



# Wastewater Management – Challenges, Treatment and Circular Economic Opportunities in Asia Pacific Region



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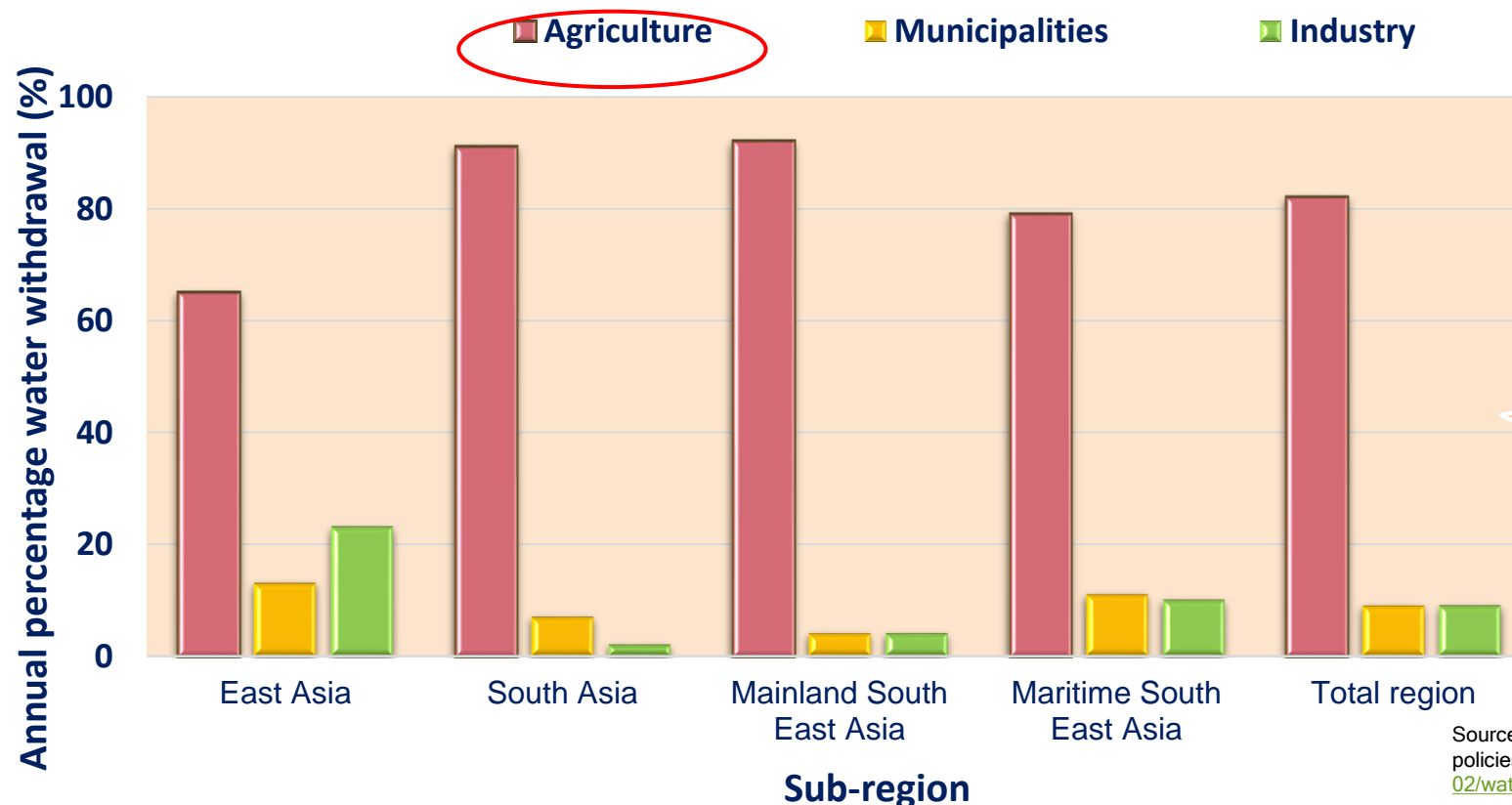
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# Water Consumption in Asia Pacific Region

- Irrigation for agricultural practices consumes highest share of water (60-90%) in the region
- Asia Pacific region accounts for 36% of the global surface water runoff

Annual percentage water withdrawal by different sub-regions of Asia Pacific region (Source: UNESCAP, 2016)



Water security is one of the major challenges in Asia Pacific region

Source: UNESCAP. (2016). Water markets in Asia and Pacific: An overview of trends, opportunities, risks and policies. Retrieved on 28th June, 2021 from <http://sdghelpdesk.unescap.org/sites/default/files/2018-02/water%20markets%20study.pdf>.

