Policy Brief Series

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A Practical Roadmap for Circular Wastewater Management

Smart, Sustainable, Shared Solutions for Asia-Pacific

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BACKGROUND

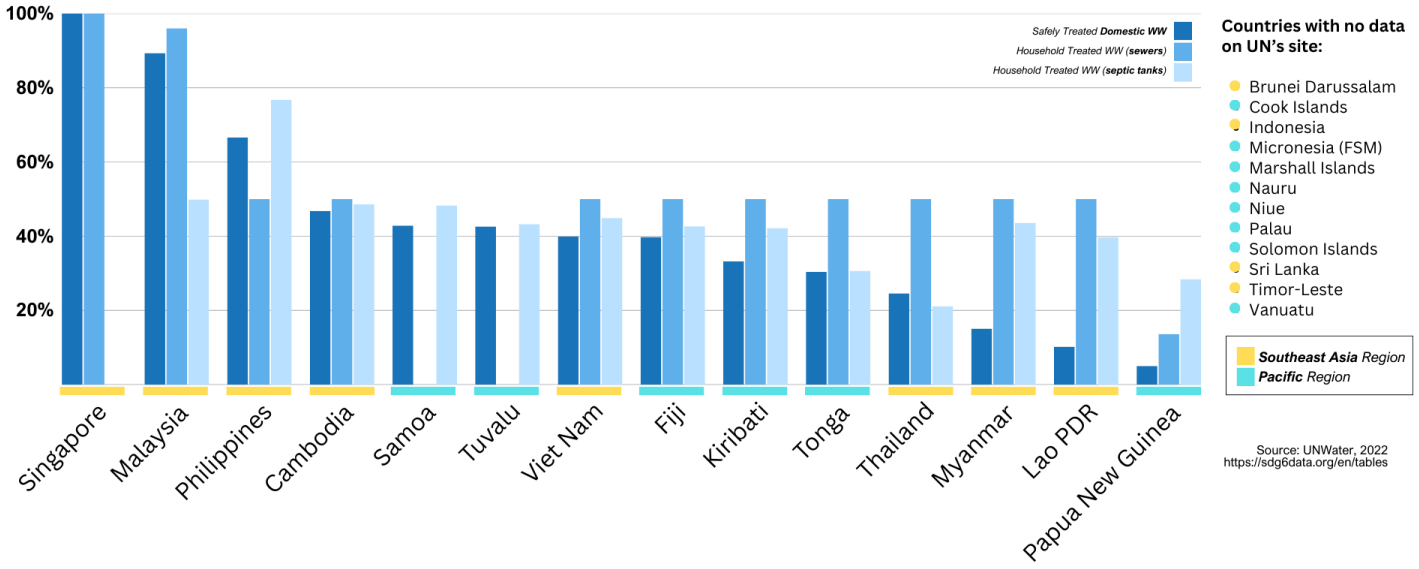
The Asia-Pacific (APAC) region, a hub of economic dynamism and industrial growth, faces mounting impacts from wastewater management. Rapid urbanization, industrial expansion, and insufficient wastewater treatment infrastructure have led to widespread water pollution, endangering ecosystems, public health, and economic development. In many developing countries, approximately 90-95% of domestic sewage and 75% of industrial waste are discharged without treatment into water bodies, exacerbating environmental degradation and increasing the risk of waterborne diseases (WHO, 2021).

Many small states in the Pacific lacks a reticulated sewerage system, relying primarily on septic tanks and pit latrines, and like in Tonga, this puts its shallow groundwater as its main supply at great risks. The Solomon Islands' Water Utility discharges untreated wastewater into the sea.

The inadequate treatment of wastewater across these regions not only contributes to public health crises through the spread of waterborne diseases but also leads to biodiversity loss and economic setbacks (ADB, 2023; UNEP, 2022).

Addressing these challenges requires coordinated regional action, enhanced investment in wastewater treatment infrastructure, and stronger policy enforcement to ensure sustainable development and the protection of vital water resources.

