7.3. 第 10 回アジアにおける分散型汚水処理に関するワークショップ

7.3.1. プログラム（英語）

Graywater Treatment by the Johkasou and its Social Benefit

Date: 4th November, 2022
Time: 15:00~18:00 (Japan standard time)
Venue: Webinar via Zoom

Registration: https://zoom.us/webinar/register/WN_3JIfuI-UQmiA4zA-DAriSg

Language: English / Japanese (simultaneous interpretation)
Organizer: Ministry of the Environment, Government of Japan (MOEJ)

Concept

Gray water (GW, domestic wastewater except toilet wastewater) is one of the big pollutant sources of water environment as well as Black water (BW, toilet wastewater). In this workshop, we would like to discuss on the Social Benefit derived from GW treatment, taking Johkasou spread in Japan as an example.

In addition, we would like to focus on what kind of benefit are brought to the public by treating the GW, and what kind of regulations / subsidies are provided by the central / local government to conserve the good water environment (cases from Japan and Vietnam).

Program

Moderator: Dr. Pierre Flamand
Manager - international affairs, Japan Sanitation Consortium (JSC)

(min.)	Topic	Speaker & Contents
15:00	Technical instructions	Secretariat (Instructions on how to use Zoom, raise hand for questions, etc.)
15:02	Opening remarks	Mr. Masaki Numata Director, Office for Promotion of Johkasou, Waste Management Division, Environmental Regeneration and Material Cycles Bureau, MOEJ
15:06	Keynote Pollutant load of gray water and the importance of its treatment	Dr. Hiroshi Yamazaki Professor, Department of Civil and Environmental Engineering, Faculty of Science and Engineering, Toyo University Based on examples of water quality surveys, etc., and experiences in Japan, Dr. Yamazaki will talk about how much gray water imposes a pollutant load to the water environment.

Session A:
Graywater treatment and its social benefit: from the perspectives of Johkasou

The Social Benefits derived from treating GW would be considered such as improving the water quality of the surrounding water environment, reducing greenhouse gas emissions, and removing microplastics, etc. However, it is not easy to estimate or calculate the social benefits in economical manner, because the preconditions differ depending on the country or region. In this session, taking Johkasou as an example, it will be introduced how much the water environment can be improved by GW treatment and whether it can be expected to reduce greenhouse gases.

15:26	A-1 Improving the water quality of the surrounding water environment by installing the Johkasou	Mr. Yasunobu Hamada Section Manager of Information Processing Division, Inspection Department, Kagoshima Prefecture Environmental Conservation Association In Aira City, Kagoshima Prefecture, there are districts where the conversion from old type Johkasou (which only treat BW) to Johkasou is progressing without the impact of sewerage facilities nor agricultural sewerage facilities. Mr. Hamada will provide information on how the water quality of the small channel in this district has changed between 2005 and 2022. In addition, Mr. Hamada will introduce regarding the difference in the appearance and water quality of the surrounding small channel between the old type Johkasou area and the Johkasou area, in Kagoshima Prefecture.
15:46	A-2 Comparison of greenhouse gas (GHG) reduction effects of decentralized wastewater treatment facilities	Dr. Masahiro Furuichi Director of Department of Education and Planning, Japan Education Center of Environment Based on his published paper, Dr. Furuichi will introduce GHG emission characteristics per volume of treated water and per BOD removed, by comparing Johkasou with other decentralized wastewater treatment facilities such as septic tanks.
16:06	Q&A	
16:20	Break Broadcast the video: “Japan’s Johkasou ~ a Comprehensive Solution for Global Sanitation and Environmental Problems ~“	

Session B: Graywater treatment and approaches from the public entities Taking Saitama Prefecture's efforts as an example, it would be introduced what kind of benefits administrative agencies will receive by improving the water environment of rivers and other areas through GW treatment. In addition, based on the case of Johkasou in Japan, will be introduced on the legal system (and its amendments) to ensure the implementation of decentralized domestic wastewater treatment, as well as policies such as the government subsidy system. Furthermore, the applicability of PPP schemes in sewerage projects in Vietnam and expected issues would be shared.		
16:35	B-1 Example of effective use of a good waterside environment	Mr. Masaki Inoue Senior Manager, Water Environment Division, Department of Environment, Saitama Prefecture Mr. Takeshi Ishino Senior Manager, River Environment Division, Department of Land Development, Saitama Prefecture Regarding the secondary effect of improving water quality in public water body, it would be considered such as improvement of amenities in the living environment, conservation of ecosystems, regional revitalization, etc. Until now, Saitama prefecture has regarded the "good water environment" as an "asset" and tried to utilize it. In this presentation, Mr. Inoue and Mr. Ishino will introduce the process of improving the water quality in public water body (rivers, etc.), will also introduce administrative measures such as the river restoration project and the SAITAMA River Supporters Project.
16:55	B-2 Governmental approach for the treatment of gray water by using Johkasou	Ms. Rio Owada Section Chief, Office for Promotion of Johkasou, Waste Management Division, Environmental Regeneration and Material Cycles Bureau, MOEJ Ms. Owada will introduce the background of the Johkasou Act enactment, and the revision of the legal system for treating GW. In addition, she will talk about measures provided by central government and municipality to support those Act and legal system, such as Johkasou Installation Promotion Program (subsidy program for individual household), Public Johkasou etc. Installation Promotion Program (subsidy program for municipality), and the Prefectural Wastewater Management Plan Formulation Manual. And, she will also mention the information on the cost level of the annual operation & maintenance of Johkasou, which is important for the sustainable implementation of domestic wastewater treatment.

17:15	B-3 Current Status and Policy on PPP in the Sewerage Sector in Japan and Vietnam	Mr. Norihide Tamoto JICA Expert of Sewerage Policy Advisor, Ministry of Construction, Vietnam There is growing international interest (especially in developing countries) in the application of PPP schemes to the sewage treatment sector. Mr. Tamoto will provide information on the applicability, benefits, and expected challenges in the sewerage sector of the PPP Investment Law that came into force in January 2021 in Vietnam.
17:35	Q&A	
17:55	Closing	Ms. Rio Owada
18:00		

7.3.2. 第 10 回ワークショップフライヤー

環境省
Ministry of the Environment

10th International Workshop on Decentralized Domestic Wastewater Treatment in Asia
Organized by Ministry of the Environment, Government of Japan (MOEJ)

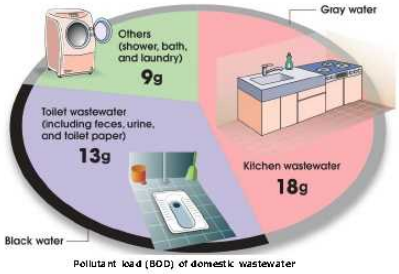
Graywater Treatment by the Johkasou and its Social Benefit

4th November 2022
15:00 - 18:00
(Japan Standard Time)

Language : English / Japanese

Venue : Webinar via Zoom

Please register from the below
https://zoom.us/webinar/register/WN_3JIful-UQmiA4zA-DAriSg



Gray water (GW, domestic wastewater except toilet wastewater) is one of the big pollutant sources of water environment as well as Black water (BW, toilet wastewater). In this workshop, we would like to discuss on the Social Benefit derived from GW treatment, taking Johkasou spread in Japan as an example.

In addition, we would like to focus on what kind of benefit are brought to the public by treating the GW, and what kind of regulations / subsidies are provided by the central / local government to conserve the good water environment (cases from Japan and Vietnam).

PROGRAM

Moderator : Dr. Pierre Flamand, Manager - international affairs, Japan Sanitation Consortium

Opening Remarks	Mr. Masaki Numata Director, Office for Promotion of Johkasou, Waste Management Division, Environmental Regeneration and Material Cycles Bureau, MOEJ
Keynote	**Pollutant load of gray water and the importance of its treatment** Dr. Hiroshi Yamazaki

Session A: Graywater treatment and its social benefit: from the perspectives of Johkasou

The Social Benefits derived from treating GW would be considered such as improving the water quality of the surrounding water environment, reducing greenhouse gas emissions, and removing microplastics, etc. However, it is not easy to estimate or calculate the social benefits in economical manner, because the preconditions differ depending on the country or region. In this session, taking Johkasou as an example, it will be introduce how much the water environment can be improved by GW treatment and whether it can be expected to reduce greenhouse gases.

A-1	**Improving the water quality of the surrounding water environment by installing the Johkasou** Mr. Yasunobu Hamada
A-2	**Comparison of greenhouse gas reduction effects of decentralized wastewater treatment facilities** Dr. Masahiro Furuichi

Session B: Graywater treatment and approaches from the public entities

Taking Saitama Prefecture's efforts as an example, it would be introduced what kind of benefits administrative agencies will receive by improving the water environment of rivers and other areas through GW treatment. In addition, based on the case of Johkasou in Japan, the legal system (and its amendments) and policies (such as the government subsidy system) to ensure the implementation of decentralized domestic wastewater treatment will be introduced. Furthermore, the applicability of PPP schemes in sewerage projects in Vietnam and expected issues would be shared.

B-1	**Example of effective use of a good waterside environment** Mr. Masaki Inoue and Mr. Takeshi Ishino
B-2	**Governmental approach for the treatment of gray water by using Johkasou** Ms. Rio Owada, Section Chief, Office for Promotion of Johkasou, Waste Management Division, Environmental Regeneration and Material Cycles Bureau, MOEJ
B-3	**Current Status and Policy on PPP in the Sewerage Sector in Japan and Vietnam** Mr. Norihide Tamoto

環境省
Ministry of the Environment

10th International Workshop on Decentralized Domestic Wastewater Treatment in Asia (Webinar)

KEY PERSONS

Dr. Hiroshi Yamazaki

Dr. Hiroshi Yamazaki is a Professor of Department of Civil and Environmental Engineering, Faculty of Science and Engineering, Toyo University. He obtained a doctoral degree at Department of Civil Engineering, Graduate School of Engineering, Tohoku University. He has been researching the effects of diversification of influent water on the treatment performance of Johkasou and the characteristics of greenhouse gases emission from Johkasou more than 20 years. He is an expert in the area of water environmental engineering. He currently serves as a board member of Johkasou review and evaluation, and so on.

Mr. Yasunobu Hamada

Mr. Hamada is a Section Manager of Information Processing Division, Inspection Department, Kagoshima Prefecture Environmental Conservation Association. He has been involved Johkasou legal inspection works as a qualified inspector more than 23 years in Kagoshima prefecture. He inspects more than 1,000 units of Johkasou every year. Mr. Hamada has contributed to invent the efficient automatic BOD measurement system, and to develop the IT based legal inspection ledger system (by using such as iPhone). Throughout his activities, Johkasou legal inspection system in Kagoshima prefecture has been improved more suitable and effective.

Dr. Masahiro Furuichi

Dr. Masahiro Furuichi is a Director of Department of Education and Planning, Japan Education Center of Environment. He has been involved in research & development of the wastewater treatment facilities including Johkasou at Hitachi Chemical Co., Ltd. (lately, the company name changed to House Tech Co., Ltd.) more than 30 years. He is qualified as a Professional Engineer (Sanitary Engineering Department), APEC Engineer (Environmental), and IPEA International Engineer. He was awarded the Environment Minister's Commendation (FY2016 Distinguished Contributor to Waste and Johkasou Research and Development), and currently serves as a technical chair of Johkasou System Association, Part-time lecturer at Toyo University, and so on.

Mr. Masaki Inoue

Mr. Inoue is a Senior Manager of Water Environment Division, Department of Environment, Saitama Prefecture. He is currently involved in conservation of river environment and its utilization in the symbiotic manner.

Mr. Inoue had also much experienced on sound-material cycle program in Saitama prefecture such as utilization of treated water (Phosphorus recovery) and sludge (composting) generated from sewage treatment plant, material recycle of domestic/ business plastic waste, and so on.

Mr. Takeshi Ishino

Mr. ishino is a Senior Manager of River Environment Division, Department of Land Development, Saitama Prefecture. He is undergoing intense the regeneration and conservation of rivers. Furthermore, he is currently activated to utilization of river spaces, for example, promotion of commercial use by private businesses, and so on, from the perspective of local government close to the citizen. Also, Mr. Ishino tackles on promoting the parks and green spaces in Saitama Prefecture.

Mr. Norihide Tamoto

After joining the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Mr. Tamoto was mainly involved in administration and research activities related to sewerage system and urban development at the MLIT, National Institute of Land and Infrastructure Management, Japan Sewage Works Agency, Shiga Prefectural Government, and Miyazaki City Government. Mr. Tamoto is currently dispatched to the Vietnamese Government (Ministry of Construction) to provide advice on sewerage policy and supports human resource development, as a JICA Expert of Sewerage Policy Advisor.

