efficient grass roots management.[73]

Private sector involvement to alleviate water scarcity

The private sector plays an important role in the planning, development and management of water resources. It also may help generate financial resources, introduce corporate management, and improve service efficiency and accountability.[74]

In the past 10 years, the private sector has invested in an average 50 projects per year, with an investment commitment of US$2–3 billion on an average.[83]

"Water can be managed professionally. There is an industry behind the tap you have at home. What is important is the arrangement. It should be made in such a manner that the service will be efficient and that the water will reach as many people as possible," said Margareta Wahlström, the UN Disaster Risk Reduction Chief, in a recent press release published in *Handshake*, an International Finance Corporation (IFC) quarterly journal on public-private partnerships.[75]

The journal, published in March 2012, stated that the private sector is delivering reliable and safe water to nearly 160 million people in emerging markets. In fact, in the past 10 years, the private sector has invested in an average 50 projects per year, with an investment commitment averaging US$2–3 billion.[76] Private players can contribute greatly toward water projects in low- and middle-income countries. According to the IFC, over the past decade, these countries accounted for more than 55 percent of the public-private partnership projects, with China contributing the highest amount of investment. Most of these projects were implemented in potable water and sewage treatment plants.[77]

Overall, private participation in the global water industry can include privatization, 'greenfield' projects, concessions, leases, operation and management contracts, and outsourcing.[78] In some countries such as Peru and Guatemala, private sector companies receive territorial concessions to procure, purify, distribute, meter and charge for water.[79] In Latin America, of the 113 projects implemented over the past decade, most were concessions, followed by water and wastewater treatment plants under build-operate-transfer (BOT) agreements.*, [80]

"It is an absurd paradox that millions who lack access to water live in areas where there is plenty of rainfall or freshwater. Improving the way we conserve, manage and deliver water is fundamental to solving the water crisis. The private sector has a critical leadership role in this," as reflected within *Handshake*.[81]

Further, the private sector can also assist in providing microfinance credit to the rural people. Microfinance can provide the necessary funding for paying the capital costs, and also the operational and maintenance costs. It can benefit the small-scale water providers by helping them establish the necessary infrastructure. In Lomé, the capital of the West African country, Togo, microfinance facilities were used to provide shallow boreholes and rainwater harvesting tanks to small-scale water providers. These providers were not only able to provide safe water, at a marginal cost, but also were able to repay the loans.[82]

The challenges related to water management and scarcity, therefore, become a mutual responsibility of governments (national and local), the private sector and international donors, with each institution having a role to play in addressing the various aspects of water scarcity. What also is critical in the analysis is the voice of the stakeholders and those who are the potential recipients in water-impacted regions.

However, there are certain risks associated with granting private players complete ownership of water resources. It is therefore critically important that governments ensure they put in place appropriate regulations and standards to safeguard local interests and promote holistic development.

* *In BOT arrangements, the private sector builds an infrastructure project, operates it and eventually transfers ownership of the project to the government.*

CASE: Collaboration between private sector, government and international donors[84, 85]
The United Nations Environment Programme (UNEP) has collaborated with several multinational and private organizations to focus on water efficiency. The Water Footprint, Neutrality & Efficiency (WaFNE) umbrella project engages the public and private sectors (business and industry, including financial services) to promote sustainable water use in highly water-intensive industries in developing countries. The project aims to improve water efficiency through various water accounting/footprint and water neutrality methodologies, and through building capacity and raising awareness among the public and private sector. The project has a time frame of three years, from 2009–10 to 2012–13. The various project stakeholders included UNEP Finance Initiative (Geneva), International Environmental Technology Centre (IETC) (Osaka), private companies, and banks.

Water governance

Ensuring equal access to water resources depends largely on good governance. However, in most countries institutions involved in water management remain fragmented, local capacity is often limited, and roles and responsibilities are often misaligned. Further, lack of long-term strategic planning, poor financial management and ineffective legislation add to the challenge of good governance.[86]

Water governance has been defined as "the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society."[87]

Effective water governance programs are critical to a country's water management system, particularly in developing countries. The economic value of water, including the global market value of marine and coastal resources and industries, is estimated at US$3 trillion annually — approximately five percent of the global GDP. To improve the socioeconomic benefits of water, there is a need for adaptive, integrated and ecosystem-based approaches to the management of freshwater and ocean resources.[88] According to the UN Economic Commission for Europe (UNECE) Deputy Executive Secretary Andrey Vasilyev, for an equitable distribution of water resources, political will and strong governance is required.[89] Effective water governance has in fact become a key political priority globally, with governments trying to improve water policies to reduce wastage and exploitation of water resources. In October 2011, the Indian government announced plans to set up a regulatory body to streamline water management and introduce stricter norms aimed at reducing wastage of the resource.[90]

In developing countries, poor governance standards can allow foreign entities to easily gain control of water resources.[91] The UN has been actively promoting water governance among developing countries. A resolution passed by the UN General Assembly in July 2010 recognizes "the right to safe and clean drinking water and sanitation as a human right."[92] Further, the UNDP's Water and Ocean Governance Programmes are helping many developing countries effectively administer their resources.[93]