Ratio of Total and Household Wastewater (WW) Being Treated per Country in the Asia-Pacific Region



Key Policy:

Systemic wastewater management with policy and program integration for sustainable development	Effective polices, innovations, service delivery, financing models, with political commitment and leadership for APAC region's commitment to SDG 6.2, understanding water security and the economic value of water in relation to other pressing priorities.	Management of wastewater from industrial and urban development in a comprehensive manner, with climate change adaptation and information, and circular economy to be integrated into national and local water and wastewater strategies.	Technological transfer, investment, capacity development, interoperable data systems for risk management and strategic foresight

WASTEWATER ISSUES IN ASIA-PACIFIC

Environmental Security: APAC region, one of the world's most vulnerable areas, faces a dual crisis: rising sea levels driven by climate change and widespread water pollution caused by rapid urbanization and industrialization. In the Pacific Islands, coral reefs have been damaged by destructive fishing practices, terrestrial and marine pollution, siltation from land clearing, poor agricultural practices, urban development, and climate change. The Global Coral Reef Monitoring Network estimates that the world has effectively lost 19% of productive reef area, with another 15% under immediate threat of loss (The Guardian, 2025).

These intertwined challenges have far-reaching impacts, including environmental degradation, threats to livelihoods and ecosystems, and economic repercussions. A critical factor exacerbating these issues is the lack of comprehensive wastewater treatment policies or regulations in many countries within the region, particularly in the Pacific region. Unlike Japan, which has implemented structured rules and regulations for sanitation and wastewater management, many Asia-Pacific nations have yet to establish effective frameworks (ADB,2020). In Asia, 80% of untreated wastewater is discharged (ADB, 2011), while the Pacific, faces even greater challenges, with PNG safely treating only 5% of its wastewater, leading to severe public health risks, and contaminated water causing 368 deaths every six weeks (ABC, 2012; WHO, 2023).

Food Security and Health: Agricultural productivity and fishery are heavily dependent on water quality, yet the Asia-Pacific suffers from industrial, urban, and agricultural pollution (FAO, 2023); ADB, 2024). In China, untreated industrial effluents contribute to water pollution, costing public health around 41.73 billion yuan (US$3.9 billion) each year (Cambridge University Press, 2007). Untreated wastewater from fashion factories, including toxic dyes and chemicals, significantly impacts both human health and the environment. Factory workers in Bangladesh, for example, are directly exposed to hazardous chemicals, leading to health problems and unsafe working conditions. Local communities suffer from waterborne diseases like cholera and skin problems due to contaminated water sources. The discharge pollutes rivers and coastal ecosystems, reducing biodiversity and threatening livelihoods dependent on fishing and agriculture. Additionally, the contamination compromises access to clean water, violating basic human rights. These environmental and health issues also result in economic losses, with water pollution costing the country an estimated 2-3% of its GDP (World Bank, 2021; ILO, 2018; and Human Rights Watch, 2020).

Poverty and Economic Security: Pollution of the natural environment, including land and water systems due to untreated wastewater, can have both direct and indirect connections to poverty. Those with limited access to resources and social support are particularly vulnerable to losing basic food supplies or sources of income due to land and marine resource contamination (Koshy et al., 2006). The World Bank estimates that inadequate water supply and sanitation cost APAC 1.5% of its GDP annually (World Bank, 2013).

ASEAN treats twice as much wastewater as Pacific Islands, with 20% treated.

Pacific Islands discharges untreated wastewater contaminates freshwater and marine ecosystems.

Untreated water impacts health, ecosystems, and vulnerable populations in the Asia-Pacific.

Women spend 4-6 hours daily collecting water in rural areas, where 70% of water sources are contaminated.

Almost 1.9 billion people in APAC region could not afford a healthy diet in 2020 due to increased cost.

In Southeast Asia, diarrheal diseases account for approximately 8.5% of all deaths

For children under five in the Pacific Islands, water and sanitation-related diseases are among the leading causes of death

In PNG there is 368 deaths in every 6 weeks due to access to untreated wastewater

Pressure on renewable water resources will remain severe and may slightly increase in some countries.

Urbanization is leading to increasing claims on water resources away from agriculture and irrigation.

RESPONSES-POLICY ANALYSIS

The following critical issues were identified as having the highest impact in the challenges and efforts to tackling wastewater related water pollution in APAC region. All of these issues require resources for better and effective progress in these areas which APAC region have limited access to, exacerbated by cross cutting issues such as gender, climate change and disaster risk management which are barriers to development in the region and is included in the issues below:

Weak Water & Wastewater Sector Governance, delaying policies' approval and implementation of policies, strategies and regulations

Weak WASH and drinking water regulatory environment. The nature of the regulatory environment for these sectors is fragmented, leaving Wastewater and Sanitation in a grey zone with lack of attention to wastewater management leading to weak, unclear and sometimes overlapping institutional mandates. Wastewater management is not prioritized in many countries, leading to inadequate funding for infrastructure, operational systems, and monitoring mechanisms.