# Overview of On-site Sanitation Facilities in Asia Pacific Region

- Low-cost onsite sanitation facilities in Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, and Vietnam
- Double-vault latrines, composting toilets, and pour-flush toilets with twin pits
- On-site sanitation systems have low treatment efficiencies around 30-60%
- Septic tank coverage in Indonesia, Philippines, Malaysia, Vietnam and India are around 60%, 71%, 21%, 41% and 22%  
(Asia Pacific water forum, 2018)

*Septage management by Haiphong Sewerage and Drainage Company (SADCO) (Haiphong, Vietnam)*



*Septage management is a critical issue in Asia Pacific region!*

Source: Asia Pacific water forum. Asia-Pacific Regional Process Report. (2018). Retrieved on 23rd of June, 2021 from, [http://apwf.org/apwf\\_wp/wp-content/uploads/2019/02/Asia-Pacific-Regional-Report-for-8th-Forum\\_20180318.pdf](http://apwf.org/apwf_wp/wp-content/uploads/2019/02/Asia-Pacific-Regional-Report-for-8th-Forum_20180318.pdf).

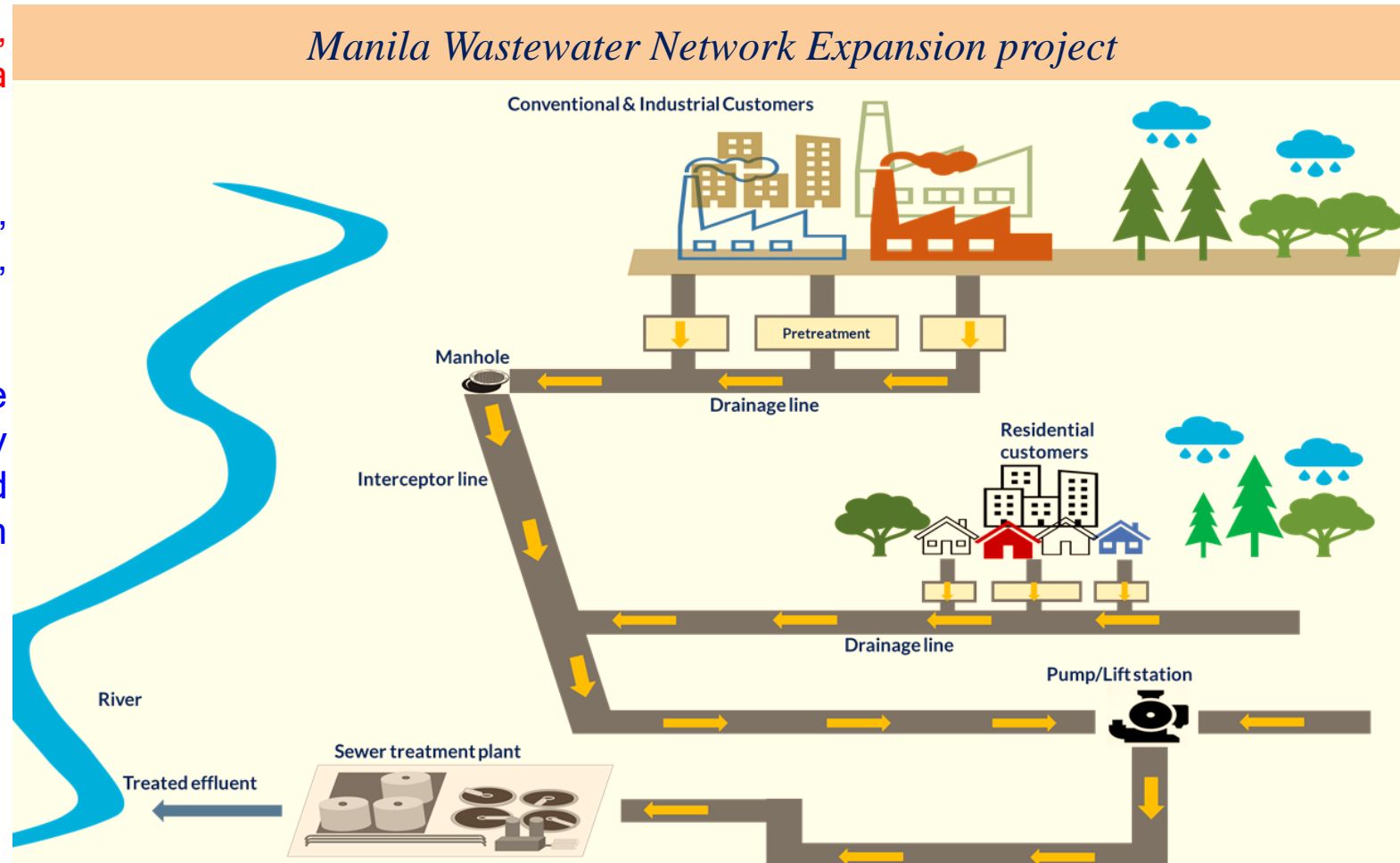
# Overview of Off-site Sanitation Facilities in Asia Pacific Region