Dr. Pierre Flamand

Pierre is the Manager of International Affairs at the Japan Sanitation Consortium (JSC). He has over 15 years experience in sanitation, having particularly focused and conducted research on fecal sludge management. Since 2015, he has been involved in several Working Groups of ISO/TC 224 as an expert representing Japan for the creation of international standards on stormwater management in urban areas and on-site domestic wastewater systems. Pierre holds a doctoral degree in regional development studies and is also a visiting researcher at Toyo University in Japan.

SECRETARIAT CONTACT

Japan Education Center of Environmental Sanitation (JECES) is a secretariat of this Workshop. If you have any questions in advance, please contact Secretariat (shirakawa@jeces.or.jp) via email.

Dr. Yurie Shirakawa
Researcher, Japan Education Center of Environmental Sanitation (JECES)
Address: 2-23-3 Kikukawa, Sumida-ku, Tokyo 130-0024, Japan
E-mail: shirakawa@jeces.or.jp

7.3.3. 発表資料 Keynote, 生活雑排水の汚濁負荷と処理の重要性, 山崎 宏史 氏　東洋大学理工学部都市環境デザイン学科　教授

The 10th International Workshop on Decentralized Domestic Wastewater Treatment in Asia

4th November, 2022

Keynote

Pollutant load of gray water and the importance of its treatment

Dr. Hiroshi Yamazaki
Professor, Department of Civil and Environmental Engineering, Faculty of Science and Engineering, Toyo University

Changes in domestic wastewater treatment (primary stage)

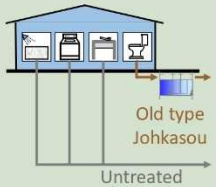
primary stage
Night soil removal
secondary stage (early period)
Treat hygienically
secondary stage (late period)
Conserving the water environment
tertiary stage
Circulate water/waste protect the environment

Japan	World (Asia)
 「hauler of manure」	 「A night in London where the scum falls on the drunkard's head」 (by Hogarth, 1738)
 「Edo Meisho Zue」 (Collection of the National Diet Library)	

2

Changes in domestic wastewater treatment (secondary stage at early period)

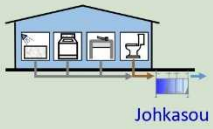
primary stage
Night soil removal
secondary stage (early period)
Treat hygienically
secondary stage (late period)
Conserving the water environment
tertiary stage
Circulate water/waste protect the environment

Japan	World (Asia)
 Old type Johkasou; Untreated domestic wastewater	 Septic tank
 Untreated domestic wastewater	

3

Changes in domestic wastewater treatment (secondary stage at late period)

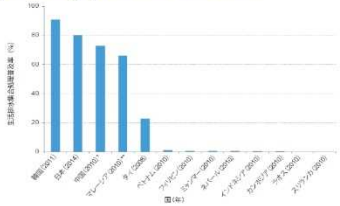
primary stage
Night soil removal
secondary stage (early period)
Treat hygienically
secondary stage (late period)
Conserving the water environment
tertiary stage
Circulate water/waste protect the environment

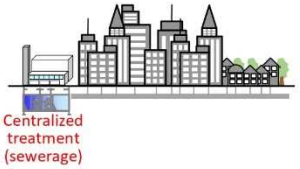
Japan	World (Asia)
 Sewerage coverage ratio : 81%	 Sewerage coverage ratio : 2-3% (Indonesia)
 Johkasou coverage ratio : 9%	
 Johkasou	

4

Situation of domestic wastewater treatment in Asian countries

- Penetration rate of domestic wastewater treatment by centralized treatment (sewerage) in Asian countries





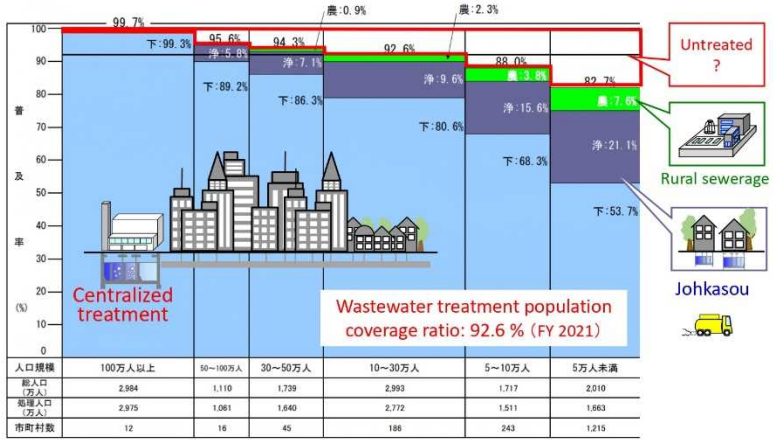
- Discharge of night soil and domestic wastewater into the water environment in Asian countries

country	feces (tons)	urine (m^3)	Gray water (m^3)	BOD (tons)
Cambodia	85,000	852,000	3 million	181,500
Indonesia	6,406,000	64,059,000	8,541 million	2,137,000
Philippines	4,237,000	33,900,000	1,962 million	762,000
Vietnam	2,275,000	22,754,000	610 million	357,500

Source : WEPA, Economic impacts of sanitation in southeast Asia (2008) The World Bank

5

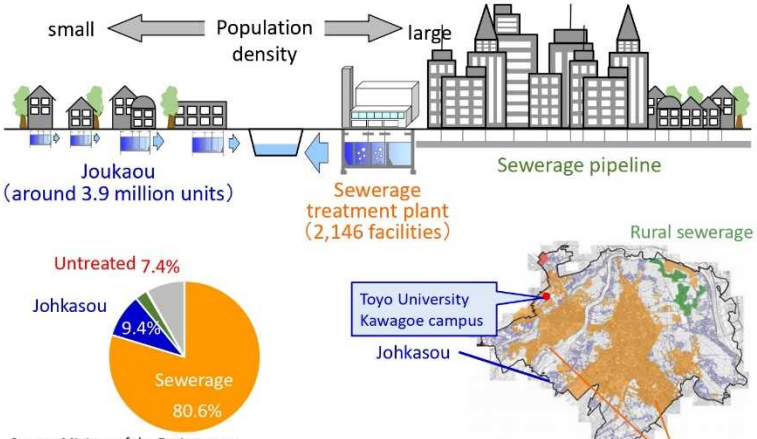
Wastewater treatment population coverage ratio by urban population size in Japan



Source: Ministry of the Environment Johkasou website (http://www.env.go.jp/recycle/jokaso/data/population/), partially modified by the author

6

Sewerage and Johkasou development in Japan

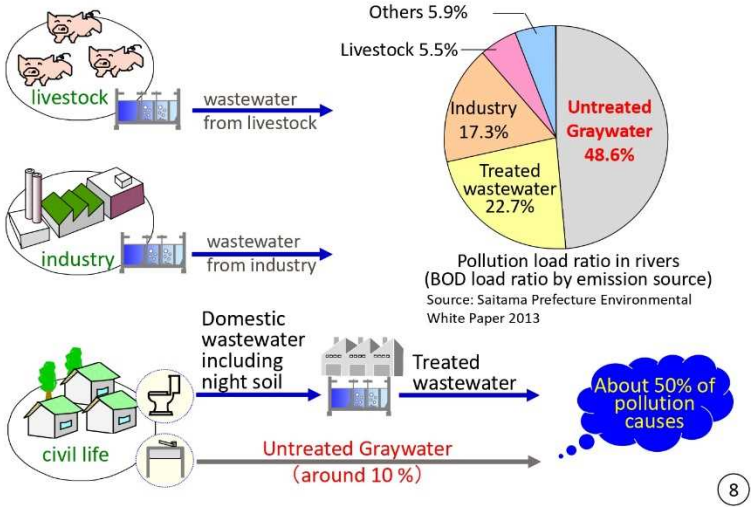


Source: Ministry of the Environment, Wastewater treatment population coverage ratio by treatment facility (FY 2021, nationwide)

Source: Kawagoe City, Basic plan for domestic wastewater treatment (2019, Kawagoe City)

7

Factors polluting rivers (BOD load ratio by emission source)

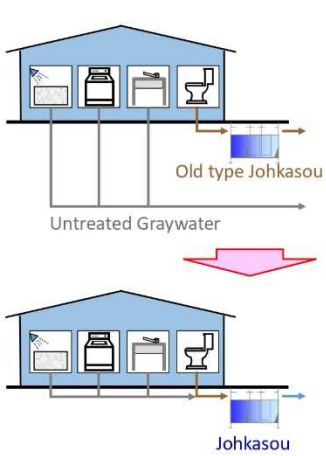


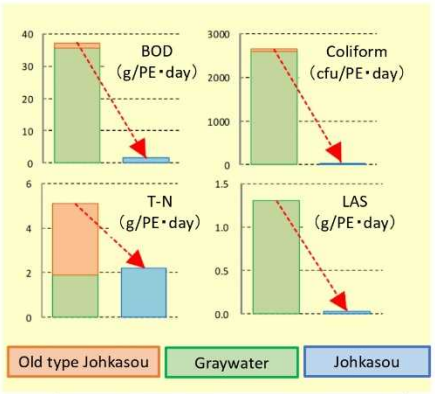
Pollution load ratio in rivers (BOD load ratio by emission source)

Source: Saitama Prefecture Environmental White Paper 2013

8

Pollution load of each wastewater to the water environment





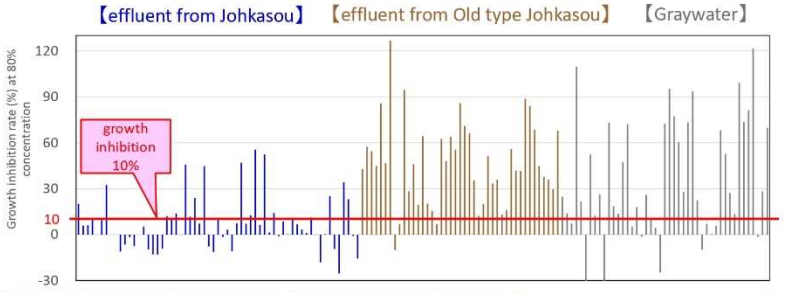
A large amount of pollutant load remains in the treated water from Old type Johkasou and Graywater

Source: Ministry of the Environment Johkasou site:
https://www.env.go.jp/recycle/jokaso/publicity/pamph/pdf/pp_for_the_clean.pdf

9

Effects of each wastewater on aquatic organisms

Effect of each effluent on algae growth (AGI)



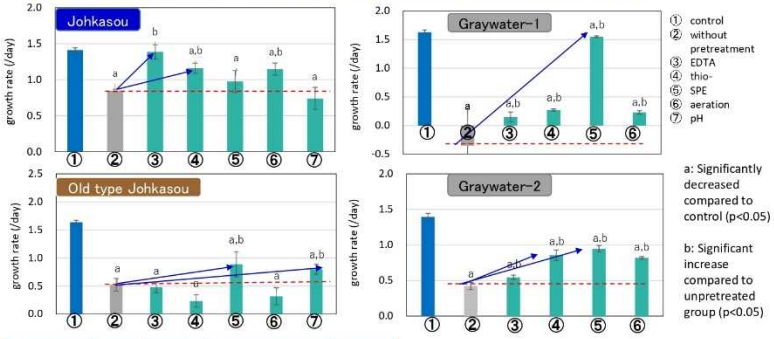
	Inhibited (80% concentration zone)	Average growth inhibition rate (80% concentration zone)
Johkasou	20/57	7.5%
Old type Johkasou	40/43	46.9%
Graywater	33/45	33.0%

Effluent from Old type Johkasou or Graywater inhibit the growth of aquatic organisms (algae)

10

Effects of each wastewater on aquatic organisms

Factors Affecting Algae Growth in Each Wastewater (TIE)



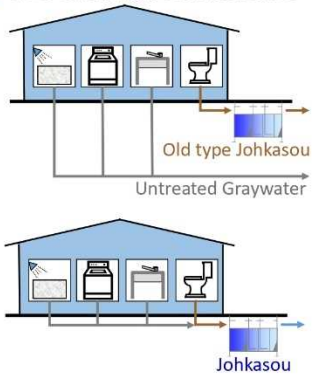
sample	Group of Suspected Toxic Substances
Johkasou	Cationic metals, oxidizing agents (disinfectants)
Old type Johkasou	Organic matter, NH4-N, others
Graywater	Organic matter
Graywater	Oxidizing agent, organic matter