Empowering local governance

Sustainable water supply is essential for economic growth and development of a nation. However, water and its management are not simply a national matter; greater local issues are also important to ensure water accessibility. In fact, all poverty reduction efforts need local considerations, as it is the local government that has to improve the conditions on the ground. For instance, the local government can provide exhaustive information related to the quality and extent of provision of water for each household. While national averages may only provide a fraction of the information, with limited sample sizes.[94] Donor agencies, international funding organizations and to most extent national governments depend largely on the quality and effectiveness of local government and organizations, for implementation of projects.[95, 96] Recently, the Ministry of Drinking Water Supply and Sanitation of India, prepared a long term strategy, over 2011–22, aimed at ensuring drinking water security to all rural households. The strategy emphasizes delivering water security measures through decentralized governance with oversight and regulation. The service delivery models require state administrative institutions, such as Zilla Panchayats (District-

The economic value of water, including the global market value of marine and coastal resources and industries, is estimated at US$3 trillion annually.[97]

> **"Right now, farmers and cities are competing for water. Cities are using water, then putting it back out, polluting the environment. It would make so much more sense if more of the water used in the cities was then cleaned and reused in agriculture."**
>
> *— Javier Mateo-Sagasta, a specialist with FAO's Water Unit, in a press release on World Water Day 2011, March 2011*[103]

level administration) implementing and managing water security schemes across villages, while Gram Panchayats (village-level administration) implementing and managing in-village and intra-Panchayat schemes.[98]

Water management and reuse

Integrated programs in water management are among the most sustainable solutions to facilitating water governance. According to a World Bank report, appropriate water management can increase a country's GDP by 5–14 percent.[99]

Water reuse and growth in peri-urban agriculture can contribute significantly to water management practices. In Tunisia, approximately 30–43 percent of purified wastewater is used for agricultural and landscape irrigation.[100]

Another major way to ensure water availability is preserving and enhancing the quality of wetlands. In addition to being an important water source, natural wetlands purify water, restore soil ecology and create a habitat for wildlife. However, watersheds are now facing a number of challenges — such as high population growth, expansion of irrigated cropland and high deforestation. Climate change is further adding to the challenge, as its irreversible damages to watersheds are impacting food security. At the same time, there is now more awareness about the multiple environmental, economic and social benefits provided by watersheds.[101] Laura Gabanski, Senior EPA Biologist and Healthy Watersheds Initiative Leader, stated, "The cost of protecting watersheds is much less than the cost of restoring impaired waters. Choosing to protect ecologically valuable systems will save money in the long run."[102]

Watersheds cover a number of resources, such as agricultural and grazing land, forests, wetlands, common waterways and residential areas. It is critical to implement the best methods of restoration and preservation to maximize the benefit from all these sources. Forests play

an important role in forming and replenishing water resources, as they help "reduce the effects of floods, prevent soil erosion, regulate the water table and assure a high-quality water supply for people, industry and agriculture." In fact, a significant portion of drinking water to large cities, such as New York, Singapore, Jakarta, Rio de Janeiro, Bogotá, Madrid and Cape Town, are drawn from forested areas.[104] However, between 2000 and 2010, every year approximately 13 million hectares of forest were converted to other uses or lost through natural causes. Globally, there are still 850 million hectares of degraded forest land available, which can be restored and used for climate change mitigation and adaptation. Effective forest management and afforestation of these degraded areas can greatly reduce erosion and increase slope stability, consequently leading to regulated water supply and protection against natural hazards.[105]

Multi and bilateral organizations such as the World Bank and USAID are promoting water management in developing countries:

- **The World Bank**: During 2003–09, the bank released more than 20 'Country Water Resources Assistance Strategies,' aimed at extending the bank's involvement in different water projects in association with local ministries of finance. In Zambia and Mozambique, the World Bank made significant contributions to improve water resource planning, highlighting the need for a river basin approach to investments.[106] The bank also increased lending in water resource management from US$274 million in 2006 to US$2 billion in 2011.[107] Table 1 highlights some of the World Bank's support teams for water management.

Table 1: World Bank's various support teams for water management

Support team	Details
Ground Water Management Advisory Team (GWMATE)	• The GWMATE supports and strengthens the groundwater components of World Bank projects and provides policy guidance on groundwater management and protection issues. Since 2001, the GWMATE has committed US$4.4 million to capacity development, knowledge products and operational support in 68 projects.
Hydrology Expert Facility (HEF)	• The HEF provides consultancy services to various governments in project-focused hydrology and water management services.

Source: Sustaining water for all in a changing climate, World Bank, 2010

- **USAID:** USAID focuses on promoting water management in many developing countries to protect water quality and ensure that future demand is met. In 2010, the agency allocated US$47.2 million toward watershed/water resource-management programs, 58 percent of which was directed to Asia.[108]

Table 2: Key water management projects by the USAID

Country	Details
The Dominican Republic	• USAID is working closely with farmers in three micro watersheds to establish functioning watershed management committees. The committees are responsible for the post-hurricane rehabilitation of the watersheds and the establishment of plans for the long-term development and management of these resources.
Panama	• USAID continues to assist the Panama Canal Authority and the National Environmental Management Authority to establish functioning Watershed Management Councils and effective watershed management. The councils are completing action plans for sub-watersheds, focusing on zoning for multiple-uses, including economic growth and conservation.
The Philippines	• USAID assists local governments in identifying economically feasible pollution-control and wastewater-treatment technologies. Activities to promote water conservation and pollution control are coupled with solid waste management as the basis of major citizen-involvement campaigns across the islands.