Japan, Singapore, the Republic of Korea, Malaysia and the People's Republic of China have expanded sewerage networks

Sewerage treatment ratio in Lao PDR, Cambodia, Myanmar, Nepal, Vietnam, Sri Lanka, and Indonesia is less than 10%.

Manila Water Company has adopted the **combined sewer drainage approach**, for partially treated black water from septic tanks and untreated grey water from the showers, kitchen and laundry

*Sewerage development is not making much progress in some of the Asia Pacific countries!*



Source: ADB. (2013). Philippines Water Supply and Sanitation Sector Assessment, Strategy, and Road Map. Retrieved on 23<sup>rd</sup> of June, 2021 from, <https://www.adb.org/sites/default/files/institutional-document/33810/files/philippines-water-supply-sector-assessment.pdf>.

# National Policies and Legislations on Wastewater Treatment & Sanitation

## *National wastewater & sanitation regulations in selected Asia Pacific Countries*

3<sup>rd</sup> Asia Pacific Water Summit (APWS) in Yangon, 2017, encouraged the policy makers to take initiatives to achieve goals of SDG 6 (Yangon Declaration, 2017)

Ha Noi 3R Declaration discusses the critical importance of integrated waste management in the water sector (Ha Noi 3R Declaration, 2013).

The potential for the reuse of treated wastewater and sludge in most of these countries remains underappreciated (except for Singapore and Japan)

### Vietnam

Drainage, sewerage and wastewater collection and treatment, 2014, Vietnam (Decree No. 80/2014/ND-CP)

Revised sewerage development policy in Vietnam in 2016

Unified sanitation sector strategy and action plan in Vietnam

Environmental protection fee for wastewater, 2016, Vietnam (Decree no. 154/2016/ND-CP)

Adjusted orientations for development of drainage and sewerage in urban and industrial areas up to 2025, with a vision towards 2050, Vietnam (Decision No. 589/QD-TTg)

Orientation for development of drainage and sewerage in urban and industrial areas up to 2025, with a vision towards 2050 (Decision No. 1930/QD-TTg)

National technical regulation on domestic wastewater QCVN 14/2008/BTNMT

National technical regulation on industrial wastewater, 2011 in Vietnam QCVN40:2011/BTNMT



### India

State sewerage & waste water policy, India 2016  
India's National urban sanitation policy 2008  
Urban fecal sludge management policy, India  
Reuse of Treated Waste Water Policy, India

### Japan

Sewerage Law Enforcement Ordinance, Japan  
The Johkasou law, Japan  
The waste management and public cleaning law in Japan

### The People's Republic of China

Integrated wastewater management policy in Shenzhen, China

### The Republic of Korea

National Wastewater reuse policy, the Republic of Korea

### Philippines

Philippines Clean Water Act (CWA), 2004  
(Philippine Sanitation Code  
(Presidential Decree no. 856))

(National Policy for urban sewage and sanitation)

Source: Yangon Declaration: (2017). The Pathway Forward. Retrieved on 22nd of June, 2021 from [http://apwf.org/apwf\\_wp/wp-content/uploads/2017/12/Yangon-Declaration.pdf](http://apwf.org/apwf_wp/wp-content/uploads/2017/12/Yangon-Declaration.pdf).