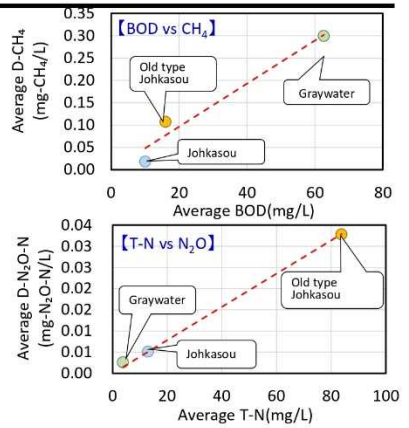
Factors Affecting Algae Growth
- Organic matter remaining in Graywater
- Organic matter and NH4-N remaining in effluent of Old type Johkasou

11

GHGs remaining in each wastewater

GHGs remaining in each wastewater



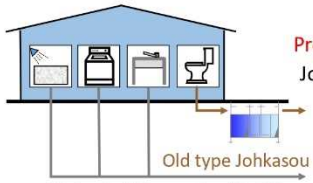


Effluent of Old type Johkasou and Graywater contain residual GHGs

Source: Environmental Research and Development Fund, Elucidation of GHG emission mechanism derived from wastewater discharged into the environment and study of emission amount calculation method

12

Conversion from Old type Johkasou to Johkasou



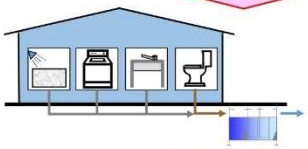
Prohibition of new installation of Old type Johkasou

Johkasou Act revision（FY 2000）

Old type Johkasou（3.6 million units）

Untreated Graywater（7.4%）

Conversion from Old type Johkasou to Johkasou



- Mid-term (about 10 years) General wastewater treatment
- Long-term (20-30 years) Building a sustainable sewage treatment system

Source: Prefectural Concept Formulation Manual (2014)

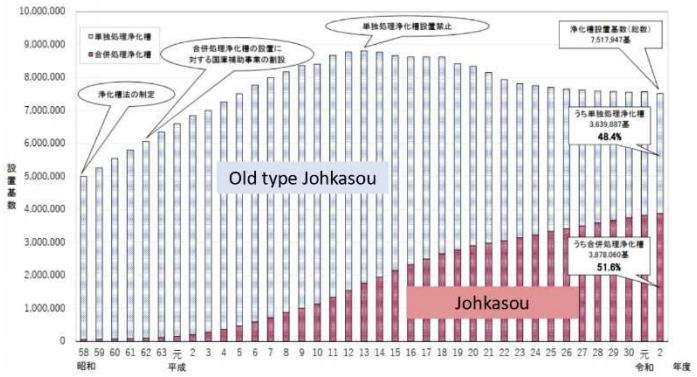
Johkasou（3.9 million units）

Conversion from Old type Johkasou to Johkasou is underway in Japan

13

Conversion from Old type Johkasou to Johkasou

Changes in the number of installed units

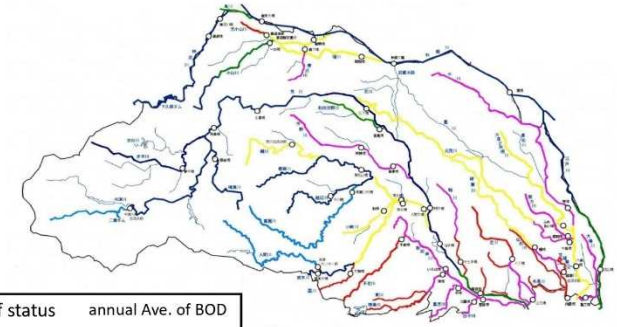


After the Old type Johkasous were installed, those were converted to the Johkasou.
（ Double Investment ）

Source: Ministry of the Environment Johkasou site, https://www.env.go.jp/content/900518582.pdf

14

Designation status of river water quality types in Saitama Prefecture (FY1990)



Usage Guide

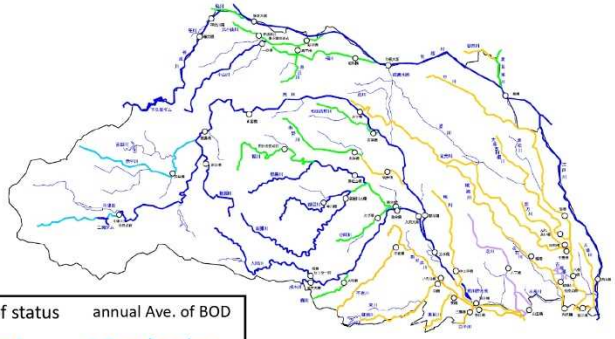
color	rate of status	annual Ave. of BOD
	Very good	1.0 mg/L or less
	good	2.0 mg/L or less
	moderate	3.0 mg/L or less
	little polluted	5.0 mg/L or less
	polluted	10 mg/L or less
	very polluted	10 mg/L or more

Water quality in the lower reaches of the river (southeast region): very polluted

Source: Type designation status in Saitama Prefecture

15

Designation status of river water quality types in Saitama Prefecture (FY2020)



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	very polluted	10 mg/L or more

Water quality in the lower reaches of the river (southeast region): little polluted

Source: Type designation status in Saitama Prefecture

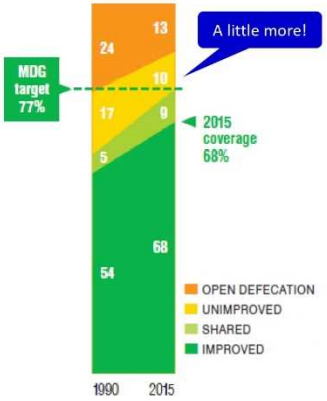
16

Activities of the world (United Nations)

- Millennium Development Goals (MDGs)
  - With 1990 as the base year and 2015 is the deadline for achievement

Target 7.C

Halve the proportion of people without sustainable access to safe drinking water and sanitation.



- 2.1 billion people have access to improved sanitation
- 2.4 billion people still use unimproved sanitation facilities
- 946 million people still practice open defecation

17

Activities of the world (United Nations)

- Sustainable Development Goals (SDGs)
  - With 2015 as the base year, 2030 is the deadline for achievement

Target 6.2:

By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

Target 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

18

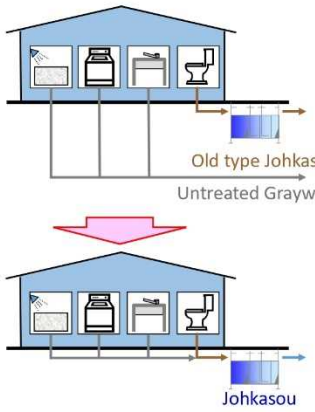
From hygiene improvement to environmental improvement

secondary stage (early period)

to treat hygienically

secondary stage (late period)

to conserve the water environment



Millennium Development Goals → Sustainable Development Goals
Sanitary treatment → Water environment conservation

19

Major pollutants and technical countermeasures related to the water environment

	Target substance	situation	
Primary stage to Secondary stage at early period (sanitation issue)	Pathogen	cholera	
Secondary stage at late period (water environmental issue)	organic matter (BOD)	River pollution/sludge	
	heavy metal	Pollution problem	Effects on aquatic organisms
	Nitrogen Phosphorus	eutrophication	
tertiary stage (environmental issue)	Water / waste	depletion of resources	
	greenhouse gas	Global warming	

shift

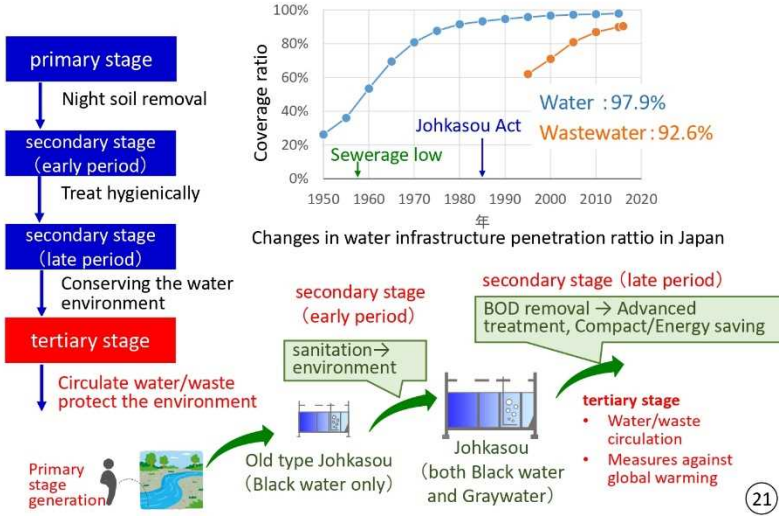
Asian countries

Japan

Asian countries need to develop wastewater treatment infrastructure in a leap

20

Changes in domestic wastewater treatment（tertiary stage）



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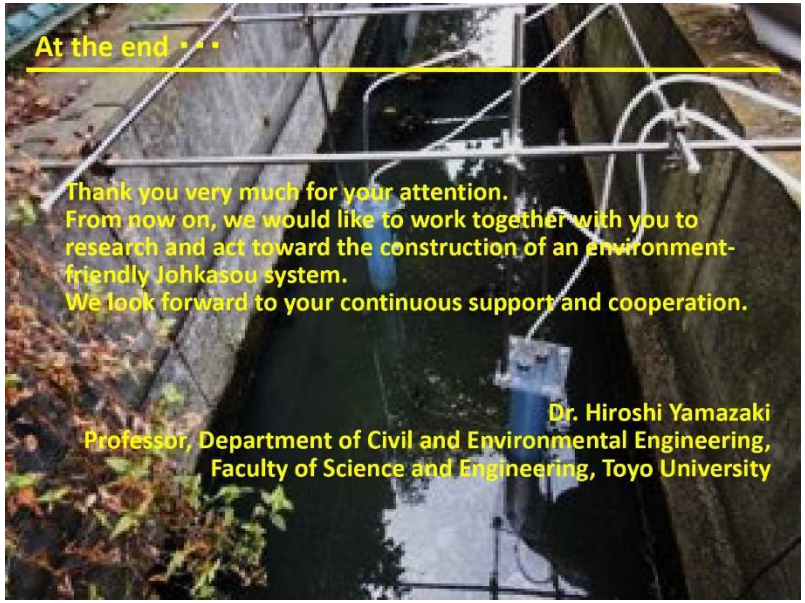
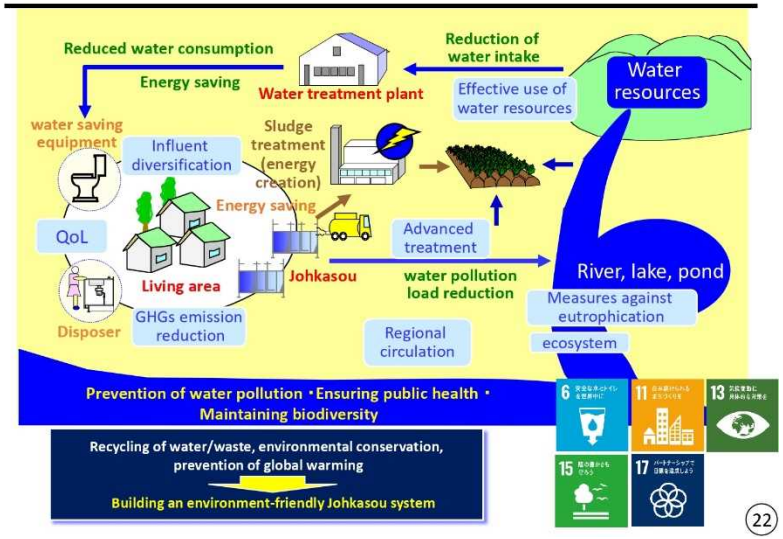


Building an environment-friendly Johkasou system



22

7.3.4. 発表資料 A-1　浄化槽の整備による周辺水環境の水質改善，濱田 恭暢 氏，公益財団法人鹿児島県環境保全協会　検査部　情報処理課　課長

The 10th International Workshop on Decentralized Domestic Wastewater Treatment in Asia

Improving the water quality of the surrounding water environment by installing the Johkasou

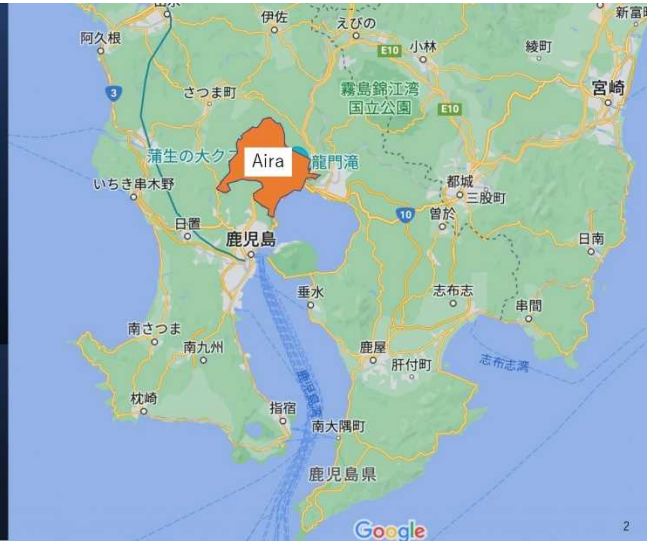
Mr. Yasunobu Hamada

Section Manager of Information Processing Division,
Inspection Department, Kagoshima Prefecture
Environmental Conservation Association

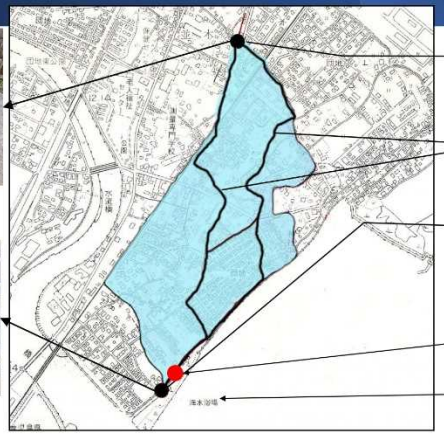
公益財団法人
鹿児島県環境保全協会

Location of Aira City and Background of this study

How the water quality of the small water channel in the area has changed between 2003 and 2022 by promoting Johkasou?



