Achieving Water Security in Japan and Worldwide

The world is now facing water challenges on a global scale. Climate change will continue to impact on our water resources, at a time when the world is still struggling to achieve water-related MDGs. Integrated Water Resources Management must be explored as an instrument of constructive change in the water scenario.

Japanese culture and society were shaped in a diverse natural environment with a climate ranging from subtropical to subarctic. Subject to recurring droughts and floods, we have learned to efficiently use and share our precious water; we have developed various water technologies with a strong sense of thrift. We believe that our experience in water management is relevant to the many countries currently facing major water challenges, and we hope that by sharing our experience we can contribute to world stability and prosperity.

1. Water-oriented Climate Change Adaptation

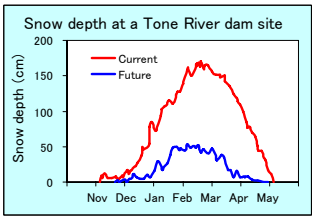
Human-induced climate change presents a new challenge to the global community. Much of climate change's impact will be manifested in the form of increased magnitude and frequency of extreme water events. Better water management is the key to mitigating the adverse impacts of climate change: increased water scarcity and water-related disasters.

1.1 Two Major Policy Reports Advance Japan's Climate Change Strategy

Water plays a central role in adaptation to climate change. Recognizing that integrated water resources management (IWRM) is a powerful instrument for the exploration of climate change adaptation measures, Japan recently compiled an interim policy report on the country's strategy for integrating the climate change parameter into IWRM. (http://www.mlit.go.jp/tochimizushigen/mizsei/07study/documents/torimatome/Interim%20Report%20_Full%20Text_.pdf)

Being one of the most disaster-vulnerable among the developed nations, Japan has also developed a policy report on climate change adaptation strategies for coping with water-related disasters. (http://www.mlit.go.jp/river/basic_info/english/climate.html)

The reports reveal that within 100 years the snow cover in the upstream catchments of major rivers will decrease dramatically, lowering the late-spring water storage levels of reservoirs, impacting on agricultural water. Floods are another factor: increased rainfall is expected, reducing the flood safety levels of rivers across the country. In the region surrounding Tokyo, the yearly average maximum daily rainfall is predicted to increase by 11% under the A1B scenario (2080-2099 compared with 1979-1998). This would mean, for example, that a flood with a current recurrence period of 100 years would occur every 50 years under the future scenario.



In response to the above reports, Japan is tackling these water related climate change impacts through the promotion of a flexible approach with an emphasis on preventive measures.

1.2 Adaptation Strategies for Drought and Flood

(1) Effective Utilization of Infrastructure

Taking full advantage of existing infrastructure is an effective way of quickly adapting to change and achieving the desired outcome with limited financial resources.

During the drought of 2005, four dams in the Kiso River Basin were operated in a synchronized and flexible manner to accommodate the water needs of the communities. If it were not for this efficient operation, the dams would have dried up for a 10 day period, affecting the basin's commerce and its more than 5 million residents.

(2) Synergy with Urban Area Development Schemes

Implementing adaptation measures in step with urban area development schemes has a synergistic effect.

International Stadium Yokohama, the venue of the 2002 FIFA World Cup final, appears to be floating during floods. It sits on the multipurpose retarding basin which temporarily stores Tsurumi River flood discharge, thus preventing flooding in the surrounding area.

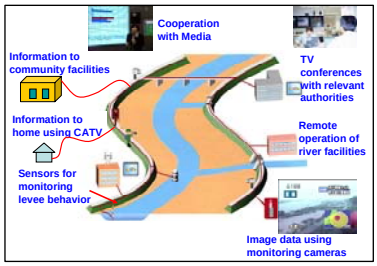
Yokohama, Japan's second largest city, lies in the Tsurumi River Basin, recently the scene of rapid urbanization. Fast-changing land use led to increased runoff. With increasing population and property development, the area became highly vulnerable to flood disaster. This problem was addressed by improving the basin's rainwater infiltration and storage in harmony with urban area development. Aside from the multipurpose retarding basin, rainwater storage and infiltration facilities of many sizes were built into private homes and businesses. Furthermore, disaster risk zones were designated to reduce flood-susceptible land use, and the flood resistance of new and existing housing was improved.