# Wastewater Treatment: Linear to Circular Economy Management

## Key Target and Indicators

SDG 6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and substantially increasing recycling and safe reuse globally

SDG6.3.1: Proportion of domestic and industrial wastewater flow safely treated

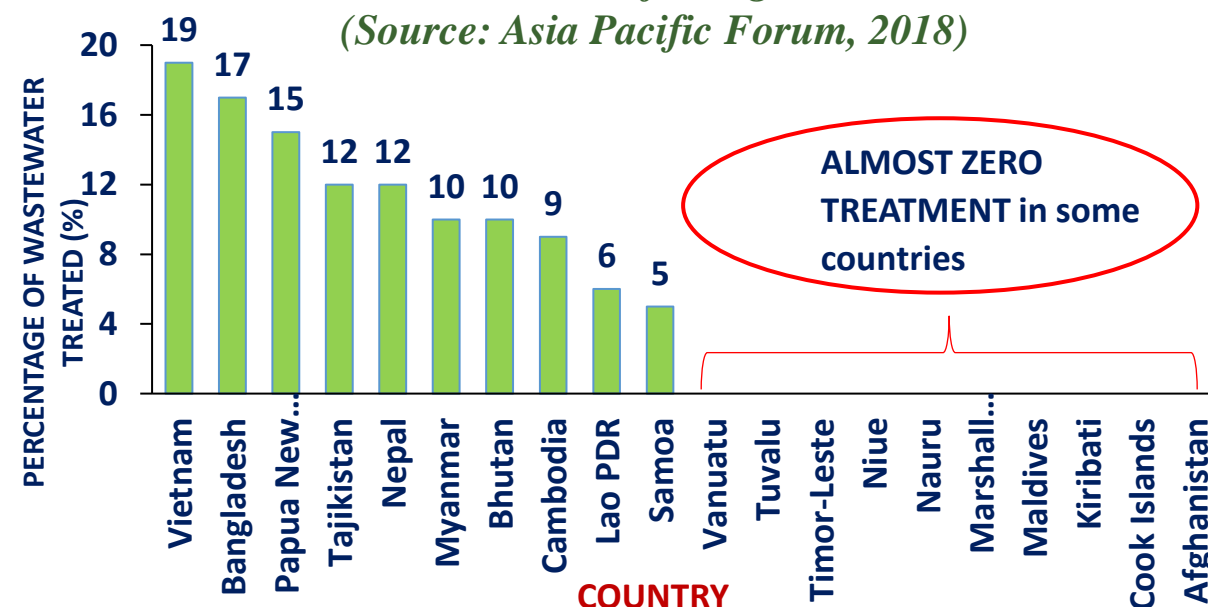
SDG6.3.2: Proportion of bodies of water with good ambient water quality

### Progress on SDG Indicator 6.3.1 in 2021

- Aims to track the percentage of wastewater flows from different point sources that are treated in compliance with national or local standards
- Wide disparities among the regional proportions of household wastewater safely treated (ranging from 25-80%) by SDG region
- Therefore, it is necessary to strengthen regulatory mechanisms (for example, national standards and discharge permits) for all sources of wastewater
- A global standardized monitoring effort will provide necessary and timely information to decision makers and stakeholders to make informed decisions.

### Percentage of wastewater treated in less developed countries in Asia Pacific Region

(Source: Asia Pacific Forum, 2018)



Source: Asia Pacific water forum. (2018). Asia-Pacific Regional Process Report. (2018). Retrieved on 23rd of June, 2021 from, [http://apwf.org/apwf\\_wp/wp-content/uploads/2019/02/Asia-Pacific-Regional-Report-for-8th-Forum\\_20180318.pdf](http://apwf.org/apwf_wp/wp-content/uploads/2019/02/Asia-Pacific-Regional-Report-for-8th-Forum_20180318.pdf)

# Proportion of Domestic & Industrial Wastewater treated in Asia Pacific Region

## *Progress on SDG Indicator 6.3.2 in 2021*

- In all world regions, in low, medium and high-income countries alike, there are water bodies that are still in good condition.
- 60% of water bodies assessed in 2020 were classified as having good ambient water quality (UN-Water, 2021).
- Ambient water quality data are not routinely collected in most of the countries.
- To have the greatest impact, water quality data need to be embedded in management and policy actions
- Capacity development in data management is needed.