Survey area



Water sampling point : water channel (**upstream**)

Water channels

Water sampling point : water channel (**downstream**)

Area with Old type Johkasou

Shigetomi Beach

3

Features of survey area

1. Since there is no other inflow between upstream and downstream survey points except domestic wastewater, analysis is easy.
2. Aira city actively promotes the Johkasou installation and maintenance project. In Aira city, the wastewater treatment population penetration ratio has been increased due to the development of the Johkasou.
3. However, every year, the water quality at the downstream point is particularly remarkably polluted.
4. And, Shigetomi Beach is located downstream of the downstream sampling point, however the rating of water bathing has been level B judgment for the past few years, and the interest of residents is very high. There is a high need for countermeasures against domestic wastewater.

Comparison of the situation in the surveyed areas	FY 2003	FY 2022
Number of Johkasou installed annually	400～500 units/year	200 units/year
Inflow other than domestic wastewater between upstream and downstream sampling points of the water channel	None	None

4

Method of survey

- Population by type of domestic wastewater treatment in the basin

The number of households, the number of installed Johkasou, the number of installed Old type Johkasou, and the number of vault toilets in the survey area were investigated from the data, and the population served by each treatment was calculated.

- Water volume

The flow velocity at the survey point was measured using an electromagnetic current meter and calculated the flow rate of the water channel.

- Water quality

8 items of water quality were analyzed ; pH, DO, BOD, COD, SS, T-N, T-P, and Fecal coliform count

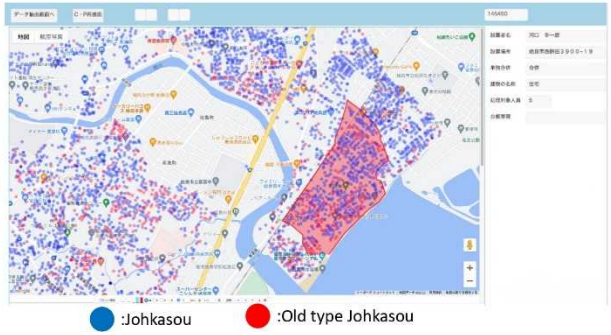
- The actual pollutant load (kg/day) = ｛water quality of downstream (mg/L) – water quality of upstream (mg/L)｝ × water volume（㎥/day）

Based on the results of water quality analysis and water volume, the actual pollutant load discharged from the survey area into the water channel was calculated.

5

Get Position Coordinates and plot the Coordinate

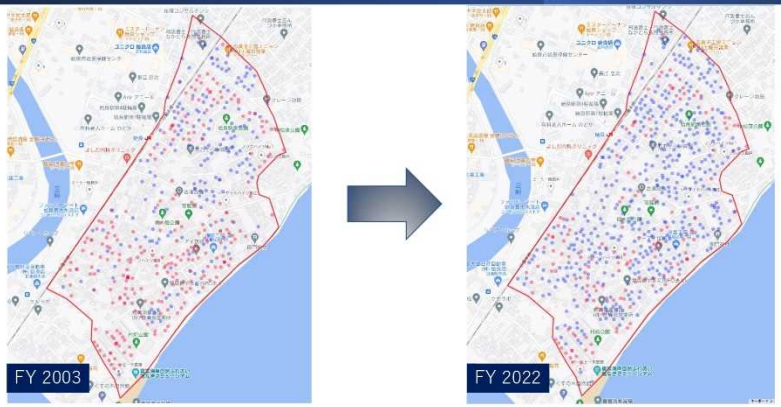
Mobile phone screen when acquiring coordinates (location information) during legal inspection.



Coordinates plotted on the map. (survey area is marked red.)

6

Johkasou installation conditions (FY2003 vs FY2022)



7

Result: Wastewater treatment population coverage ratio by type of treatment facilities (FY2003 vs FY2022)

Due to the promotion of Johkasou, the wastewater treatment population coverage ratio has been increased from 23.5% to 68.8%.

FY	Item by type of domestic wastewater treatment facilities	PE/ household	Households with Johkasou	Households with Old type Johkasou	Households with vault toilet	Total
2003	Number of households		176	376	196	748
	PE	2.5	440	940	490	1,870
2022	Number of households		593	204	65	862
	PE	2.14	1,269	437	139	1,845

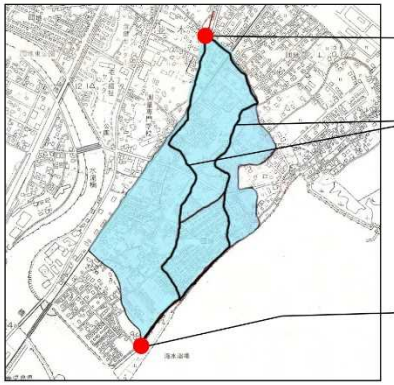
FY2003 23.5%

FY2022 68.8%

The wastewater treatment population coverage ratio in whole Aira City is 82.2% as of 2020.

8

Result: Water volume of the water channel (FY2003 vs FY2022)



Water sampling point : water channel (**upstream**)

Water channels

Water sampling point : water channel (**downstream**)

The amount of domestic wastewater discharged from the survey area is estimated to be

approximately **600 m³/day in FY 2003** and

approximately **480 m³/day in FY 2022**.

9

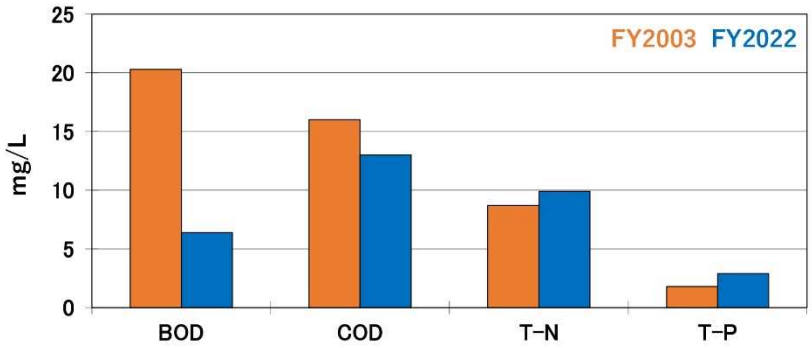
Result: Water quality of the water channel (FY2003 vs FY2022)

FY		item	pH	DO	BOD	COD	SS	T-N	T-P	Fecal coliform count
		unit	–	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	count/100mL
		Environmental standard ※	6.5 ~8.5	More than 7.5 mg/L	Less than 2 mg/L		Less than 25 mg/L			Less than 1,000/100mL
2003	Upstream	2003/9/19	7.4	7.9	1.9	3.1	5.7	0.87	0.16	1900
		2003/11/26	7.8	5.7	27	22	29	12	2.6	2,500
		2003/12/18	7.6	8.2	6.5	8	4.3	5.8	1.4	110
	Ave. of upstream		**7.6**	**7.3**	**11.8**	**11.0**	**13.0**	**6.2**	**1.4**	**1,503**
	Downstream	2003/9/19	7.4	2.1	11	11	6.1	3.9	0.81	27,000
		2003/11/26	7.7	4.0	23	19	14	9.1	2.4	25,000
		2003/12/18	7.6	5.3	27	18	11	13	2.1	18,000
	Ave. of downstream		**7.6**	**3.8**	**20.3**	**16.0**	**10.4**	**8.7**	**1.8**	**22,500**
2022	Upstream	**2022/7/28**	**7.6**	**7.0**	**11**	**17**	**5.8**	**16**	**3.2**	**160**
	Downstream	**2022/7/28**	**7.7**	**2.0**	**6.4**	**13**	**3.9**	**9.9**	**2.9**	**450**

※ Environmental standard values for Class 2 rivers (Type A) of Aira city

10

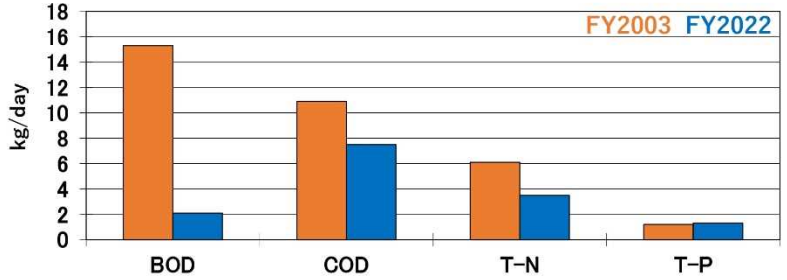
Comparison of water quality at downstream (FY2003 vs FY2022)



11

The actual pollutant load (FY2003 vs FY2022)

The actual pollutant load discharged from the survey area into the water channel decreased, except for T-P.



The actual pollutant load (kg/day)
= { water quality of downstream (mg/L) – water quality of upstream (mg/L) } × water volume (㎥/day)

12

Changes in effluent BOD and effluent volume (FY2003 vs FY2022)

- The effluent quality of the Johkasou was investigated through legal inspections and wastewater surveys.
- The effluent volume was obtained from the change in the tap water meter.
- Both the BOD concentration in the effluent and the effluent water volume from the Johkasou decreased compared with FY2003.

	Effluent BOD (mg/L)	Effluent volume (L/day・PE)	Effluent BOD Unit (g/day・PE)	Reference data
FY 2003	9.6	267	2.6	Estimated from the survey results of approximately 57,000 Johkasous conducted from 1994 to 2002.
FY 2022	7.3	258	1.9	Estimated from the survey results of approximately 300,000 Johkasous conducted from 2018 to 2021.

13

Johkasou area vs Old type Johkasou area

Aira, FY2005 vs FY2022

14

Johkasou area

：sampling spot

Old type Johkasou area

：sampling spot

15

Appearance at the sampling spot (FY 2005)

Johkasou area

- There is no sludge or biofilm in the gutter and the water channel where the effluent is discharged.

Old type Johkasou area

- The biofilm is attached to the bottom of the gutter, and sludge is also flowing out. Sanitary pests such as mosquito larvae are occurring.

16

Appearance at the sampling spot (FY 2022)

Johkasou area

- Continuously, there is no sludge or biofilm in the gutter and the water channel where the effluent is discharged.

Old type Johkasou area

- The biofilm attached to the bottom of the gutter was completely absent. The sanitary pests that were seen before are not observed.