The experience in the Tsurumi River Basin will be relevant to many of the world's existing and emerging cities with densely populated communities along rivers.

Tsurumi River Multipurpose Retarding Basin
(http://www.ktr.mlit.go.jp/keihin/english/index.htm)

(3) Emphasis on Crisis Management

Japan's ability to monitor against extreme water events has been enhanced by the country's integrated monitoring system. Japanese rivers are equipped with a network of 27,000 km (as of 2003) of ultra-high speed optical fiber laid along the rivers. The system constantly monitors water related information, and transmits real-time data to government and regional authorities and the media, enabling quick and effective emergency response.



Integrated water monitoring system

Emergency water supply is a critical aspect of disaster response. Japan is continuing to develop and promote various post-disaster water supply technologies including emergency water storage tanks, mobile desalination units, and water bags.

A water bag is a giant lightweight membrane container with a volume of more than 1,000 m^3. It floats near the surface of the sea when filled with freshwater and can be towed long distances by a small tugboat. This system is much cheaper and requires much less energy than conventional water transportation methods using tankers or pipelines, and is a promising technology for emergency water supply.

(4) Water-Saving Society Through Demand Management

Improving water use efficiency and managing water demand offer no-regrets options for coping with climate change impact.

Fukuoka City learned much from the severe drought of 1978 which deprived 3,280,000 people and many businesses of a stable water supply for 287 days. In 1979, in response to that experience, Fukuoka City developed water conservation guidelines and urged the collaborative effort of citizens, businesses and the city to achieve an efficient water supply through leakage minimization, wastewater recycling for non-potable use, promotion of water-saving technologies, and public awareness-raising.

In 2003 the city established its own water conservation ordinance, which requires the owners of all buildings of area greater than 5,000 m^2 (or 3,000 m^2 within the urban center) to install recycled water supply systems and to submit water conservation plans. These efforts have transformed Fukuoka into a water-saving city. In 1977 Fukuoka's daily per capita water usage was 360 liters. Now it is 290 liters, roughly 60% of the national average and about the same as in the severe drought year of 1978. At that time, that volume was not enough to support people's everyday needs, and many businesses were forced to close. Now, that volume sustains the lives, businesses and development of the city.

1.3 Modeling Tools for Adaptation to Climate Change

Highly accurate prediction of extreme events is essential for assessing the impact of climate change. The Japan Meteorological Agency has developed a global circulation model with 20 km resolution, the world's highest, and its data is distributed for use by researchers engaged in regional climate change assessment and for multi-model comparison. (http://kyousei.aesto.or.jp/~k041open/data)

Climate change impact assessments in areas such as water resources, human health, agriculture, forest ecosystems, coastal zones and disaster prevention are under way. Japan is currently developing CommonMP, a modeling platform to facilitate the utilization and sharing of water related simulation models, ranging from hydrologic and hydraulic models to material circulation models. Open to all, it will enable simulation analyses using multiple analytical engines simultaneously, and will enhance integrated assessment of water-related climate change impact.
(http://framework.nilim.go.jp/eng/index.html)

1.4 Wise Water Management Leads to Climate Change Mitigation

Wise water management through energy conservation measures and water efficiency improvement leads to climate change mitigation. In Tokyo, wastewater treatment accounted for 43% of all greenhouse effect gas (GHG) emitted by the Tokyo Metropolitan Government. Recycling and utilization of wastewater sludge as fuel have cut the sector's GHG emission by 80%. The sewerage sector emits 0.5% of total GHG emission in Japan. An 80% reduction in the sector would result in a 0.4% reduction of total GHG emission in Japan, or about 7% of Japan's Kyoto obligation (6%). Thus the water sector can play a substantial role in climate change mitigation.