## *Water Quality at Dokai Bay and rivers of Kitakyushu in (a) 1960 before improvement and (b) in 2014 after improvement (Source: ADB, 2016)*

- In 1960, in Japan, the Dokai bay and rivers of Kitakyushu were extremely polluted
- Investment made by private factories for developing wastewater treatment facilities for industrial effluent
- Significant public investment made to develop the sewerage system.



ADB. (2016). Sanitation and Sustainable Development in Japan. Retrieved on 01<sup>st</sup> of July, 2021 from, <https://www.adb.org/sites/default/files/publication/209511/sanitation-sustainable-dev-japan.pdf>.

# Water and Sanitation Related Official Programmes



**India**  
Project Nirmal  
Fecal sludge treatment plant  
for Dhenkanal Municipality

The Republic of Korea  
“Blue Gold” initiative  
planned to increase the water  
reuse



Japan Sewage Works Agency  
Teijin's Multi-Stage Activated  
Biological Process technology  
(MSABP)



**India**  
Bangalore interventions  
ECO-Sewage treatment plant  
in Bangalore





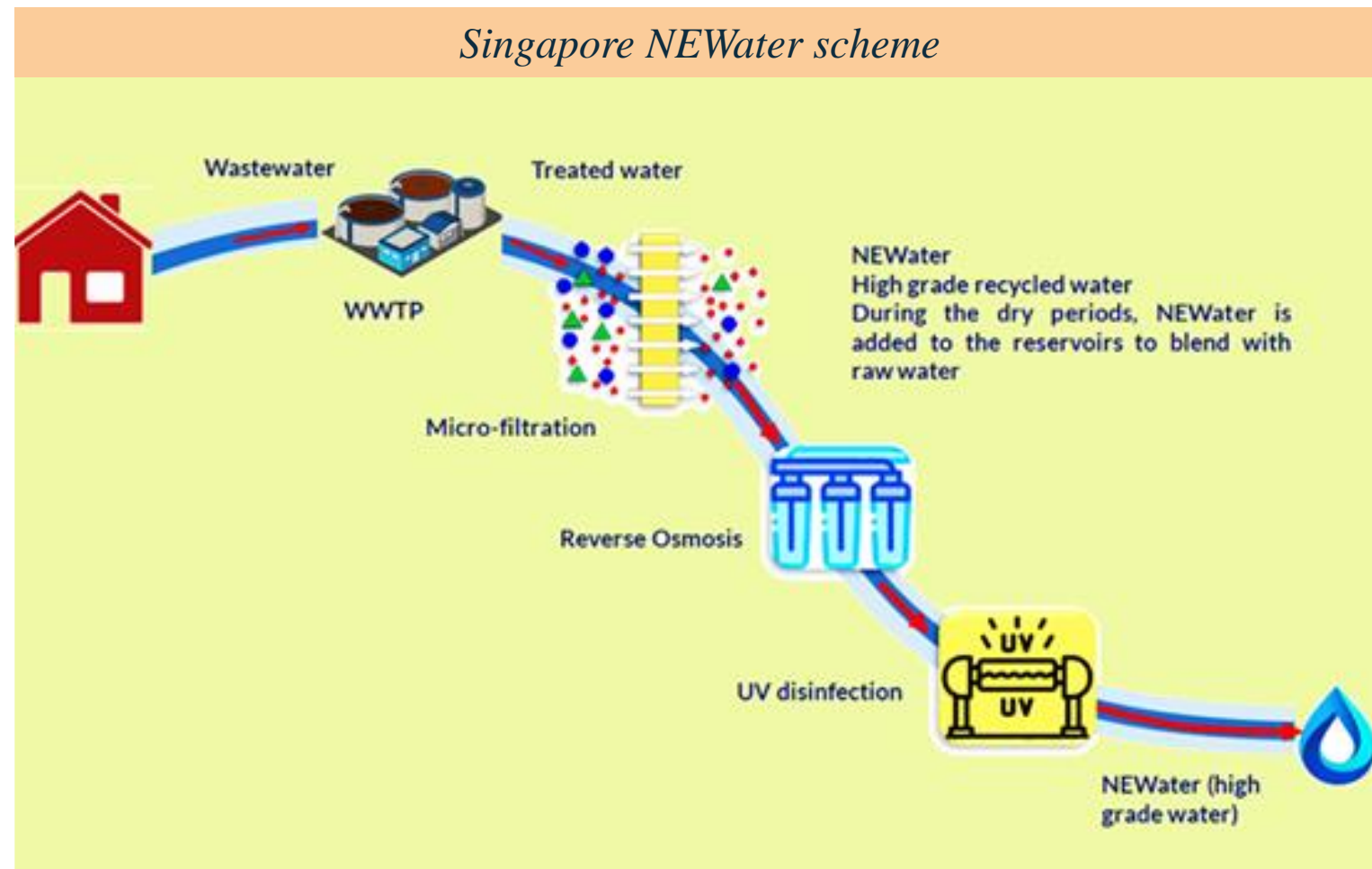
# Water and Sanitation Related Official Programmes