Weak governance and capacity for Enforcement of Wastewater Treatment and Environmental Compliance. Despite frameworks requiring Environmental Impact Assessments (EIAs) and adherence to wastewater discharge and treatment best practices, industrial and domestic non-compliance is widespread. Contributing factors include limited institutional capacity, limited funding for monitoring, corruption, and conflicts of interest within political and bureaucratic systems. Without strict enforcement, industries are less likely to invest in sustainable wastewater treatment solutions. Rural communities, where factories are more often built at, are particularly more vulnerable and impacted by industrial pollution.

Poor WASH Infrastructure and Asset Management, lacking operation and maintenance skills, parts, support, inefficient/inadequate wastewater treatment

The high capital and operational costs associated with wastewater treatment systems deter private investment, as the sector is perceived as unprofitable. Governments often prioritize immediate economic growth over long-term environmental and socioeconomic sustainability. Funding gap and lack of access to cost-effective technologies also discourages private investors, who seek profitable and stable markets.

Aging and inefficiencies in the maintenance and management of existing infrastructures. Wastewater infrastructure systems, services and rural facilities are in a state of disrepair and thus difficult to maintain at the sanitary and hygiene requirements to service daily operations of public and household facilities.

Wastewater sector related stakeholders lack the professional training and/or capabilities to implement, manage, or monitor the water programmes. At the community-level, personnel lack operation and maintenance skills, financial support, as well as tools and/or parts to rehabilitate systems and infrastructures.

Low Public Awareness, Poor Sanitation and Hygiene Behaviors

Poor Sanitation and Hygiene Behaviors and Low awareness needs major efforts in the APAC region, as many individuals are continuing to consume polluted water untreated sources without understanding the associated health risks. Where there are existing national Environmental, Water and Public Health Legislations and policies, they consist of provisions for public awareness campaigns, but their reach is limited. Effective behavior change can reduce pollution from domestic sources, improve public health, and create grassroots support for broader water management initiatives.

Cross Cutting: Gender Issues, Climate Change and Disaster Risks Management

While APAC region takes a participatory approach in efforts to address challenges in wastewater management, it still needs to make their actions strategies more inclusive, in particular the participation of women and address the needs of elderly and disabled persons. Water is at the center of economic and social development; it is vital to maintain health, grow food, generate energy, manage the environment, lands, and create jobs. Water availability and wastewater management impacts include; whether poor girls are educated, whether cities are healthy places to live, and whether growing industries or poor villages can withstand the impacts of floods or droughts or not.

The APAC region consists of the highest most at-risk countries from impacts of climate change- sea level rise and extreme weather events- flooding, inundation and tropical cyclones etc. Improper and inefficient wastewater and septage treatment systems - network and septic tanks are susceptible to flooding, inundation, seismic damage which can lead to leakage and cross-contamination.

RECOMENDATIONS

Key Strategic Priority Areas for Actions in Wastewater Management and Service Delivery:

Strengthen Water and Wastewater Sector Governance

Governments must establish a clear and centralized regulatory framework for wastewater management, ensuring better coordination between institutions. Strengthening enforcement mechanisms, increasing funding for compliance monitoring, and addressing corruption and conflicts of interest are essential to ensuring industries and communities adhere to wastewater treatment standards.

Invest in Sustainable WASH Infrastructure and Capacity Building

Increased funding and technical support are needed to rehabilitate aging water and sanitation infrastructure, improve wastewater treatment efficiency, and build local capacity for operation and maintenance. Governments should create incentives to attract private sector investment. There is a need to improve access to cost-effective and innovative technology options and financing mechanisms to attract private sector investment.

Promote Public Awareness and Behavior Change for Improved Sanitation and Hygiene

Government and stakeholders must implement large-scale education campaigns to improve hygiene behaviors, reduce reliance on untreated water sources, and mitigate waterborne diseases. Behavior change strategies should be community-driven and culturally sensitive to ensure lasting impact.

Integrate GEDSI, Climate Resilience, and Disaster Risk Management in WASH Policies

WASH programs must integrate gender equality/equity, disability, and social inclusion (GEDSI), ensuring that women, elderly individuals, and people with disabilities are actively involved in planning and decision-making. Climate change adaptation measures, such as strengthening infrastructure resilience to extreme weather and seismic events, should be embedded in all water and sanitation strategies to mitigate disaster risks.