The Japanese water supply sector has been adopting energy conservation measures: employment of energy efficient water processing technologies, operation optimization by pump inverter control, small-scale hydro-power generation and new energy utilization (solar, wind, etc). The sewerage sector has been producing biogas from wastewater sludge. This biogas has been supplied to gas utilities and utilized as fuel for natural gas vehicles.

Japan's leading-edge energy efficient technologies and high operation standards can contribute to climate change mitigation in water sectors around the world.

1.5 Strengthening Adaptation Capacity of Partner Countries

Developing countries, in particular least developed countries and small island developing states, are the most vulnerable to the adverse impacts of climate change. Japan is committed to strengthening the adaptation capacities of the developing countries. This was reaffirmed at the G8 at the Hokkaido Toyako Summit in July 2008.

Japan announced the "Kyoto Initiative" at COP3 in 1997, promising to provide capacity development for 3,000 persons in climate change related fields in the subsequent five years. In fact, Japan exceeded its promise, providing capacity building for approximately 15,000 people in climate change related fields in the seven years from FY 1998 to 2005. (http://www.mofa.go.jp/mofaj/gaiko/oda/shiryo/pamphlet/pdfs/jk_cop12_e.pdf) Japanese assistance with capacity building against water-related disasters is enhanced by the International Center for Water Hazard and Risk Management (ICAHRM). ICHARM shares Japan's experience and expertise through research, training and information exchange with trainee water and disaster professionals and researchers in developing countries.
(http://www.icharm.pwri.go.jp/index.html)

Hazard map training Course

Effective climate change adaptation requires close collaboration between water and climate experts. Japan supported "Dialogue on Water and Climate," the first international initiative to promote two-way exchange of information between the climate community and the water management community. Dialogue output was reported at the 3rd World Water Forum held in Japan in 2003.

The "High-Level Expert Panel on Water and Disaster/ UNSGAB" addresses climate change, focusing on water-related disasters. The Panel mobilizes political will for climate change adaptation in order to mitigate water-related disasters around the world. Japan has been assisting the panel, whose output will be announced at the 5th World Water Forum, to be held in Turkey in March 2009.

2. IWRM Governance in Japan


Night soil collection
Recycling-oriented society in Edo

More than 300 years ago, Edo (now Tokyo), a city of more than one million people at that time, was an efficient and recycling-oriented water management society. Water was re-used in a phased manner from drinking/cooking to washing to watering. Forests were conserved to control recurring floods, and an energy efficient water transportation system supported the distribution of goods. All human waste was purchased and resold to farmers for use as fertilizer, resulting in improved food production efficiency.

With its diverse natural environment, Japan has developed region-specific integrated water resources management (IWRM) tailored to regional climatic and social conditions. Japan's IWRM promotes sustainable water use and sound water cycle governance through appropriate policy and frameworks involving the relevant sectors and stakeholders, and integrated water resources management from such standpoints as "groundwater and surface water," "water quantity and quality," and "upstream and downstream," while also promoting water efficiency and environmental conservation.

2.1 IWRM Governance

(1) IWRM Policy and Plans at National and River Basin Levels

The Japanese national integrated water resources management plan (Water Plan 21) is formulated with three basic objectives: 1) establishment of a sustainable water use system; 2) conservation and improvement of the water environment; and 3) fostering of water-related culture. Water Plan 21 identifies long-term water supply and demand prospects and means of improving water use stability through water efficiency measures and effective use of existing infrastructure.