- **NEWater** produces high grade reclaimed water through regular treatment followed by additional 3 step purification process (Connor et al., 2017)

- NEWater quality is safe and high, and meets the standards of World Health Organization

- By 2060, NEWater is expected to meet **55%** of Singapore's future water demand.

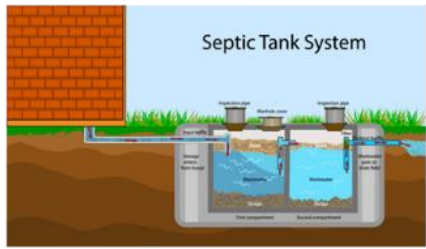
- Most of the NEWater is directly supplied for the industrial needs such as **cooling water for air-conditioners** and **ultra-pure water for the semiconductor manufacturing**



Source: Connor, R., Renata, A., Ortigara, C., Koncagül, E., Uhlenbrook, S., Lamizana-Diallo, B. M., & Brdjanovic, D. (2017). The United Nations World Water Development Report 2017. Wastewater: the untapped resource. The United Nations World Water Development Report.

# Centralized VS Decentralized Treatment (DEWATS) in Circular Water Systems

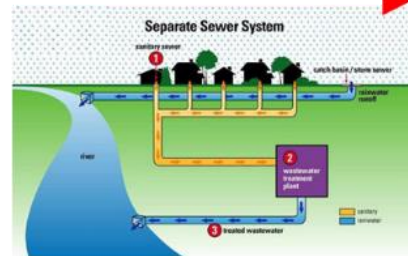
Increasing cost



On-site sanitation system



De-centralized sanitation system



Centralized sanitation system

Increasing Complexity

On-site sanitation Systems and Decentralized Systems (Anaerobic type DEWATS)

Centralized System (Sewerage Systems)

Cost

Inexpensive Compared with Sewerage system

Higher cost is required

Construction Period

Short period compared with Sewerage System

Long period is required for construction of sewer network

*Community based sanitation systems (SANIMAS) in Indonesia*



- Indonesian government tried to make the efforts for the development of community-based sanitation systems (SANIMAS)
- 3 types of basic SANIMAS systems in Indonesia with community sanitation centers comprising **public toilets, bathing and washing facilities, shallow sewerage systems and combined systems**

Source: UNESCAP/UN-Habitat/AIT. (2015). Policy Guidance Manual on Wastewater Management with a Special Emphasis on Decentralized Wastewater Treatment Systems (DEWATS). Retrieved on 22<sup>nd</sup> of June, 2021 from [www.unescap.org/resources/policy-guidance-manual-wastewater-management](http://www.unescap.org/resources/policy-guidance-manual-wastewater-management).

# New Business Models for Promoting Wastewater Reuse

## Inter-sectoral water transfers or “water swaps”

- Provide the treated water to farmers for irrigation, in exchange of freshwater for domestic and industrial purposes
- This allows for the allocation of more freshwater to high value uses
- The concept is based on benefit sharing,
- The agency responsible for drinking water pays an amount for partial treatment and medium storage

## On-site value creation

- Reuse can be integrated via the absorption of nutrients from the wastewater into biomass, duckweed which could be used as the fish feed.
- Combines a low-cost treatment solution with potentially high revenue generation
- Partnership between Hospital Trust and NGO to treat wastewater for producing duckweed as fish feed and cultivate crops for local market in Bangladesh