17

Water quality of each area

Items	unit	Johkasou area		Old type Johkasou area	
		FY 2005	FY 2022	FY 2005	FY 2022
BOD	mg/L	7.6	5.3	81	31
COD	mg/L	19.1	16	55.0	22
Fecal coliform count	count/cm^3	0	0	118,000	980
T-N	mg/L	13.9	17	17.2	4.7
T-P	mg/L	2.9	4.2	3.0	3.8

Survey period of FY2005：June-2005～May-2006, Kagoshima Environmental Inspection Center （n=8）

Survey period of FY2022: July -2022, Kagoshima Prefecture Environmental Conservation Association (n=1)

18

Summary (FY2003 vs FY2022)

- Although the population of the survey area remained almost constant, the wastewater treatment population coverage ratio increased from 23.5% (FY 2003) to 68.8% (FY 2022) due to the promotion of Johkasou installation. Only one time survey (water quality and water volume) has been conducted in 2022, however there was an improvement trend in the water quality of the small water channel.
- Concentrations of T-N and T-P were higher than in 2003 at the downstream water quality of the small water channel. However, in 2022, except for dissolved oxygen and fecal coliform counts, downstream water quality was better than upstream water quality.
- From the changes in the actual pollutant load, it is considered that the pollutant load of BOD, COD, and T-N discharged from the survey area into the small water channel has decreased due to the installation of the Johkasou. It is thought that the improvement of effluent water quality from Johkasou and the decrease in the amount of effluent water volume have also affected.
- The appearance of the water channel in the Johkasou area has not changed between 2005 and 2022, and the water quality is maintained in good condition. Half of the old type Johkasou in the Old type Johkasou area have been converted to Johkasou, resulting in improvements in appearance and water quality.
- Regarding the Shigetomi Beach, although the fecal coliforms count meets the standards, the COD exceeds the standards and rating of water bathing remains level B judgment as of 2022.

19


Shigetomi Beach
Thank you for your attention!

7.3.5. 発表資料 A-2　分散型汚水処理施設の温室効果ガス（GHG）削減効果の比較，古市 昌浩 氏，公益財団法人日本環境整備教育センター　事業企画グループリーダー

Comparison of greenhouse gas (GHG) reduction effects of decentralized wastewater treatment facilities

Dr. Masahiro Furuichi
Director of Department of Education and Planning,
Japan Education Center of Environment

Outline

1. Introduction
2. Method
3. Result & Discussion
4. Summary

1. INTRODUCTION

Background

SDGs: Halve the proportion of untreated wastewater globally
Paris Agreement: Reduction of greenhouse gas (GHG) emissions
It also affects the spread of wastewater treatment facilities

※ High population density area→Centralized wastewater treatment facility
※ Low population density area→Decentralized wastewater treatment facility

Need for knowledge on the environmental impact of decentralized wastewater treatment facilities

Challenges for the diffusion of decentralized wastewater treatment facilities overseas

①Septic Tank（Widespread in the world）
➢effluent BOD: 145～912mg/L
cf: Small-scale sewage treatment facility（EU）
cf: Johkasou（Japan）
➢ Good effluent water quality

② Differences in domestic wastewater among countries and regions
➢Asian countries: 131 mg/L (low)
➢EU: 337 mg/L (High)

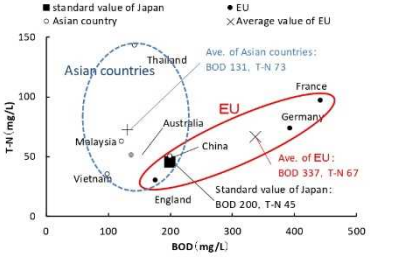


Figure -1　Characteristics of Domestic Wastewater in Japan and Overseas

1. INTRODUCTION

Necessary knowledge

- GHG emissions considering discharged pollutant load
- Environmental Impact of Decentralized wastewater treatment facilities by treatment method

Expected effect

- Widespread use of wastewater treatment facilities that aim to comprehensively reduce the environmental impact according to the region

➢ To contribute the achievement of the SDGs and the Paris Agreement

Purpose of this research

Promoting the spread of environmental load-reducing wastewater treatment facilities that both achieve the water environment conservation and prevention of global warming

Comprehensive comparison and analysis on the effect of reducing environmental impact under the same usage conditions as in the EU, where the concentration of pollutants in domestic wastewater is the highest.
➢ This makes it possible to apply it to Asian countries, etc.

2. METHODS 5

1. Setting conditions for the decentralized wastewater treatment facilities subject to environmental impact assessment

① Facility scale : Minimum PE for individual house (5 PE)
② Utilizing condition : Equivalent to performance evaluation test by EU regional standard EN12566-3+A2

Table -1 Outline of each decentralized wastewater treatment facility assumed in this presentation

Category	Classification in this study	Process of treatment	Target of the wastewater
Septic tank	Septic tank	Solid-liquid separation process	Domestic wastewater (Both Black water and Gray water)
EU type wastewater treatment facility	BOD removal type	Combination of anaerobic and aerobic treatment	
	Nitrogen removal type		
Johkasou made in Japan	Applied to overseas usage		

2. METHOD 6

2. Condition to set up a calculation model of environmental load from each decentralized wastewater treatment facility

① EU - BOD removal type (Arithmetic Mean of 3 Models: from Literature)
② EU – Nitrogen removal type (Arithmetic Mean of 5 Models: from Literature)
③ Johkasou made in Jpan applied to overseas usage (Same BOD volume load as Japanese specification)
④ Vietnam Septic tank (5 years after desludging, average 4.9 years for 37 units: from Literature)

3. Evaluation method of effluent pollutant load to water environment and sludge discharge

① testing method: Performance evaluation test according to EU standard EN12566-3+A2. With regard to the septic tank the field survey conducted (inflow conditions equivalent to EU standards)
② Monitored pollutant amount in effluent: BOD and T-N (Johkasou made in Japan applied to overseas usage was monitored by Total Kjeldahl Nitrogen)

2. METHOD 7

4. Assessment of greenhouse gas emissions

Table -2 Types and main emission sources of GHG from wastewater treatment facilities focused in this study

Types of GHG	category	Main emission sources
CO_2	＜Energy-related＞	
	A	Emissions from fuel combustion (heavy oil, kerosene, gasoline, etc.)
	B	Emissions from the use and purchase of electricity (Not include in-house power generation etc.)
CH_4	＜Non-Energy-related＞	
	C	Emissions associated with wastewater treatment (domestic wastewater treatment facility: Johkasou)
	D	Emissions from wastewater treatment (domestic wastewater treatment facility: anaerobic treatment)
	E	Emissions associated with sludge treatment (night soil treatment facility)
	F	Natural decomposition of untreated wastewater
N_2O	＜Non-Energy-related＞	
	G	Emissions associated with wastewater treatment (domestic wastewater treatment facility: Johkasou)
	H	Emissions from wastewater treatment (domestic wastewater treatment facility: anaerobic treatment)
	J	Emissions associated with sludge treatment (night soil treatment facility)
	K	Natural decomposition of effluent
	L	Natural decomposition of untreated wastewater

2. METHOD 8

Types of target GHG and scope of emissions calculation

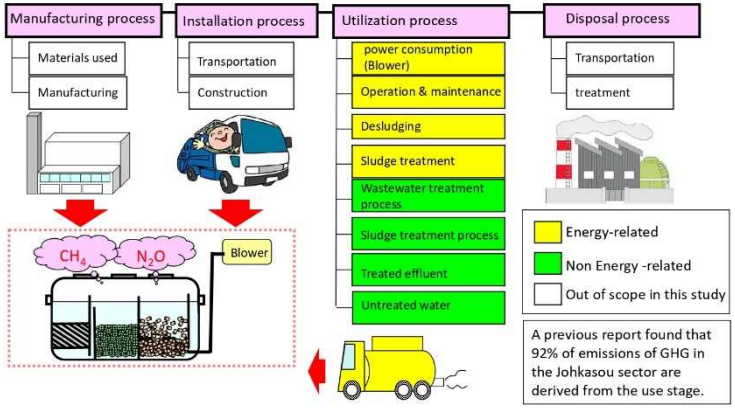


Figure -2 Activity classification by stage of decentralized wastewater treatment facility

2. METHOD 9

Table -3 Environmental load units and GHG emission factors used in calculations in this study

Item	Classification in Table 2	Environmental load unit		Unit	GHG factor
Energy -related	B	Power consumption by Blower		($kg\text{-}CO_2$/kWh)	0.555
	A	Vehicle fuel for maintenance inspection (private passenger car)		($kg\text{-}CO_2$/PE・km)	0.188
	A	Vehicle fuel for desludging (vacuum vehicle)		($kg\text{-}CO_2$/km)	0.554
	A, B	Sludge treatment		($kg\text{-}CO_2$/kL)	86
Non Energy related	C, G	Wastewater treatment process	BOD removal type	($kg\text{-}CO_2$/PE・year)	65.8
	C, G		Nitrogen removal type	($kg\text{-}CO_2$/PE・year)	62.8
	D, H		Septic tank	($kg\text{-}CO_2$/PE・year)	119.39
	E, J	Sludge treatment process	Night soil treatment plant	($kg\text{-}CO_2/m^3$)	0.551
	K	Natural decomposition of effluent		($kg\text{-}N_2O$/kg-N)	0.01
	K			($kg\text{-}CO_2$/kg-N)	2.354
	F	Natural decomposition of untreated wastewater		($kg\text{-}CO_2$/kg-BOD)	1.500
	L			($kg\text{-}CO_2$/kg-N)	2.354

① Global Warming Potential (GWP)
=> Compliant with IPCC Fourth Assessment Report (CH_4: 25, N_2O: 298)

② Emission factor of wastewater treatment process with respect to influent pollutant load difference
=> Emission Factor of Johkasou x Inflow amount of pollutant load into each facility / Inflow amount of pollutant load into Johkasou

③ Effluent from Septic tank
=> Untreated wastewater (Higher concentration than untreated domestic wastewater in Japan, BOD 180mg/L)

3. RESULT AND DISCUSSION 10

1. Establishment of an environmental load calculation model for decentralized wastewater treatment

Table -4 Environmental Load Calculation Model for Decentralized Wastewater Treatment Facilities

Item				Septic tank	BOD removal type	Nitrogen removal type	Johkasou made in Japan applied to overseas usage
Performance evaluation testing method				Field survey	EN12566-3+A2	EN12566-3+A2	EN12566-3+A2
Term of evaluation testing				4 days	38 weeks	38 weeks	63 weeks
Water temperature			(℃)	—	—	—	—
Population equivalent (PE) for treatment			(PE)	4	5	5	5
Volume of wastewater			(m^3/day)	0.451	0.750	0.750	0.780
			(L/PE・day)	112.8	150.0	150.0	155.9
Test results and specifications	BOD	Water quality of influent	(mg/L)	525	301	312	481
		Water quality of effluent	(mg/L)	378	9.0	9.7	10.7
		Inflow amount of pollutant load	(g-BOD/PE・day)	59.2	45.1	46.8	75.1
	T-N	Water quality of influent	(mg/L)	323	61	61	102
		Water quality of effluent	(mg/L)	238	54.2	7.9	20.2
		Inflow amount of pollutant load	(g-T-N/PE・day)	36.4	9.2	9.2	16.0
	Operation and maintenance	Interval	(day)	—	548	183	476
		distance travelled	(km/time)	—	11.9	11.9	11.9
	Desludging	Interval	(day)	1,825	791	365	476
		distance travelled	(km/time)	16.1	16.1	16.1	16.1
	Designed capacity		(m^3)	1.00	5.03	3.62	2.87
		Volume of removed sludge	(m^3)	1.00	2.84	2.43	2.31
	Designed power consumption		(W)	0	59	80	58
	Uptime of blower (standard)		(h)	0	20	14	24
	Annual power consumption		(kWh)	0	408	416	508

- Even in the same performance evaluation testing, the inflow BOD concentration varied from 301 to 481mg/L (concentration has not been adjusted)
- Unification of inflow water quality is difficult. The model shown above is based on the results of the same test method

3. RESULT AND DISCUSSION 11

2. Pollution load discharged into the water environment from wastewater treatment facilities

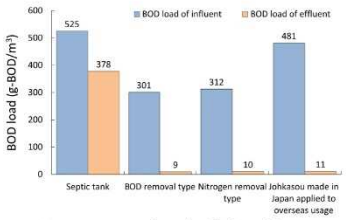


Figure -3 Amount of BOD load discharged from decentralized wastewater treatment facilities (per m^3)

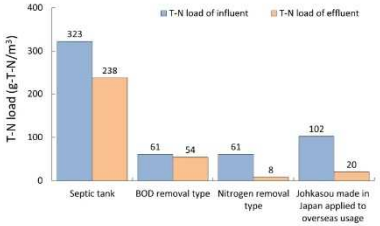


Figure -4 Amount of T-N load discharged from decentralized wastewater treatment facilities (per m^3)

BOD load of effluent (per m^3)
- Septic tank : 378g-BOD/m^3
  - 34 to 42 times higher environmental impact than other facilities
- other facilities: 9～10g-BOD/ m^3

T-N load of effluent (per m^3)
- Septic tank : 238g-T-N/ m^3
  - Large amount of load inflow but low removal ratio
- Nitrogen removal type and Johkasou made in Japan applied to overseas usage : lower than 20g-T-N/ m^3

- The amount of BOD polluted discharged from the septic tank suggested the impact on the ecosystem and water environment.
- To reduce the amount of T-N load, Nitrogen removal type and Johkasou made in Japan applied to overseas usage are considered to be useful.