Integrated water resources management plans have been developed by the national government for Japan's seven designated major river basins, which serve about 50% of the country's population and industrial activity. The plans were prepared in consultation with the ministers of the relevant ministries and heads of other relevant administrative agencies, and were approved by the cabinet. Opinions of a panel of experts and prefectural governors are reflected in the plans, which outline strategies for comprehensive development of water resources and efficient water utilization. Construction and operation are carried out by the Japan Water Agency. Plans for other basins are developed by regional authorities. The national and regional IWRM plans are evolving documents, and are updated regularly. (http://www.mlit.go.jp/tochimizushigen/mizsei/water_resources)

(2) Integration and Coordination of Water Related Sectors

Cross-sector coordination of water related sectors in Japan has been implemented by the Department of Water Resources, Ministry of Land, Infrastructure, Transport and Tourism (MLIT). The department acts as the coordinating body among the relevant ministries and departments to ensure coherence in water related policies and in the implementation of projects and regulations.

The "Coordination Committee for the Promotion of a Sound Water Cycle," established in 1998 and involving five water related ministries (Health, Labor and Welfare; Agriculture, Forestry and Fisheries; Economy, Trade and Industry; Land, Infrastructure, Transport and Tourism; and Environment), has been examining comprehensive water measures and formulating revitalization plans for rivers and guidelines for sound water cycle promotion.

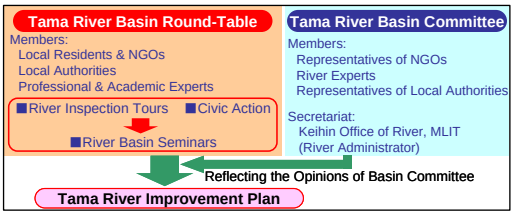
(3) Stakeholder Participation in Water Resources Management

The River Law, amended in 1997, requires the formulation of a river improvement plan for flood control, water use and environmental conservation for every river in Japan. The law requires public participation in the planning. (http://www.mlit.go.jp/river/basic_info/english/pdf/riversinjapan.pdf)

Tama River basin seminar

The Tama River, which flows through Tokyo, is intensively used for water supply, agriculture, industry and power generation while still conserving the diverse natural environment. The Tama River Basin Round-table was established for the formulation of a Tama River plan with the active participation of local residents, municipalities, industry, academic experts, and administrators. Civic action, river

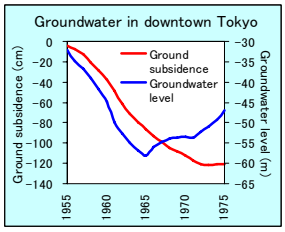
inspection tours and river basin seminars organized jointly by the residents and administrations involved a total of 26,600 people from the basin. Effective stakeholder participation right from the initial planning stage not only enriched the plan itself but also enabled the development of the plan in two years, much more quickly than anticipated.



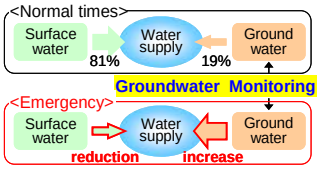
2.2 Promoting Integration and Efficiency

(1) Integrated Surface Water / Groundwater Management

In the 1960s, large Japanese cities experienced severe ground subsidence due to excessive groundwater abstraction during that period of rapid economic growth. In response, national laws and local government ordinances were enacted to regulate groundwater abstraction by industry and business. Comprehensive measures were implemented in areas with extensive extreme subsidence, by means of the "Land Subsidence Prevention Guidelines" drawn up by a conference of concerned ministers. The national government, along with the related prefectures, regulated groundwater abstraction while also developing surface water as an alternative source. Through these efforts, ground subsidence decreased after peaking in the early 1970s.



Recently, local authorities have been implementing further measures for effective groundwater utilization and the avoidance of the adverse effects of over-abstraction. Saitama Prefecture, responsible for supplying water to its industries and its 7 million people, has introduced an extensive real-time groundwater monitoring system to ensure appropriate and sustainable use of groundwater. Limits on groundwater and surface water abstraction are set for normal conditions, and are modified during droughts and other emergency situations in accordance with groundwater levels, thus securing emergency water sources while avoiding any negative impact from groundwater abstraction. Saitama Prefecture is also implementing water conservation measures targeting industries that use more than 50 m³/day of groundwater.