## Marketing reclaimed water

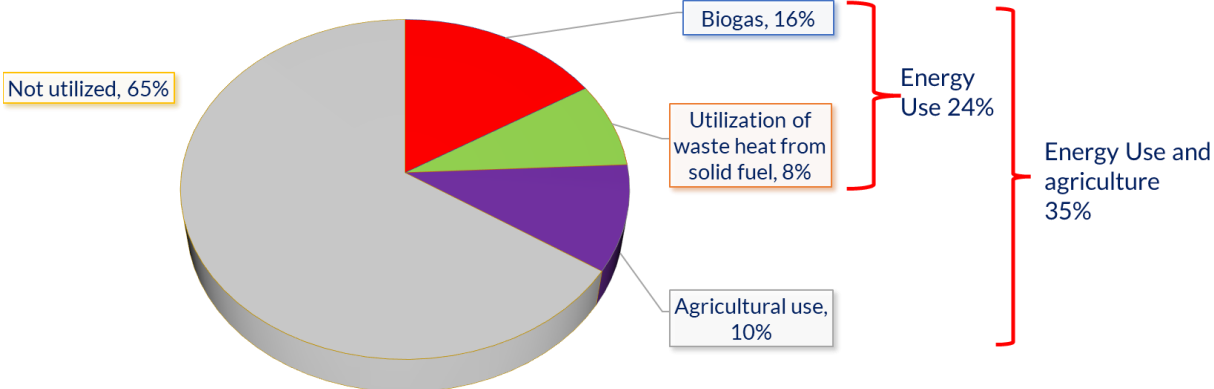
- Partially treated (fit-for-purpose) wastewater is made available to the user at a lower cost than the fresh water
- The concept is aimed at matching the future water buyers with suppliers of treated wastewater
- Securing the investment capital beforehand for wastewater treatment projects

## Replenishing Natural Capital

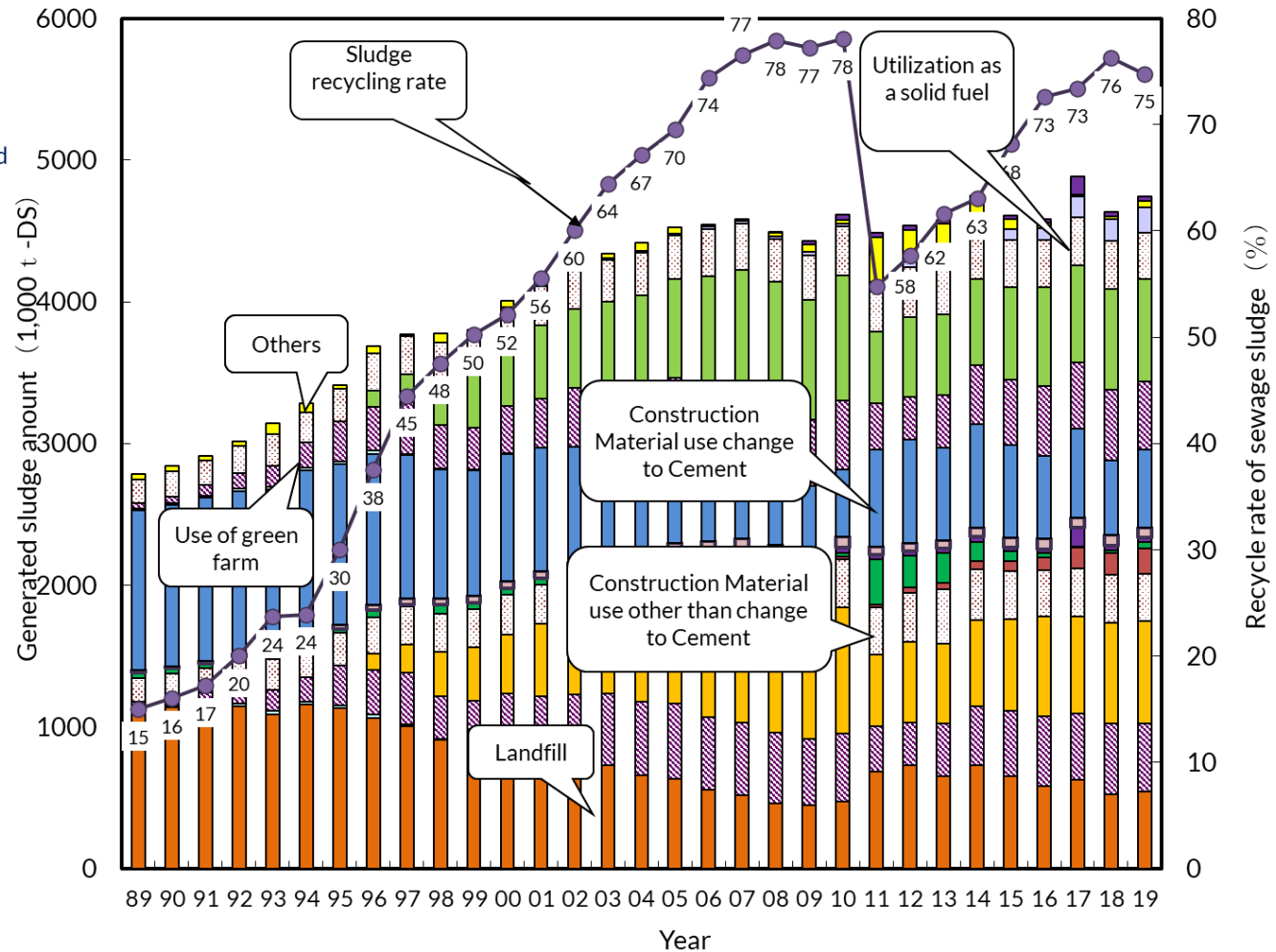
- Secondary treated wastewater could be used to recharge groundwater in the water stressed regions
- In Bangalore, India, urban wastewater is used to refill depleted irrigation tanks in the rural vicinity, which in turn helps to replenish the groundwater level