Source: Water Governance and Regulation, USAID, Accessed on February 3, 2012

Funding for water-accessibility programs

In 2009–10, total annual average aid commitments to water and sanitation amounted to US$8.3 billion.[112]

Along with stronger policy and monitoring, substantial investments are required to expand, upgrade and maintain water infrastructure. The emphasis on sustainable investment in water infrastructure has increased in recent years, as demand for the natural resource is gradually increasing with the growing population pressures in urban areas, agricultural needs and overall climate change. Moreover, even though most regions are achieving their MDG targets, there will still be millions of people without any access to water. In another few years countries will have to spend substantial amounts on the maintenance and the replacement costs for existing infrastructure. In fact, more than 75 percent of the annual needs to attain MDGs are related to maintenance and replacement of existing infrastructure. In developing countries, the annual maintenance cost of existing services is approximately US$54 billion.[109]

According to the latest OECD report, assistance for water and sanitation rose at an average annual rate of five percent in real terms since 2001. In 2009–10, total annual average assistance commitments to water and sanitation amounted to US$8.3 billion. Japan was the largest donor in the water sector — delivering 28 percent of all global assistance in 2009–10, followed by Germany (10 percent), the International Development Association (IDA) (9 percent), France (8 percent) and the EU institutions (7 percent). In terms of recipients of assistance, Sub-Saharan Africa received 26 percent of total assistance to the sector, and South and Central Asia 21 percent.[110, 111] In 2010, OECD Development Assistance Committed (DAC) was the largest donor to water projects in developing countries, as reflected in Figure 7, while Sub-Saharan Africa was the largest recipient, as shown in Figure 8.

Figure 7: Funding commitments by different donors in 2010, %

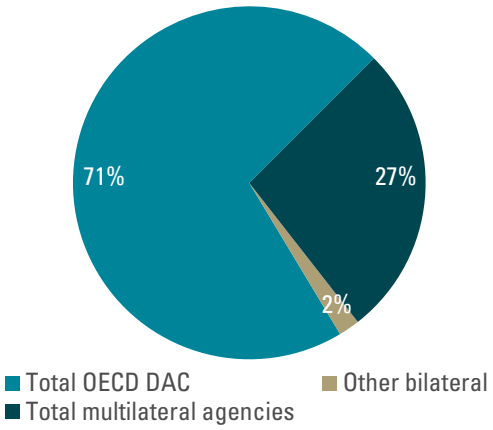
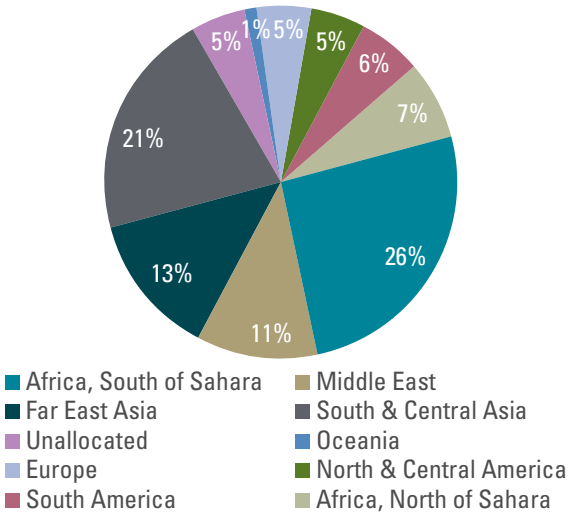


Figure 8: Share of funds among the recipient regions in 2010, %



Source: Financing Water And Sanitation In Developing Countries: The Contribution Of External Aid, OECD, March 2012

According to a 2011 report – *UN Global Annual Assessment of Sanitation and Drinking-Water*, the annual cost of reaching the MDG 7 in developing countries is US$6.7–75 billion, which creates a total funding requirement of US$33.5–375 billion by 2015. These cost estimates vary due to the different assumptions used on the types of investment made.[113] Table 3 outlines funding toward water projects from various donor organizations.