3. RESULT AND DISCUSSION 12

3. Evaluation of GHG emissions from decentralized wastewater treatment plant

Table-5 GHG emissions (CO2 equivalent) per 5 PE of decentralized sewage treatment facility

Item				Field survey	EN12566-3+A2		
				Septic taank	BOD removal type	Nitrogen removal type	Johkasou made in Japan applied to overseas usage
Water temperature			(℃)	—	—	—	—
Population equivalent (PE) for treatment			(PE)	5	5	5	5
Energy - related	Power consumption by Blower		($kg\text{-}CO_2$/unit・year)	0.0	226.3	230.9	282.0
	Operation and Maintenance			0.0	1.5	4.5	1.7
	Desludging			1.8	4.1	8.9	6.8
	Sludge treatment			21.5	112.7	208.7	152.3
	Subtotal			23.3	344.7	453.0	442.9
Non Energy - related	Wastewater treatment process			597.0	362.3	339.4	570.6
	Sludge treatment process			0.1	0.7	1.3	1.0
	Natural decomposition of effluent			0.0	34.9	5.1	13.5
	Natural decomposition of untreated wastewater			231.7	0.0	0.0	0.0
	Subtotal			828.8	398.0	345.9	585.1
合計				852.0	742.7	798.9	1,028.0

- Septic tanks have a small amount of Energy -related GHG emission, however have the largest Non energy-related GHG emission.
- The BOD removal type (742.7 kg-CO2/unit/year) has the lowest GHG emissions, and Johkasou made in Japan applied to overseas usage has the largest GHG emission.

Inflow pollutant load and outflow pollutant load differ depending on the test.
- It is necessary to compare GHG emissions taking into account wastewater treatment capacity.

3. Result and Discussion 13

Comparison of GHG emissions considering inflow/outflow water quality (per kg BOD removed)

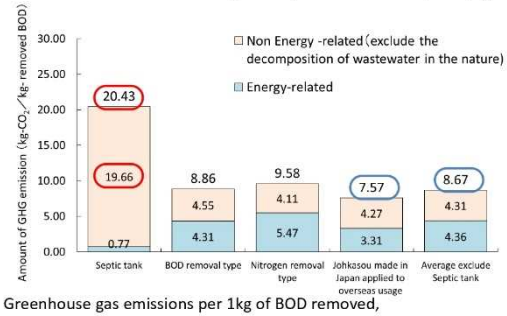


Figure -5 Greenhouse gas emissions per 1kg of BOD removed, excluding the decomposition of wastewater in the natural (CO^2 conversion)

- Johkasou made in Japan applied to overseas usage has the smallest GHG emission(7.57 kg-CO2／kg-removed BOD)
- Septic tank has a 2.7 times higher GHG emission (20.43 kg-CO2/kg-removed BOD) compared with Johkasou made in Japan applied to overseas usage.
  - This might be due to the low BOD removal capacity and high GHG emissions in the wastewater treatment process.
- The average value of GHG emissions for BOD removal type, nitrogen removal type, and Johkasou made in Japan applied to overseas usage (exclude Septic tank) is 8.67 kg-CO2/kg-removed BOD.
  - It's only 42% of septic tank emission when considering inflow/outflow water quality

4. Summary 15

From the perspective of the international wide spread of decentralized wastewater treatment facilities, with regard to the environmental impact, the amount of discharged pollutant load and the amount GHG emissions was studied in this research, and the following results were obtained.

1. The amount of BOD contamination in the effluent from the septic tank was 34 to 42 times higher than that of other facilities, giving a high environmental impact.
2. The amount of GHG emissions per unit was the lowest for the EU-BOD removal type.
3. Considering the wastewater treatment capacity of each facility, the amount of GHG emissions per removed BOD was the lowest for Johkasou made in Japan applied to overseas usage
4. The average value of GHG emissions per removed BOD for facilities applying combination of anaerobic and aerobic treatments was 42% of that of Septic tank, and 34% of that of septic tanks when considering natural decomposition of effluent / untreated wastewater

3. Result and Discussion 14

Comparison of GHG emissions considering natural decomposition of effluent / untreated wastewater

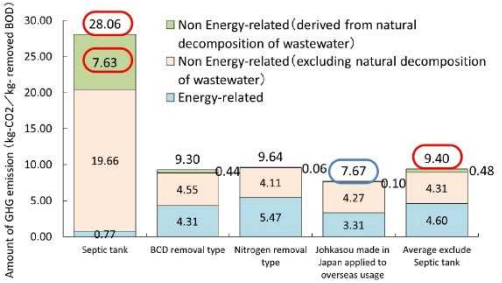


Figure -6 GHG emissions per 1kg of BOD removed considering natural decomposition of effluent / untreated wastewater (CO2 equivalent)

- Johkasou made in Japan applied to overseas usage has the smallest GHG emission (7.67kg-CO2／kg- removed BOD)
- Septic tank has a 3.7 times higher GHG emission (28.06 kg-CO2/kg-removed BOD) compared with Johkasou made in Japan applied to overseas usage.
  - It would be pollutant load contained in effluent from Septic tanks is high.
- The average value of GHG emissions for BOD removal type, nitrogen removal type, and Johkasou made in Japan applied to overseas usage (exclude Septic tank) is 9.40kg-CO_2／kg- removed BOD.
  - It's only 34% (1/3) of septic tank emission when considering inflow/outflow water quality.

16

Thank you for your attention!

7.3.6. 発表資料 B-1　良好な水辺環境の有効活用事例, 井上 昌樹 氏 埼玉県環境部水環境課 浄化槽・豊かな川づくり担当 主幹, 石野 剛史 氏 埼玉県県土整備部河川環境課 河川環境担当 主幹

Next 川の再生

The 10th International Workshop on Decentralized Domestic Wastewater Treatment in Asia
4th November, 2022

B-1 EXAMPLE OF EFFECTIVE USE OF A GOOD WATERSIDE ENVIRONMENT

There is no sea, but there is the river!
River-Rich Prefecture of Saitama

From the restoration of river to
"Next-river restoration" & "SAITAMA River Supporters Project "

—Conservation & symbiosis of rivers, and sustainable utilization of river spaces in cooperation with private sectors —

川の国 埼玉

Next 川の再生

Background

Growing needs for river restoration

A river whose water quality is deteriorating due to rapid urbanization

Rivers where flood control is prioritized and the thrown away garbage are neglected

There are two rivers with water quality that ranks among the top worst 5 in Japan.

FY	Rank	District / name of river (name of river system)	Prefecture	BOD (mg/L) Average	BOD (mg/L) 75 %value
2008	1	Kanto / Ayase river (Tone river system)	Saitama, Tokyo	3.9	4.5
	2	Kinki / Yamato river (Yamato river system)	Osaka, Nara	3.7	3.7
	3	Kinki / Ina river (Yodo river system)	Osaka, Hyogo	3.6	4.6
	4	Kanto / Naka river (Tone river system)	Saitama, Tokyo	3.6	4.3
	5	Kanto / Tsurumi river (Tsurumi river system)	Kanagawa	3.2	3.9
2007	1	Kinki / Yamato river (Yamato river system)	Osaka, Nara	4.7	5.5
	2	Kanto / Ayase river (Tone river system)	Saitama, Tokyo	4.2	4.6
	3	Kanto / Naka river (Tone river system)	Saitama, Tokyo	3.8	3.9
	4	Kanto / Tsurumi river (Tsurumi river system)	Kanagawa	3.6	5.5
	5	Kinki / Ina river (Yodo river system)	Osaka, Hyogo	3.3	3.9

Source： Ministry of Land, Infrastructure, Transport and Tourism

川の国 埼玉 2

Next 川の再生

Background

Actually, Saitama Prefecture has high potential of river

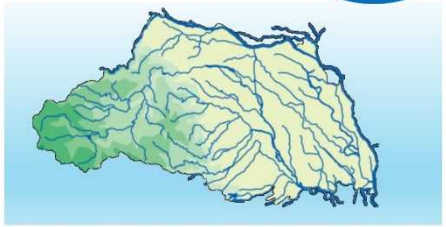
The Arakawa River is the widest in Japan

The widest in Japan

River width (Distance between dikes) of Arakawa river is 2,537 m. *in normal times

The ratio of the river area to the prefectural land is 3.9%

2nd place nationwide



川の国 埼玉 3

Next 川の再生

Former history of "River restoration"

Starting in 2008, "River Restoration" was launched as a Saitama government-wide project.

Hop
① create a mood for public opinion

From FY 2008

Certainly improved
100 waterfront had been improved in 4 years
"Riverside Revitalization 100 Plan"

Became a movement involving the citizen.

Support for the "River Country Cheering Team"

Issuance of "Kawa no Kuni love Prefectural Bonds"

Step
② expansion and dissemination

From FY 2012

Development of 17 rivers from upstream to downstream
"Whole River Restoration Project"

Development of 28 bases in cooperation with tourism
"River-Rich Prefecture of Saitama Lively Project"

The number of riversite used for commercial purposes is the largest in Japan.

Open river space: 16 places
"Waterside Space Thorough Utilization Project"

(continue)

(～ FY 2015)

Jump
③further development

From FY 2021

Promotion of Saitama version SDGs
Selected as an SDGs Future City (May 2021)

Next-river restoration
"Business venture challenge at the waterside "

SAITAMA River Supporters Project
"River Supporters"

川の国 埼玉 4

Next 川の再生

New initiative “Next-river restoration” & “River Supporters”

Custom-made waterfront design

Next-river restoration･Business venture challenge at the waterside

Cooperation

Toward sustainable efforts in three aspects: environment, society, and economy

Revitalization of activities of companies, individuals and organizations

SAITAMA River Supporters Project

Creation of an attractive waterside space

Synergy

Raise awareness to love, protect and nurture rivers

A virtuous circle where people love the river, raise awareness of protecting and nurturing it, and people gather in attractive waterfront spaces.

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Feature and Benefit of “Next-river restoration” & “River Supporters”

Participation of Diverse Entities ~Companies/Organizations/Citizens~

Public-private partnership/ Business-to-business exchange

Collaborative Activities of Diverse Entities

Responding to social changes ~COVID-19 pandemic/DX~

Growing interest in outdoor work

Use of SNS for information dissemination

Creation of regional development and prosperity

Sustainability Guarantee /Management Perspective

Cooperation with private business operators from the planning stage

Fostering environmental awareness

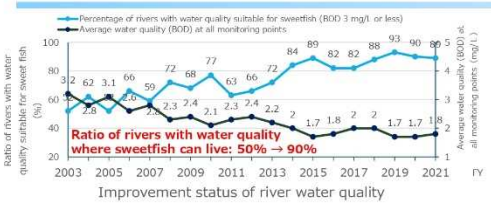
Valuable open space / familiar nature in urban areas

Place for environmental learning

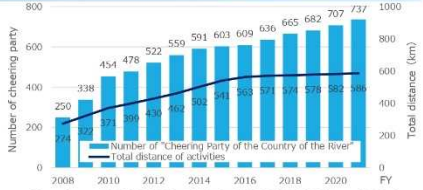
Next 川の再生

Achievements

Results of water quality improvement and local activities through “river restoration”



Improvement status of river water quality



Number of “SAITAMA RIVER SUPPORTERS” and Total distance of activities

Achievement of “River Supporters”

Number of supporter (As of August, 2022)	
Individual supporter	5,770 persons
Cooperate supporter	277 companies
Group supporter (SAITAMA RIVER SUPPORTERS)	753 groups

Number of matching achievements between companies (FY 2021) : 51

Good practice of “River Supporters” matching

Next 川の再生

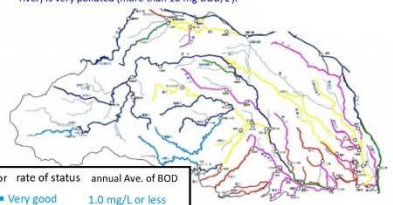
Achievements

Water quality improvement by “River restoration”

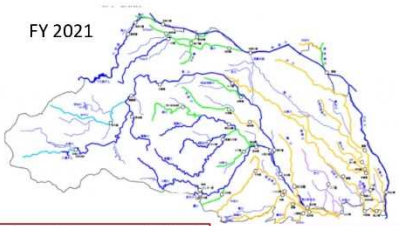
Designation status of river water quality types in Saitama Prefecture

- West part of Saitama Prefecture (Chichibu area) is relatively has good water quality (less than 2 mg-BOD/L).
- Southeast part of Saitama Prefecture (downstream of river) is very polluted (more than 10 mg-BOD/L).