# Sewage Sludge as a New Resource for Energy Production VS Fertilizer Production

Utilization of Biomass in Sewage Sludge in Japan in 2019 (MLIT, 2019)



Sewage sludge recycling rates in Japan (MLIT, 2019)



- The recycling rate has decreased to around 55% in 2011, with the increase of number of landfills after the Great East Japan Earthquake.
- In 2019, only 24% of the sewage sludge has been used for the energy while, 10% of the sludge has been used for agriculture as well.

Source: Utilization of Biomass in Sewage Sludge in Japan in 2019 (MLIT). (2019). Formation of resource/energy cycle. Retrieved on 23<sup>rd</sup> July 2021 from [https://www.mlit.go.jp/mizukokudo/sewage/crd\\_sewage/tk\\_000124.html](https://www.mlit.go.jp/mizukokudo/sewage/crd_sewage/tk_000124.html).

MLIT. (2019). Systematization of Resource/Energy Recycling. Retrieved on 23<sup>rd</sup> July 2021 from <https://www.mlit.go.jp/crd/sewage/policy/09.html>.

# Level of Achievement in SDG Goals and Targets of Ha Noi 3R Declaration in Asia Pacific Region

- ❖ In most of the Asia Pacific countries, efforts have been taken for achieving the goals of Ha Noi 3R Declaration and SDG 6
  - Japan planned to develop the ideal future sewage system towards the formation of a recycling society.
  - Singapore is expecting to meet 55% of Singapore's future water demand via the reclaimed water with NEWater Scheme by 2060
- ❖ In the countries such as Vietnam, the insufficient levels of investment in wastewater treatment by the government is a major constraint.
- ❖ More than 800 billion in investment through 2030 would be required for the development of water and sanitation infrastructure within the region (ADB, 2018)
- ❖ Thailand, Vietnam, Brunei, Cambodia, and Lao PDR are facing the challenge of lack of research knowledge and information regarding safe water reuse applications
- ❖ Therefore, technology and knowledge sharing by the developed countries in the region such as Singapore and Japan are of crucial importance.
- ❖ Decentralized wastewater treatment systems (DEWATS) could be most suitable solutions to respond to the local needs and resource recovery in the underdeveloped countries as well.

# Way Forward

- **Improving Public perception on wastewater reuse**
  - Educate them on the technologies that are expected to be used
- **Policy, legislative and institutional reform**
  - Incentives should be introduced for the initiation of wastewater treatment projects
- **Improving Infrastructure & technology**
  - DEWATS could fill the gap between on-site treatment systems (septic tanks) and centralized treatment.
- **Improving Research and Development**
  - Research for the safe reuse of water using membrane technology
  - Transferring technology and other resources within the region
- **Alternate Financing**
  - Public private participation (PPP) projects
  - Blended finance schemes

**Thank You!**