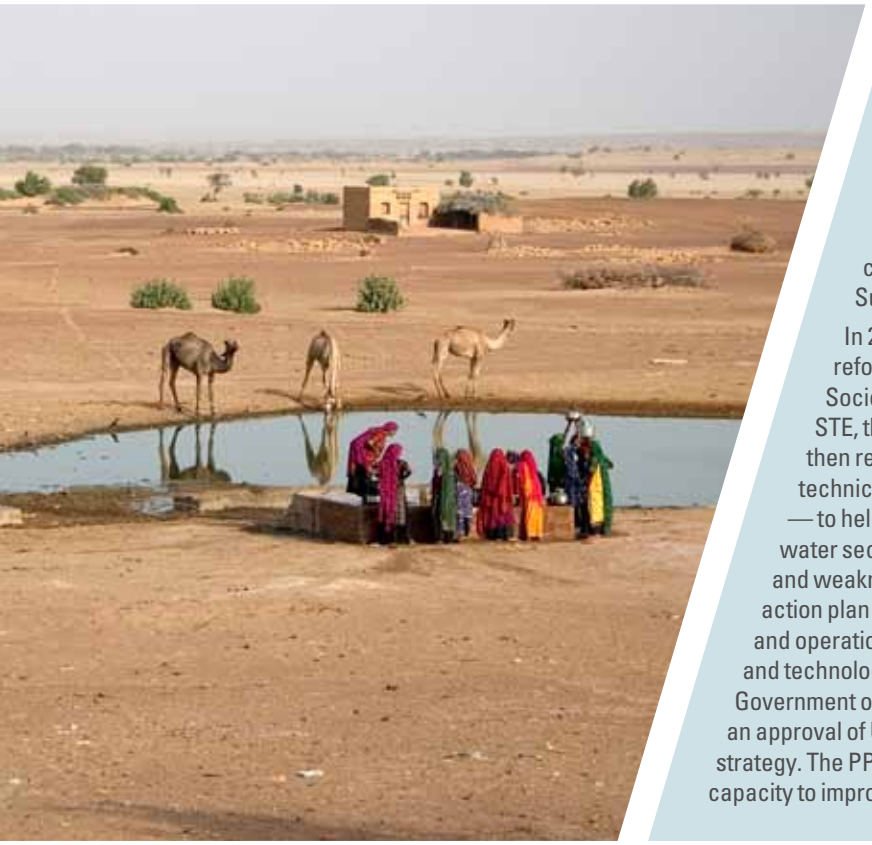
Table 3: Aid toward water projects from various organizations

Organization	Details
UK DFID	• The Department for International Development (DFID) has a Programme Partnership Agreement (PPA) with international NGO WaterAid. Under this PPA, DFID committed £3.9 million (US$6 million) for various water projects over 2008–11. Other significant projects are also taking place as part of rural development or climate change programs.
OECD DAC	• During 2009–10, aid to water and sanitation from the OECD DAC totaled US$8.3 billion.
The World Bank	• During 2006–09, the World Bank's commitment to water projects amounted to US$18 billion. • During 2010–13, the World Bank's projected commitment is US$20.6–24.5 billion.

Source: WaterAid - Partnership Programme Arrangement, DFID, Accessed on February 9, 2012; Financing Water and Sanitation In Developing Countries: The Contribution of External Aid, OECD, March 6, 2012; Sustaining water for all in a changing climate, World Bank, 2010

While there is a growing need for increased funding, the conditions donors have imposed on recipient countries to qualify for aid has met criticism from many organizations. These conditions are mostly related to transforming policies and privatizing water systems. The balance between investment in water infrastructure and investment in water management depends on a country's socioeconomic situation. Developing countries need more investment in water infrastructure than developed countries. At the same time, many developed countries need more investment in water management than developing countries, according to a 2007 report by David Grey, Senior Water Advisor, and Claudia Sadoff, Lead Economist for Agriculture and Rural Development at the World Bank.[114]

Local governments can leverage basic sources of finance (i.e., tariffs, taxes and transfers) to meet funding requirements. In the water sector, most governments have relied on debt financing for infrastructure investment. However, private funding options — referred to as 'market-based repayable finance,' including loans from microfinance institutions, capital market bonds and private equity funds — can further assist governments in reducing funding gaps. In fact, countries with comparatively developed capital markets, such as India, Brazil, the Philippines and South Africa could increase their use of sources such as bond finance, project finance or equity finance toward water projects.[115] Another mechanism to implement water projects in developing countries is a public–private partnership (PPP). With sustained guidance of donor agencies, along with private sector expertise, this could be an efficient mechanism of improving water management.



CASE: Public-Private Infrastructure Advisory Facility (PPIAF) assistance in the Republic of Chad[116]

The Republic of Chad is one of the world's poorest countries, with extreme vulnerability to food insecurity. Moreover, the country is struggling with water scarcity, with only 36 percent of the urban population and 32 percent of the rural population having access to potable water. In contrast, an average 80 percent of the urban population in Sub-Saharan Africa has access to improved water sources.

In 2008, the International Monetary Fund (IMF) initiated a reform of Chad's national water and electricity company Société Tchadienne d'Eau et d'Electricité (STEE), and created STE, the national public water utility. The Chadian Government then requested the PPIAF — a multi-donor trust fund that provides technical assistance to governments in developing countries — to help Chad create a framework for an efficient PPP in the water sector. Consequently, the PPIAF identified the strengths and weaknesses of the country's water system and devised an action plan focused on legal and regulatory framework, investments and operations (including finances, accounting, human resources and technologies), to facilitate PPPs in the country. In April 2011, the Government of Chad adopted the PPP model and subsequently received an approval of US$27 million from the World Bank to support the PPP strategy. The PPP engagement is expected to help Chad enhance its capacity to improve its water systems.