FY 1990



FY 2021



color	rate of status	annual Ave. of BOD
	Very good	1.0 mg/L or less
	good	2.0 mg/L or less
	moderate	3.0 mg/L or less
	little polluted	5.0 mg/L or less
	polluted	10 mg/L or less
	very polluted	10 mg/L or more

Environmental standard achievement ratio (BOD based)
- Average of Japan : 94 % (FY 2021)
- Saitama Prefecture: 95 % (FY 2021)
  (FYI, 100 % at FY 2016)

A long-term improvement trend can be observed, however continuous efforts are important.

Next
川の再生

Achievements

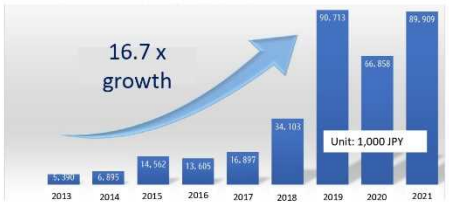
Achievement of Open river space (Waterside Space Thorough Utilization Project)

Tourist arrivals increased by 340,000

Annual sales: 90 million yen

"Waterside Space Thorough Utilization Project"
Number of facilities and number of tourist arrivals
(April to March of FY)

"Waterside Space Thorough Utilization Project"
Annual facility sales (April to March of FY)
* Total sales of 11 facilities excluding 3 facilities whose operating sales are not disclosed



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Achievements

New employment and increasing the profit

Iruma River (Sayama City)
Japan's first Starbucks coffee shop on the riverbed has opened.
Number of visitors: 240,000 people / year
5th sales in Kanto area of Japan (As of May 2021)

Toki River (Tokigawa town)
A special space like a private riverbed
Popular glamping sites
Saturdays and Sundays are fully booked,
Celebrities also visit incognito.

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Further development: Increase the river lovers

Disseminating the charm of the river to the whole country

Create custom-made attractive waterfronts in various parts of the prefecture and disseminate information about "River-Rich Prefecture of Saitama", to the whole country

Image of utilization of Koshigaya Lake Town

The city and the private sector conclude an agreement

Raising interest in rivers through various opportunities

Efforts such as "River-cycle" or "River Pup" etc., to get citizens to love the river more.

cleaning/beautification activities in conjunction with riverside activities

"River-cycle"

"River Pup"

Utilization of DX

Create a riverside in virtual space, and hold a live performed by a tourism ambassador. 700 people attended. (Development of new supporters)

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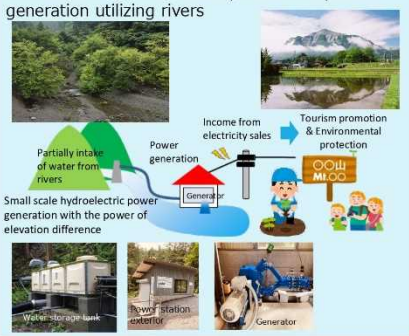
Further development: Fostering environmental awareness

Marine pollution countermeasures

Preventing marine plastic pollution by picking up garbage from rivers (supporting activity groups)

Contribution to carbon neutrality

Introduction of small scale hydroelectric power generation utilizing rivers



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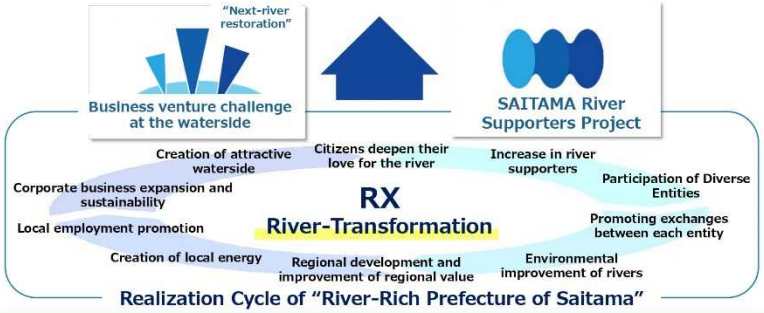
Realization of a platinum society through symbiosis with rivers

There is no sea, but there are the best rivers!

Realizing "River-Rich Prefecture of Saitama" both in name and reality, and passing it on to the next generation



Next
川の再生

Thank you for listening!

Saitama Prefecture Mascots "Kobaton" and "Saitamattchi"

7.3.7. 発表資料 B-2 国としての生活雑排水処理への取組について，大和田 莉央 氏，環境省 環境再生・資源循環局 廃棄物適正処理推進課 浄化槽推進室 指導普及係長

Governmental approach for the treatment of gray water by using Johkasou

4th November, 2022

Ms. Rio OWADA
Section Chief, Office for Promotion of Johkasou

Dr. Johkasou

環境省
Ministry of the Environment
Government of Japan

Office for Promotion of Johkasou
Waste Management Division
Environmental Regeneration and Material Cycles Bureau
Ministry of the Environment
Government of JAPAN

Introduction of Japanese regulation on the decentralized wastewater management

1

Table of contents

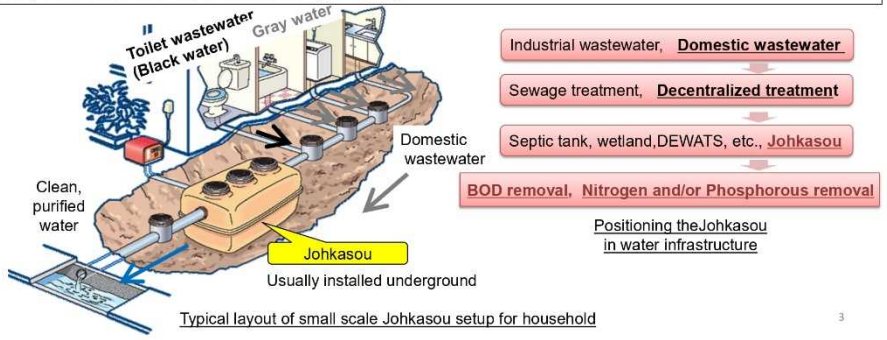
Table of content

1. Introduction
2. Legal Framework of Johkasou
3. Treatment of Gray water
   by old type and current Johkasou
4. Measures for promoting Johkasou with including
   the conversion from old type to current ones

2

1. Introduction

- "Johkasou" is categorized as decentralized wastewater treatment system for domestic wastewater discharged by household, apartment and so-on and it can be installed beside these building structure without long pipeline.
- Johkasou have a combined purification structure capable of treating both toilet wastewater (Black water) and domestic wastewater other than toilet wastewater (Gray water).
- Johkasou attains high and stable performance as same as that of sewage treatment plant. And, Johkasou is certified by the government for performance and maintainability, and it is manufactured in factory with adequate quality control. As a result, it has extremely reliability.



Industrial wastewater, **Domestic wastewater**

Sewage treatment, **Decentralized treatment**

Septic tank, wetland,DEWATS, etc., **Johkasou**

BOD removal, Nitrogen and/or Phosphorous removal

Positioning theJohkasou in water infrastructure

Typical layout of small scale Johkasou setup for household

3

1. Introduction

- **Water pollution in Japan during rapid economic growth**

Sumida River (Tokyo) In '1970s

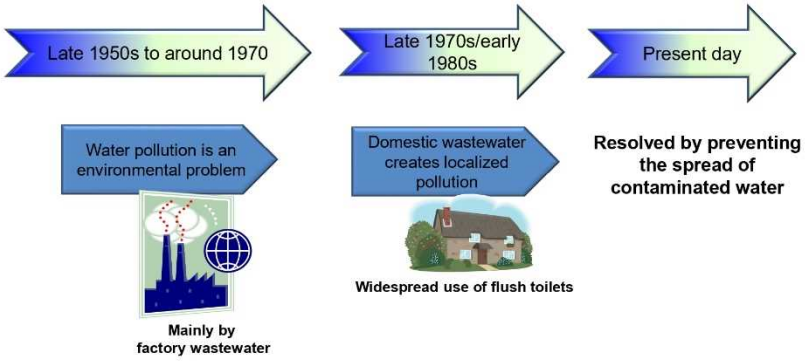
Dohkai Bay (Kitakyushu) in '1960s

Chofu Weir, Tama River (Tokyo) in '1970

5

1. Introduction

■ **Domestic wastewater issues and outcomes over time**



6

2. Legal framework of Johkasou

■ **History of Johkasou Act**

Year	Item
1960 to around 1980	With increasing population of flush toilet, rapid installation of tandoku (old type) Johkasou to treat black water only
1983	Johkasou Act enacted (legislation introduced by a Diet member, came into force in 1985)
2000	Amendment: New installation of tandoku-shori (old type) Johkasou was prohibited
2005	Amendment: Stricter water quality management systems introduced
2019	Amendment: ➢ Strengthening the authority of prefectural governors for conversion from tandoku Johkasou (old type) to gappei Johkasou (current type) ➢ Clarification for proceeding Johkasou installation as a public works ➢ Others

■ **Purpose of Johkasou Act**

- ✓ Promotion of domestic wastewater (both black and gray water) treatment by Johkasou for; Conservation of water quality in public water area,
- ✓ Preservation of the living environment
- ✓ Improvement of public health

7

2. Legal framework of Johkasou

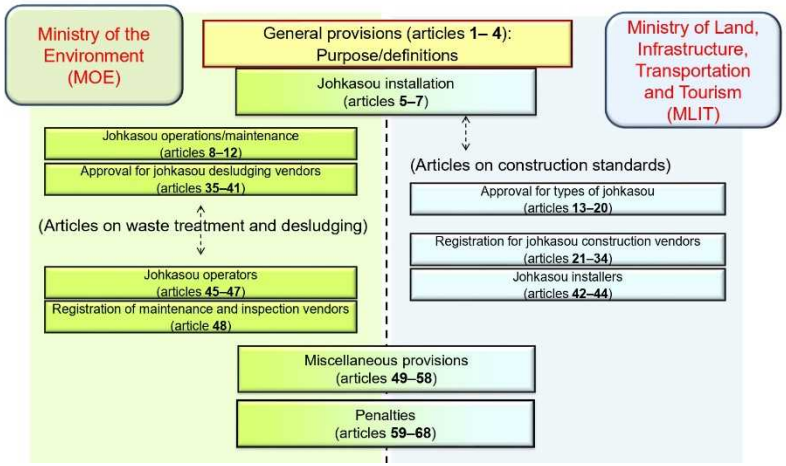
■ **Structure of Johkasou Act**

1) Johkasou's manufacture and sales
2) Johkasou's notification of installation
3) Johkasou's installation and certification system of installation engineer
4) Johkasou's report of start date to use
5) Johkasou's operation
6) Johkasou's water quality inspection after installation
7) Johkasou's maintenance and certification system of maintenance engineer
8) Johkasou's desludge (Cleaning)
9) Johkasou's periodical check
10) Penalties for violating the Johkasou Act

8

2. Legal framework of Johkasou

■ **Outline of each article from 1 (one) to 68 (sixty eight) and its jurisdiction in Johkasou Act**



9

3. Treatment of Gray water in old type and current Johkasou

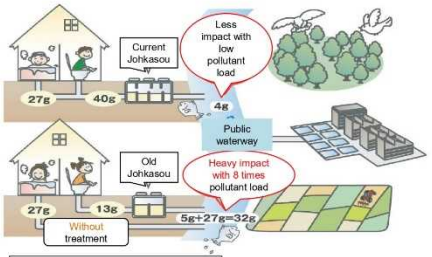
■ **What is domestic wastewater?**
Domestic wastewater = Toilet wastewater (Black water) + Gray water

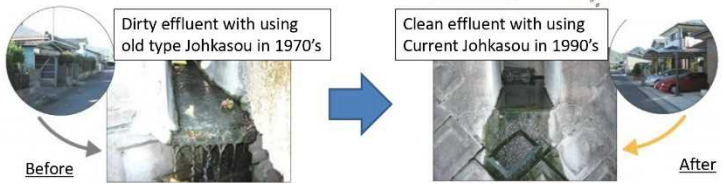
O Cutrrent Johkasou
(Called "Gappei Johkasou")
Both Toilet wastewater & Gray water are treated.