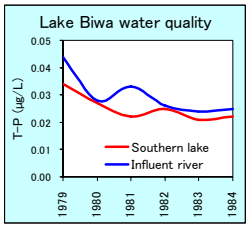
Saitama Groundwater Management Scheme

In addition, groundwater quality is closely monitored and is maintained by means of laws and ordinances regulating discharge infiltration and enabling governments to order remediation measures.

(2) Integrated Management of Water and Lake Quality

Lake Biwa, Japan's largest lake, is also its largest water source, serving 14 million people. The comprehensive program for the development of Lake Biwa was initiated in 1972 as a national project to promote effective water use and flood and drought prevention, and to address environmental challenges including the deterioration of water quality.

In 1977, residents initiated voluntary campaigns to prevent eutrophication in the lake by promoting the use of powdered soap instead of synthetic household detergents containing phosphorus. As a result, powdered soap use increased from 26% to over 70% by 1980. This grass-roots campaign convinced the local authorities to enact the first ordinance in the country controlling nitrogen and phosphorus loads. The ordinance included the banning of detergents containing phosphorus and the regulation of industrial effluent, as well as guidelines for the reduction of nitrogen and phosphorus in domestic and agricultural wastewater. These collaborative efforts by government, local authorities and citizens improved Lake Biwa water quality. Since 1993, integrated lake basin management collaboration by various stakeholders has been promoted, with financing from the basin's six prefectures and three metropolises, as well as private enterprises. The Lake Biwa experience led to the enactment of the Clean Lake Law in 1984, and has influenced lake water management throughout Japan. (http://www.mlit.go.jp/crd/daisei/biwako_hozen/pamphlet/pamphlet_en.pdf)



To share the integrated lake basin management knowledge and technology acquired from the Lake Biwa experience, Japan has been providing training programs in developing countries since 2006. (http://www.mofa.go.jp/mofaj/gaiko/oda/shiryo/pamphlet/wasabi/e-13.html)

(3) Upstream-Downstream Coordination

Since downstream regions receive direct benefits from water resource development in upstream regions, beneficiary areas should contribute to water source conservation and to compensation for resettlements of affected communities. However, this is easier said than done. Several river basins in Japan have established a "Reservoir Area Development Fund," with contributions by the authorities within the beneficiary areas of the river basin, for the promotion of conservation and revitalization of the water source areas and of face-to-face interaction between downstream and upstream communities. The funds are also used to organize seminars for children's involvement and to promote public awareness of the importance of water source conservation. (http://www.mlit.go.jp/tochimizushigen/mizsei/water_resources)

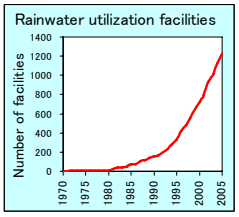
(4) Utilization of Rainwater and Recycled Wastewater

Since the early 1980s, the Kokugikan, an indoor sports arena in Tokyo's Sumida Ward and the home of Japanese sumo wrestling, has been utilizing rainwater for non-potable water use for water conservation and flood mitigation. In Sumida Ward all new public buildings must be built to include rainwater utilization facilities.

Wastewater recycling is promoted in Tokyo; recycled wastewater is put to various non-potable uses as well as the restoration of river flow for environmental conservation. This is made possible by advanced Japanese membrane technology, which purifies wastewater to produce high-quality water suitable for bathing. (http://www.gesui.metro.tokyo.jp/english/sewerage2007.htm)

Recycled wastewater utilization in Tokyo

The promotion of rainwater and recycled wastewater utilization is gaining momentum, reflecting increased public awareness of water conservation in Japan. Rainwater and recycled wastewater utilization now totals 280 million m³/year. The potential of such approaches is being further explored and is spreading throughout the country.