Multilaterals and state organizations — empowering local governments

To address any funding gap in developing countries, multilaterals and state funding agencies are promoting the empowerment of local governments. To achieve this, these agencies are focusing on empowering local communities within a national framework, with proper decentralization, capacity development and adequate financing. Table 4 lists some major initiatives toward this goal:

Table 4: Initiatives to empower local governments

Organization	Details
UNDP[117]	UNDP, in cooperation with the United Nations Capital Development Fund (UNCDF), launched the 'one percent water and sanitation innovative financing mechanisms,' which empower local governments to coordinate and facilitate the efficient use of funds. Through this initiative, resources (wherever possible) are channeled through local governments.
International Red Cross and Red Crescent Societies[118]	The International Red Cross and Red Crescent Societies called on the donor community to ensure that vulnerable communities have the knowledge and technical skills to maintain vital water facilities such as wells and pumps, to ensure that these remain functional in the event of any disaster.
African Water Facility (AWF)[119]	The AWF is an African Ministers Council on Water initiative managed by the African Development Bank. The program focuses on developing African governments' capacity to facilitate water governance. With its innovative technologies and approaches in water management, the initiative also helps attract investments into the region.

Conclusion — collaborative effort is essential for a sustainable solution

With the world population expected to reach 9.3 billion by 2050, demand for water will rise significantly. The increased population will further intensify the growing demand for safe and potable water, while simultaneously adding to the current pressure of increasing food and industrial production. These imminent developments make it imperative that governments across the world maintain a targeted focus on enhancing productivity of water resources. While an efficient infrastructure can facilitate distribution of safe and clean water, protecting watersheds and water sources can ensure continuous water availability for a longer term. Therefore, effective governance becomes crucial to ensuring sustainable water solutions and equitable distribution.

Traditionally, the effects of population growth have been more prominent in urban areas; due to people migrating from rural areas. Urbanization, however, also leads to greater demand for resources, such as food, water and energy. Cities in developing countries — which are witnessing increased urbanization, while still facing issues such as prevalence of slums and unavailability of clean drinking water and sanitation — have substandard infrastructure to support their growing populations. In such areas, establishing a distribution system will require increased investments from public and private sector into infrastructure development, such as treated water supply facilities, piped water connections and protected wells. An efficient infrastructure can also help in tapping alternative sources of water — such as rain and storm water, used water and desalinated sea or brackish water.

While infrastructure can ensure equitable distribution, protecting and maintaining the water sources can help ensure water availability over the long term. Replenishment of aquifers and freshwater availability are largely affected by the water cycle. Even though a renewable source, freshwater, unlike many natural resources, is always limited. The changes in climate are disrupting the natural water cycles. Consequently, while in some areas rainfall is increasing, other areas are struggling with drought. Widespread afforestation, over-extraction of groundwater and man-made pollutants are further shrinking existing watersheds that have long provided freshwater. Most environmentalists are now focusing on watershed protection and optimizing the use of environment-friendly techniques such as rainwater harvesting. Integrated programs and reforms in water management can increase awareness among the general public, farmers and industrial users to conserve water and help restore the natural balance.

However, these reforms require large-scale involvement and influence

Q How can governments leverage private sector expertise in establishing and maintaining water infrastructure?

of government organizations. Governments can not only promote water management, but also establish regulations that ensure optimum allocation and use. Further, governments can also facilitate the engagement of private organizations and international donors. In fact, local governments can largely assist management of resources at the grassroot level, as they are better positioned to not only provide information on local water issues and concerns, but also implement and monitor various remedial programs at regional levels.

An integrated effort that brings together donor agencies, private players, local governments and civil society to focus on specific interventions is needed. This collaborative approach could go a long way towards meeting the targets and goals related to water scarcity and accessibility, and also ensuring sustainable development for the world.

Appendix

Terms	Definitions
Water accessibility	The WHO defines water accessibility, or access to safe water, as, "the proportion of population with access to an adequate amount of safe drinking water located within a convenient distance from the user's dwelling."
Basic sanitation	According to the WHO, improved sanitation or basic sanitation is one that likely hygienically separates human excreta from human contact. Improved sanitation facilities include the following: • Flush or pour-flush to piped sewer system, septic tank or pit latrine • Ventilated improved pit latrine • Pit latrine with slab • Composting toilet
Improved drinking water sources/safe drinking water	According to the WHO, any improved drinking water source, by the nature of its construction and design, is likely to protect the source from external contamination, in particular from fecal matter. Improved drinking water sources include the following: • Piped water into dwelling, plot or yard • Public tap/stand pipe • Tube well/borehole • Protected dug well • Protected spring • Rainwater collection

Source: World Health Statistics 2011, WHO, 2011

Further information

Visit kpmg.com for the following related publications

- *Expect the Unexpected: Building business value in a changing world*
- *Sustainable Insight: Accounting for Water*
- *Delivering water infrastructure using private finance*
- *REACTION: Brazil – A world leader in the making*
- *Water in China*

How KPMG firms can help

Public sector reform and performance improvement

KPMG firms are committed to providing:

- Assistance in the institutional assessment of large donors and stand-alone non-government organizations
- Advice to the development community and public sector on good governance and strategic planning
- A broad range of human resource tools and guidance
- Services for efficient, effective and transparent public and non-profit financial management
- Specialized monitoring and evaluation of objectives and goals

Private sector development

Our global network is committed to helping:

- Improve business processes, supply chains and procurement systems across private sector enterprises in both the developed and developing world
- Develop finance legislation and enhance depository systems, credit granting, risk management, evaluation and recovery and implementation of microcredit programs
- To enable effective implementation of public-private partnerships, by improving local economic development (LED) strategies
- Improve transaction services for corporations, multinationals, development institutions, and governments in the infrastructure, energy, and natural resources sectors

Audit and assurance services

KPMG member firms have been providing:

- External audit services to many development programs funded by major donors operating throughout the world, and possesses solid understanding of their individual reporting needs
- Internal audit systems aimed encouraging future financial transparency and business results
- A range of audit services to donors to ensure that commodities such as emergency food aid, medicines, and supplies have been appropriately distributed

Program and project management

KPMG firms are providing a range of services, including:

- Acting as fund managers and intermediaries for channeling funds between major donors and governments, NGOs, civil society, communities, and other beneficiary groups
- Researching and designing programs that meet the specific development objectives of the host region and of the development partner
- Project management of development initiatives, from infrastructure and social service projects to major public sector reform programs

Key contacts

Timothy A. A. Stiles
Global Head, International Development Assistance Services
Tel.+1 212 872 5955
taastiles@kpmg.com

Eddy A. Jerez
Global Executive, International Development Assistance Services
Tel.+1 703 286 2928
ejerez@kpmg.com

Organizations mentioned in this issue

African Water Facility (AWF)	**18**
Department for International Development (DFID)	**17**
Food and Agricultural Organization (FAO)	**7, 11, 14**
International Environmental Technology Centre (IETC)	**13**
International Finance Corporation (IFC)	**12**
International Monetary Fund (IMF)	**18**
International Red Cross and Red Crescent Societies	**18**
Organization for Economic Cooperation and Development (OECD)	**2, 16, 17**
Société Tchadienne d'Eau et d'Electricité (STEE)	**18**
UN Economic Commission for Europe (UNECE)	**13**
UNESCO-IHE	**8**
United Nations (UN)	**2, 3, 5, 6, 12, 13, 14**
United Nations Capital Development Fund (UNCDF)	**18**
United Nations Children's Fund (UNICEF)	**5, 6, 8**
United Nations Development Programme (UNDP)	**13, 18**
United Nations Environment Programme (UNEP)	**2, 13**
United States Agency for International Development (USAID)	**6, 15**
World Bank	**14, 15, 17, 18**
World Health Organization (WHO)	**5**

Sources

1 *Sustainable Insights: Accounting for Water,* KPMG, October 2010

2 *Human appropriation of renewable fresh water, Postel et al.,* Science, 271(5250), February 1996

3 *Water use,* UN Water, Accessed on January 18, 2012

4 *Water: The Environmental Outlook to 2050,* OECD, October 2011

5 *Water use,* UN Water, Accessed on January 18, 2012

6 *Mexico's capital is a sinking metropolis,* AZCentral, April 9, 2010

7 *Mexico City's sinking is worsening,* Homeland Security News Wire, January 21, 2011

8 *Expect the Unexpected, Building business value in a changing world,* KPMG, February 2012

9 *Ensure Environmental Sustainability,* MDG Factsheet, September 2010

10 *Progress on drinking water and sanitation: 2012 Update,* UNICEF, March 2012

11 *Progress on drinking water and sanitation: 2012 Update,* UNICEF, March 2012

12 *Safer water, better health: Costs, benefits and sustainability of interventions to protect and promote health,* World Health Organization, 2008

13 *Deteriorating water quality threatens global gains made towards access to safe drinking water,* UNICEF, March 22, 2010

14 *South Africa: Climate Change 'Will Hit Women Harder',* UNDP, May 18, 2010

15 *Coping with water scarcity-World Water Day 2007,* FAO, March 22, 2007

16 *FACTS ABOUT WOMEN AND WATER,* UNESCO Water, 2004

17 *Water, Microfinance and Innovation,* Stanford Social Innovation Review, November 12, 2010

18 *Water scarcity, children put aside education in search of water,* Yandouba Global Initiative website, Accessed on March 28, 2012

19 *War's overlooked victims,* The Economist, 13 January 2011

20 *Water Lecture: "Sustaining Growth via Water Productivity": 2030/2050 Scenarios,"* UN University, April 2011

21 *Progress on drinking water and sanitation: 2012 Update,* UNICEF, March 2012

22 *Progress on drinking water and sanitation: 2012 Update,* UNICEF, March 2012

23 *Progress on drinking water and sanitation: 2012 Update,* UNICEF, March 2012

24 *Millennium Development Goal drinking water target met,* WHO, March 6, 2012

25 *Progress on drinking water and sanitation: 2012 Update,* UNICEF, March 2012

26 *Progress on drinking water and sanitation: 2012 Update,* UNICEF, March 2012

27 *UN reports improved access to safe drinking water, but poorest still lagging,* UN press, December 20, 2011