ACTION PLAN FOR APAC WASTEWATER MANAGEMENT

Vision: To achieve sustainable, inclusive, and climate-resilient wastewater management systems that protect public health, ecosystems, and water resources in the Asia-Pacific regions by 2040.

Key Outcomes: Strong policy frameworks, pilot projects, and capacity-building initiatives in place; Significant infrastructure upgrades, expanded coverage, and adoption of advanced technologies; Fully integrated, sustainable, and climate-resilient wastewater management systems across the region.

	Short Term (3 -5 years)- Policy Planning, Financing, Capacity Building, and Awareness	Medium Term (5-10 years) – Infrastructure, Technology & Monitoring Evaluation	Long Term (10-15 Years) – Reinforcement, Expansion, and Regional Strengthening
Activities	**Policy Planning:** • Establish integrated water and sanitation data systems. • Establish standardized regional guidelines for wastewater management. • Align national and local governance frameworks • Establish monitoring mechanisms **Resource mobilization:** • Conduct studies and roadshows to attract public-private-partnership mechanism • Establish PPP framework for wastewater investments • Design incentives to encourage private sector participation **Awareness-Raising:** • Implement public awareness campaigns. • Capacity building for local governments and private sector with ESG and GEDSI principles. • capacity building on range of technology options and financing mechanisms, and developing feasibility studies and bankable projects	**Establishment of Community-Based Local-Scale Infrastructure:** • Construct decentralized wastewater treatment systems (DEWATS) in rural and peri-urban areas, where appropriate • Request technical assistance from international agencies to ensure sustainable community-based DEWATS implementation. • Train local communities on infrastructure maintenance and operations. • Conduct continuous M&E to refine regulatory and technical approaches. **Research and Development of Innovations:** • Deploy real-time wastewater monitoring systems • Develop wastewater reuse initiatives for agriculture, industry, and energy sectors. • Pilot nature-based solution (NBS), e.g. constructed wetlands for wastewater treatment. • Promote circular economy approaches in wastewater management e.g. biogas recovery and nutrient recycling.	**Reinforcement & Expansion** • Achieve 80% clean water coverage in urban areas and 100% in low-income communities. • Fully integrate wastewater and septage management into national water security plans and climate action plans. • Scale up nature-based solutions (NBS) and climate-adaptive wastewater infrastructure. **Regional Strengthening:** • Develop climate adaptation and disaster preparedness plans for wastewater systems. • Establish regional cooperation frameworks for cross-border wastewater management. • Increase participation in regional coalitions such as the Asia-Pacific Water Forum. • Strengthen regional knowledge-sharing platforms for wastewater innovation and best practices.
Outputs	• Clear frameworks for wastewater management. • Established data collection and monitoring framework. • Increased private sector interest through incentives and funding mechanisms and cost-effective solution options • Improved awareness among businesses and households about pollution impacts. • Strengthened coordination and Whole-of-Government tactic.	• Tested and optimized DEWATS models for replication and scaling. • Expanded wastewater and septage treatment capacity across urban and rural areas. • Fully operational smart monitoring and reporting systems for regulatory compliance. • Increased wastewater reuse in agriculture, industry, and renewable energy. • Diversified financing sources, including green bonds, impact investments, and blended finance models.	• Fully operationalized climate-resilient wastewater and septage systems. • Majority of urban and peri-urban areas covered by advanced wastewater treatment technologies. • Integrated regional and septage wastewater management strategies within national economic development plans. • Secured sustainable and green financing through circular economy revenues, carbon credits, user fees, PPPs, and international climate funds.
Objectives and Target Outcomes	• National wastewater standards document finalized by 2026. • Funding commitments secured from government and international donors. • National wastewater monitoring system established and operational. • 10,000 stakeholders trained in wastewater management practices. • Nationwide awareness campaigns implemented across key regions	• 50% of urban wastewater treatment plants upgraded with advanced and cost-effective technologies. • 100 pilot projects implemented for decentralized wastewater and septage management. • 30% of industrial wastewater treated using circular economy principles. • Public-private partnerships (PPPs) established for wastewater infrastructure investment. • Dedicated regional wastewater fund created to support long-term sustainability.	• 100% of urban areas and 80% of rural areas connected to wastewater treatment services. • Disaster-resilient wastewater plans done in high-risk regions. • Regional wastewater management platform established for long-term policy coordination. • Cross-border wastewater infrastructure agreements signed • Sustainable financing mechanisms institutionalized e.g. regional wastewater fund