2.3 International Contribution to IWRM

Japan will continue to contribute to the world's IWRM efforts by promoting knowledge sharing at the international and regional levels, raising political will, building a platform for IWRM, and assisting with IWRM practices at the local level.

Japan supports UNESCO in its development of the "IWRM Guideline at the River Basin Level; Promoting IRBM (Integrated River Basin Management)," an evolving document intended for promotion of IWRM implementation in actual water practices at the national/basin level. The document will be announced at the 5th World Water Forum in March 2009.

Japan will also assist with the implementation of IWRM, e.g. usage of the guidelines by water practitioners, through the Network of Asian River Basin Organizations (NARBO). NARBO has been providing training and exchange of information and experience among river basin organizations in the interest of achieving IWRM in river basins throughout Asia. The NARBO secretariat is sponsored by the Japan Water Agency (JWA) and the Asian Development Bank. (http://www.narbo.jp)

3. Helping to Achieve Water and Sanitation MDGs

Clean water and sanitation are among the most powerful drivers of human development. They extend opportunity, enhance dignity and help create a virtuous cycle of health improvement and wealth creation. Meeting the water and sanitation related MDGs of halving the proportion of people without access to safe water and adequate sanitation by 2015 would avert some 470,000 deaths and would result in an additional 320 million productive working days every year (WHO).

Japan, with its traditional water wisdom, world-leading technology developed by private companies, and high performance water related utilities, will continue to strengthen its efforts to address present and future world water crises. In this way Japan will contribute to world security in food, energy and safety, while ensuring that developing countries may achieve human security through self-sustaining economy and environment.

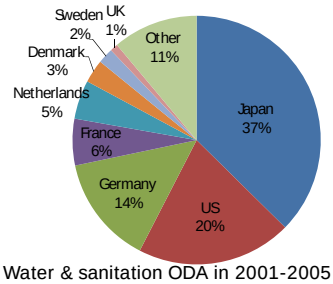
3.1 Raising the Profile of Water and Sanitation

Japan has been taking initiatives to raise the profile of water and sanitation in the international community as it builds the foundation for social and economic development. The 3rd World Water Forum in 2003 (http://219.94.170.3/index.html), the world's largest water forum, was a truly open gathering, with extensive multi-stakeholder dialogues with participation of 24,000 participants and some 130 ministerial level officials. The Asia-Pacific Water Summit in 2007 (http://www.apwf.org) was the first regional meeting where the heads of states gathered to discuss water issues specifically. It set an example for other regional water summits, e.g., the 11th African Union Summit, where on June 30, 2008 the African leaders' discussions focused on water and sanitation.

Japan has given continuing support to the activities of the UN Secretary General's Advisory Board on Water and Sanitation since its establishment in 2004, when former Japanese Prime Minister Hashimoto was first appointed by the UN Secretary General to chair the board. HRH Willem-Alexander of the Netherlands has chaired the board since December 2006, and HIH the Crown Prince of Japan has been honorary president of the board since November 2007. (http://www.unsgab.org) Following up on the "Hashimoto Action Plan" formulated by the board in 2006, Japan took the initiative to submit the "2008 International Year of Sanitation" resolution at the UN General Assembly in November 2007; it was unanimously approved. (http://esa.un.org/iys)

3.2 Water and Sanitation Development Assistance

Japan, continuously the leading water and sanitation donor among the DAC countries, donated US$4.9 billion of ODA in the five years from 2001 to 2005, accounting for 37% of total bilateral donor support.



Water & sanitation ODA in 2001-2005

In 2006 Japan announced the "Water and Sanitation Broad Partnership Initiative (WASABI)," which is aimed at bolstering Japanese cooperation with international organizations, other donor countries, domestic and overseas NGOs and other concerned parties, and hence further improving the quality of water and sanitation related aid. (http://www.mofa.go.jp/policy/oda/sector/water/action.html)

As for aid to Africa, Prime Minister Fukuda announced in May 2008 that Japan will organize a new technical assistance corps of water specialists to be known as "W-SAT," or the "Water Security Action Team." W-SAT will be dispatched to work on the ground in African nations, especially the poorest regions, to enhance access to water. Japan has committed to doubling its ODA to Africa in the next five years.