28 *Summary of the World Water Crisis and USG Investments in the Water Sector,* USAID, August 25, 2010; *Areas of physical and economic water scarcity,* FAO, 2007

29 *World must tackle water-shortage threat: adviser,* Reuters, October 12, 2010

30 *Water Scarcity and Humanitarian Action,* UN, September 2010

31 *A report of Working Group I of the: Intergovernmental Panel on Climate Change,* IPCC, June 13, 2007

32 *A report of Working Group I of the: Intergovernmental Panel on Climate Change,* IPCC, June 13, 2007

Sources

33 *Climate change-related water scarcity to affect global food production – UN,* UN, June 9, 2011

34 *Climate change-related water scarcity to affect global food production – UN,* UN, June 9, 2011

35 *Climate change, water and food security,* FAO Water Report, September 2008

36 *Himalayan melting risk surveyed,* BBC, March 5, 2006

37 *Water Resources and Population Pressures in the Ganges River Basin,* AAAS, accessed on March 29, 2012

38 *Many glaciers will disappear by middle of century and add to rising sea levels, expert warns,* The Guardian, January 19, 2009

39 *Population and Water,* Population Institute, July 2010

40 *When Demand Surpasses Supply: Water Scarcity in Afghanistan,* Reliefweb, September 2011

41 *Energy Security and Humanitarian Action: Key Emerging Trends and Challenges,* OCHA, September 2010

42 *Water for food Water for life,* FAO, 2007

43 UNWater Statistics, Accessed on January 20, 2012

44 *Water use rising faster than world population,* Reuters, October 25, 2011

45 *Growing population will tap water resources,* CBCNews, October 30, 2011

46 *Big Cities Big Water Big Challenge,* WWF, August 2011

47 *Deteriorating water quality threatens global gains made towards access to safe drinking water,* UNICEF, March 22, 2010

48 *UNWater Statistics,* Accessed on January 20, 2012

49 *Sustaining water for all in a changing climate,* World Bank, 2010

50 *Deteriorating water quality threatens global gains made towards access to safe drinking water,* UNICEF, March 22, 2010

51 *Sustainable Groundwater Management, Lessons from Practice,* The World Bank, October 2010

52 *Study: Millions in Bangladesh exposed to arsenic in drinking water,* CNN, June 2010

53 *Deteriorating water quality threatens global gains made towards access to safe drinking water,* UNICEF, March 22, 2010

54 *The green, blue and grey water footprint of crops and derived crop products,* UNESCO-IHE, December 2010

55 *Yet Another 'Footprint' to Worry About: Water,* WSJ, February 17, 2009

56 *Protecting water quality from agriculture runoff,* EPA US, 2005

57 *Water pollution,* Sustainable Table, Accessed on May 2, 2012

58 *Climate change, water and food security,* FAO Water Report, September 2008

59 *Scarcity of Water and Land Resources (IFA-WALS),* FAO, Accessed on March 2, 2012

60 *Vital Water Graphics, An Overview of the State of the World's Fresh and Marine Waters, 2nd Edition,* UNEP, 2008

61 *Climate change, water and food security,* FAO Water Report, September 2008

62 *Climate change, water and food security,* FAO Water Report, September 2008

63 *Maplecroft index identifies Bahrain, Qatar, Kuwait and Saudi Arabia as world's most water stressed countries,* Maplecroft, May 25, 2011

Sources

64 *Large-scale land acquisitions and leases: A set of core principles and measures to address the human rights challenge,* OECD, June 2009.

65 *Ugandan farmer: 'My land gave me everything. Now I'm one of the poorest',* The Guardian, September 22, 2011

66 *Philippines: Farmers evicted from their land without due process,* Asian Human Rights Commission, July 16, 2010

67 *West Africa's Many Water Wars,* West Africa Insight, March 2011

68 *Unquenchable thirst,* Economist, November 19, 2011

69 *Draft National Water Policy (2012),* Govt. Of India, Ministry of Water Resources

70 *Water shortages threaten renewed conflict between Pakistan, India,* AlertNet, August 2, 2011

71 *GRACE reveals groundwater depletion in India,* Environmental Research Web, August 13, 2009

72 *Coping with water scarcity,* FAO Newsroom, March 22, 2007

73 *How do you feed eight billion people in a water-scarce world?,* Ecologist, February 15, 2011

74 *Private sector participation,* WaterAid, Accessed on March 2, 2012

75 *Private sector role in 'Safe Water for All',* UNISDR, March 13, 2012

76 *Private sector role in 'Safe Water for All',* UNISDR, March 13, 2012

77 *Private sector role in 'Safe Water for All',* UNISDR, March 13, 2012

78 *Private Sector Participation In The Water And Wastewater Services Industry,* U.S. International Trade Commission, April 2004

79 *Partnering For Development: Government-Private Sector Cooperation In Service Provision, Dennis A. Rondinelli,* UN.org