3.3 Strengthening Local Water and Sanitation Management and Technical Capacity

Japanese water utilities provide the world's highest standards of water services in terms of population coverage, leakage level (in Tokyo, just 3.3%) and water quality.

Japan has been providing support to local water and wastewater agencies through Water Operators Partnerships (WOPs) so as to strengthen the capacity of local operators and to create financially and technically sustainable water and sanitation utilities. 650 engineers from 60 water operators in Japan have worked with water operators in developing countries from 1990 to 2006, and have transferred technology and know-how for facility improvement, including leakage prevention, operation and maintenance, financial management, human resources development and governance.

Phnom Penh's water supply system, severely damaged during the civil war, was rehabilitated through a Japanese WOP involving water utilities engineers from cities including Kitakyushu. The effective rehabilitation of the infrastructure, and capacity building in conjunction with Phnom Penh's own improvement efforts (including work to eliminate corruption) brought significant improvements. The Phnom Penh Water Supply Authority is now providing assistance to 8 other local operators in Cambodia.

Performance of Phnom Penh Water Supply

	1993	2006
Service coverage	25%	90%
Service hours (per day)	10hrs	24hrs
Non-Revenue Water rate	72%	8%
Collection rate	48%	99.9%

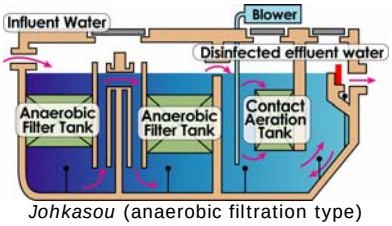
WOP in Phnom Penh

Japan is also providing support for efforts to strengthen the capacity of global WOP mechanisms to facilitate further interaction among regional and sub-regional Water Operators Partnerships.

3.4 Sanitation Infrastructure for Local Situations

Tapping into its tradition of treating human waste as economic goods, Japan employs an effective treatment system for the recycling of human waste as an environmentally sustainable solution for regions that cannot institute large-scale sewerage collection and treatment systems.

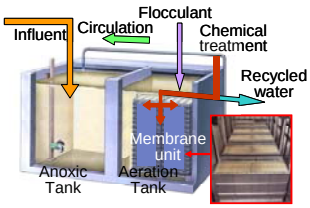
"*Johkasou,*" a small-scale decentralized wastewater treatment system similar to the septic tank but with much higher treatment efficiency, is widely used in Japan. Conventional septic tanks typically offer only primary treatment and partial biological treatment, while *johkasou* offers up to tertiary treatment, ensuring an effluent BOD of below 20mg/L, or as low as 1/20 of that of conventional systems. Relatively cheap, decentralized, and quickly installed, it is a promising technology for developing countries where sewerage system installation is prohibitively expensive. (http://www.env.go.jp/recycle/jokaso/data/challenge.pdf)



Johkasou (anaerobic filtration type)

3.5 Advanced Technologies Extend Sustainability

Japan offers its world-leading technology and contributes to further advancement and sustainability in the water and sanitation sector. For example, Japan has the world's largest share of activity in membrane technology, producing 60% of the world's membranes for water treatment. Japanese membrane technology is used around the world in desalination and advanced treatment including wastewater recycling.



Wastewater recycling using membrane technology

Sewage sludge utilization is another area of Japanese leadership. Energy generation from sewage sludge reduces CO_2 emissions and contributes to climate change mitigation. Kobe City utilizes biogas generated from sewage sludge to fuel its transit buses.

Japan is wholeheartedly committed to sharing its wide variety of advanced technologies, and to work together with other countries to achieve further advancement and sustainability in the water and sanitation sector.

Kobe City bus fueled by biogas generated from sewage sludge

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