80 *Private sector role in 'Safe Water for All',* UNISDR, March 13, 2012

81 *Private sector role in 'Safe Water for All',* UNISDR, March 13, 2012

82 *Microfinance for Water, Sanitation and Hygiene,* NWP, October 2007

83 *Private sector role in 'Safe Water for All',* UNISDR, March 13, 2012

84 *Water footprint project,* UNEP, May 2010

85 *Water Footprint, Neutrality & Efficiency (WaFNE) Umbrella Project,* UNEP, Accessed on March 29, 2012

86 *Water Governance in OECD Countries: A multilevel approach,* OECD, October 2011

87 *Water governance: trends and needs for new capacity development,* Water Governance.org, 2007

88 *Water and Ocean Governance,* UNDP, Accessed on January 10, 2012

89 *Water access must reach rural and marginalized areas in Europe – UN report,* UN, March 13, 2012

90 *Delhi to have a regulatory body for water management,* Indian Express, October 14, 2011

91 *Water scarcity guide,* UN Oneworld, November 2011

92 *Water scarcity guide,* UN Oneworld, November 2011

93 *Water and Ocean Governance,* UNDP, Accessed on January 10, 2012

Sources

94 *Introduction: why local organizations are central to meeting the MDGs,* IIED, 2005

95 *Understanding and Supporting the Role of Local Organisations in Sustainable Development,* IIED, August 2008

96 *Water security in South Africa,* DBSA, 2009

97 *Water and Ocean Governance,* UNDP, Accessed on January 10, 2012

98 *Rural water supply,* World Bank, September 2011

99 *Sustaining water for all in a changing climate,* World Bank, 2010

100 *Innovations in water management needed to sustain cities,* FAO, March 22, 2011

101 *Carbon sequestration as an integral part of watershed management strategies to address climate change issues,* FAO, July 11, 2011

102 *ALT Announces the 2012 Conservation Speaker,* ALT, 2012

103 *Innovations in water management needed to sustain cities,* FAO, March 22, 2011

104 *World must better protect forests in face of looming water scarcity, UN forum warns,* UN, March 18, 2011

105 *Managing forests for climate change,* FAO, 2010

106 *Sustaining water for all in a changing climate,* World Bank, 2010

107 *Water Resources Management,* World bank, Accessed on February 3, 2012

108 *Safeguarding the World's Water,* USAID, July 2011

109 *Meeting the Water Reform Challenge: Executive Summary,* OECD, March 5, 2012

110 *Aid to water and sanitation in developing countries,* OECD, 2010

111 *Focus on Aid to Water and Sanitation,* OECD, Accessed January 20, 2012

112 *Focus on Aid to Water and Sanitation,* OECD, Accessed January 20, 2012

113 *Meeting the challenge of financing water and sanitation,* OECD, October 2011

114 *Water and Economic Development: Correlation Between Investment in The Water Sector and Economic Growth of Developing Countries, Ministry of Public Health,* Republic of Indonesia, 2010

115 *Meeting the challenge of financing water and sanitation,* OECD, October 2011

116 *PPIAF Assistance in the Republic of Chad,* PPIAF, December 2011

117 *Turning off the taps, Action Aid, 2004 Water Initiative",* World Water Week, 2011

118 *On World Water Week, Spotlight on Sustainable Water Resources and Survival,* Devex, August 24, 2011

119 *African Water Facility,* AfDB, accessed on February 6, 2012

Notes

Contacts

Timothy A.A. Stiles
Global Head, International Development Assistance Services
Tel: +1 212 872 5955
Email: taastiles@kpmg.com

Eddy A. Jerez
Global Executive, International Development Assistance Services
Tel: +1 703 286 2928
Email: ejerez@kpmg.com

Trevor Davies
Western Europe and United Nations Desk
Tel: +44 020 76945296
Email: trevor.davies@kpmg.co.uk

Alfredo Artiles
Central America
Tel: +505 2274 4265
Email: aartiles@kpmg.com

Mark Jerome
East Asia and Pacific Islands
Tel: +856 (21) 454 240
Email: mjerome@kpmg.com

Iva Todorova
Eastern Europe
Tel: +359 5 2699 650
Email: itodorova@kpmg.com

Mercedes Sanchez-Varela
European Union Desk
Tel: +32 270 84349
Email: msanchezvarela@kpmg.com

Thierry Colatrella
Francophone Africa
Tel: +33 1 55686099
Email: tcolatrella@kpmg.fr

Mark Fitzgerald
North America
Tel: +1 703 286 6577
Email: markfitzgerald@kpmg.com

Torben Kristensen
Northern Europe
Tel: +45 381 83537
Email: tkristensen@kpmg.dk

Sudhir Singh Dungarpur
South Asia
Tel: +91 (124) 307 4171
Email: sdungarpur@kpmg.com

Charles Appleton
Sub-Saharan Africa
Tel: +254 (20) 2806000
Email: charlesappleton@kpmg.co.ke

Designed and produced by Evalueserve

Contact: Vipin Kumar
Head of Global Markets Research
KPMG in India
Tel.+91 124 612 9321

Publication name: Issues Monitor
Publication number: 120459
Publication date: May 2012