BOD Load
= 4g/day·PE
in Effluent

× Old type Johkasou
(called "Tandoku Johkasou")
Only Toilet wastewater is treated.
⇒ Heavy impact with 8 times

BOD Load
= 32g/day·PE
in Effluent



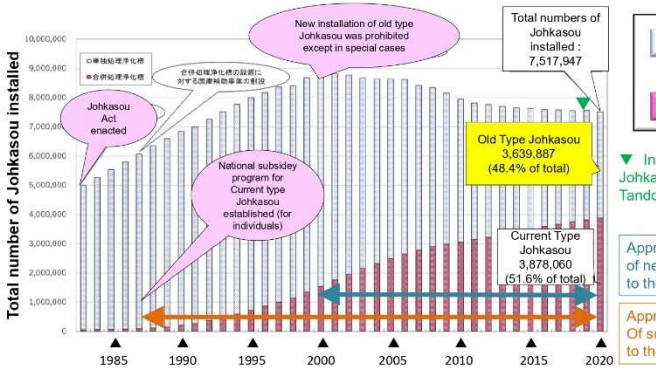


10

3. Treatment of Gray water in old type and current Johkasou

■ **Configuration of old (Tandoku Johkasou) & current Johkasou (Gappei Johkasou)**

- Though new installation of old type Johkasou (Tandoku Johkasou) was prohibited at 2000, approx. 3.6 million sets of old type Johkasou are still used in Japan.
- Encouraging the conversion to Current Type Johkasou is a big challenge.



▼ In 2019, the total number of Gappei Johkasou exceeded & reversed that of Tandoku Johkasou for the first time

Approx. 20 years from the prohibition of new installation for Tandoku Johkasou to the reversal year 2019

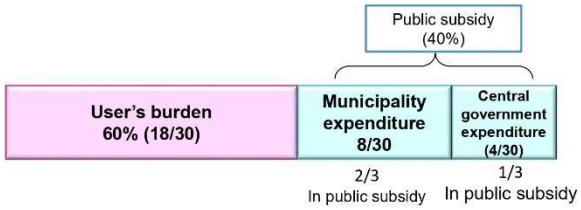
Approx. 30 years from the establishment Of subsidy program for Gappei Johkasou to the reversal year 2019

11

4. Measures for promoting Johkasou with including the conversion from old type to current one

■ **Subsidy for Johkasou private installation for house owner**

■ Subsidizes municipalities supporting their residents (private citizens) with current Johkasou (Gappei Johkasou) installation for equipment fee and its installation fee

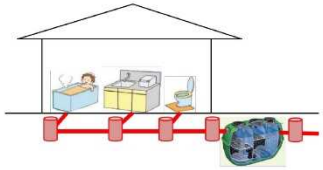


■Since 1987
■Owner of Johkasou is responsible for operation and maintenance.

12

4. Measures for promoting Johkasou with including the conversion from old type to current one

■ **Additional subsidy for installing in-house piping works at the conversion from old type Johkasou to current Johkasou**



● Subsidizes municipalities supporting their residents (private citizens) for in-house piping work

■ **Furnishing the conversion manual**

13

4. Measures for promoting Johkasou with including the conversion from old type to current one

Ref: 300 projects as of 2016 (total municipalities in Japan 1,718 as of 2021)

■ **Municipal Installation Project**

- Municipal installs Johkasou as a public infrastructure like a Sewage treatment system
- Municipal also carries out O&M works with collecting fee from house owners.

User's burden 10% (3/30)	Municipality expenditure (Local bond can be applied) (17/30)	Central government expenditure (10/30)

☐ Advantage:
If applying this scheme, it would be more easier to convert old type Johkasou to current one due to municipality implement the conversion at once where many old type Johkasou are still remained.

☐ Disadvantage:
Responsibility for finance and management would be a burden of Municipalities.

14

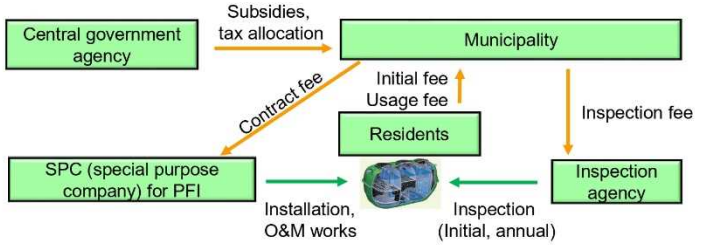
4. Measures for promoting Johkasou with including the conversion from old type to current one

■ **Application of Johkasou PFI project in Japan**

Type of PFI scheme is "BTO" (Built, Transfer and Operate)

Disadvantage of Johkasou Municipal Installation Project
- Increase of financial burden on municipalities
- Increase of workload on municipalities without enough human-resource

Advantage of Johkasou PFI projects
- PFI operators are responsible for installation, operation and maintenance.
- Municipalities can utilize private financing, technology and know-how on business.
- Decrease of overall project cost and workload on municipalities, and improvement of residential services due to the bulk contract and implementation by private business.

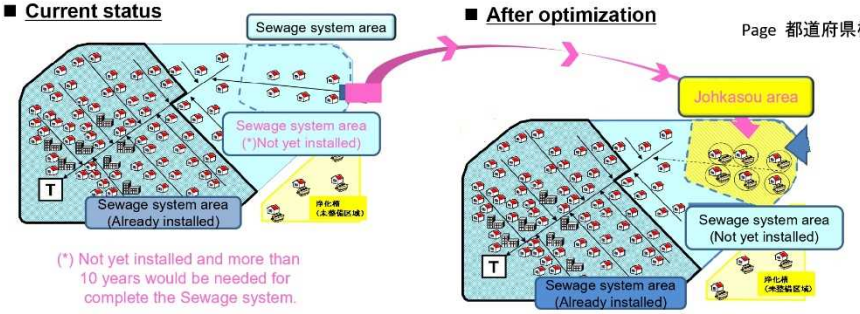


15

4. Measures for promoting Johkasou with including the conversion from old type to current one

■ **Current status** ■ **After optimization**

Page 都道府県構想



(*) Not yet installed and more than 10 years would be needed for complete the Sewage system.

■ **Countermeasure:** Collaborating with Municipalities, Prefectures shall revise and optimize the area-plan for sustainable management of domestic wastewater. Then, some area would be changed from Sewage system area to Johkasou installation area.

(As of July 2020, 52 municipalities have optimized the area-plan)

16

4. Measures for promoting Johkasou with including the conversion from old type to current one

■ Annual amount for operation & maintenance works for usual 5 P.E. Johkasou in Japan

1 US$ = 140 JPY

Item	Amount (Approx.)
Operation & Maintenance works for 5 P.E. Johkasou Item — Frequency, etc. for 5 P.E. Johkasou ● Maintenance work (3 times/year) ● Desludging work (1 time/year) ● Legal inspection (1 time/year) ● (Electrical consumption fee) (Continuous use) ● (Equipment replacement fee) (Average per year)	US$ 430/year

17

4. Measures for promoting Johkasou with including the conversion from old type to current one

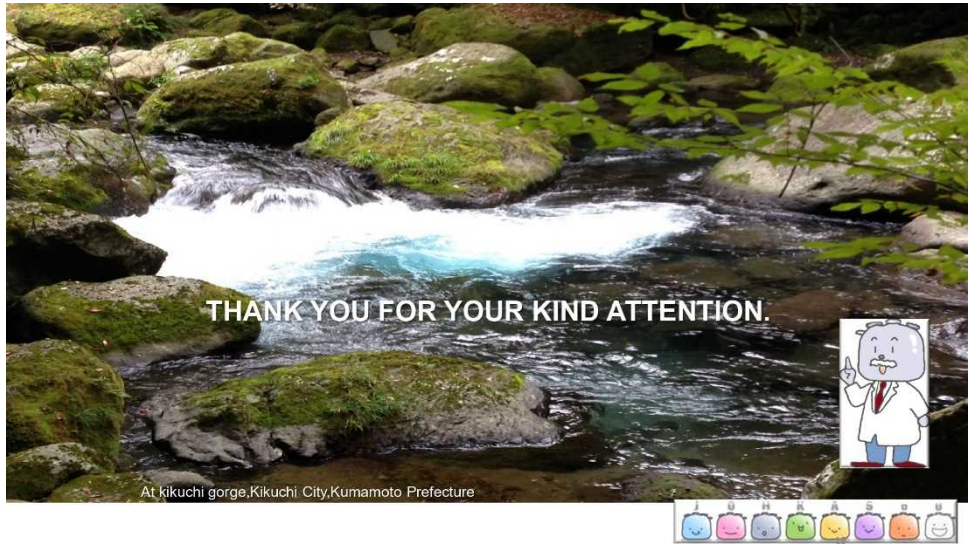
■ Example of Municipal Subsidies for Maintenance and Operation, Alphabetical order

M: Maintenance, C: Cleaning, LI: Legal Inspection

Name of Municipality	Subjects of Subsidy	Amount of Subsidy (Approx. US$)
Fujisawa City, Kanagawa Pref.	Cleaning	Approx. US$ 20 in case of 2m3 plus Approx. US$ 7 x (α(m3) – 2m3)
Fukaya City, Saitama City	M, C	Approx. US$ 140
Fukuroi City, Shizuoka Pref.	M, C, LI	(M+C+LI of Johkasou) – Sewage usage fee (assuming)
Iida City, Nagano Pref.	Cleaning	Min (Approx. US$ 110, or half of Cleaning fee)
Kakogawa City, Hyogo Pref.	M, C, LI	Approx. US$ 140
Kawagoe City, Saitama Pref.	Legal Inspection	Approx. US$ 50
Kiyosu City, Ehime Pref.	Cleaning	40% of cleaning fee
Kumagaya City, Saitama Pref.	M, C, LI	Approx. US$ 110 in case of 5 P.E.
Machida City, Tokyo Metropolitan	M, C, LI	Approx. US$ 140 in case of 5P.E.
Matsumoto City, Nagano Pref.	Cleaning	Half of Cleaning fee, Maximum Approx. US$ 140
Mitoyo City, Kagawa Pref.	M, C, LI	Approx. US$ 210
Ogose Town, Saitama Pref.	M, LI	Approx. US$ 70
Tachika City, Tokyo Metr.	Cleaning	Around Approx. US$ 70 (depended on tank volume)
Tatebayashi City, Gunma Pref.	Cleaning	Approx. US$ 70 in case of 5 P.E.
Yokkaichi City, Mie Pref.	M, C, LI	Appox. US$ 90 in case of 5P.E.

18

1 US$ = 140 JPY



7.3.8. 発表資料 B-3　日本とベトナムの下水道分野における PPP に関する政策と現状, 田本 典秀 氏, ベトナム国建設省　下水道政策アドバイザー JICA 専門家

Current Status and Policy on PPP in the Sewerage Sector in Japan and Vietnam

Norihide TAMOTO
JICA Expert (Sewerage Policy Advisor)
in Ministry of Construction, Vietnam

November 2022

1

Contents

1. Current status of sewerage projects in Vietnam
2. PPP projects in Japan
3. Challenges for PPP sewerage projects in Vietnam
4. Conclusion

2

1. Current status of sewerage projects in Vietnam

3

Rivers in Hanoi

To Lich River

Lu River

Photo by: Takatoshi WAKO

Thuy Khue Channel

4

Surface Water Quality in Vietnam (Ammonia as an example)

- The water quality of surface water bodies are significantly exceeding the standard value in the national regulation.

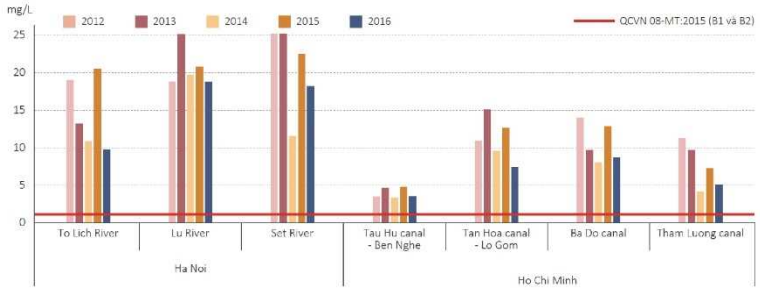


Figure 2.13.7. Changes in Ammonia content in some inner rivers, canals in Hanoi and Ho Chi Minh in the period of 2012–2016 (Source: MONRE 2016)

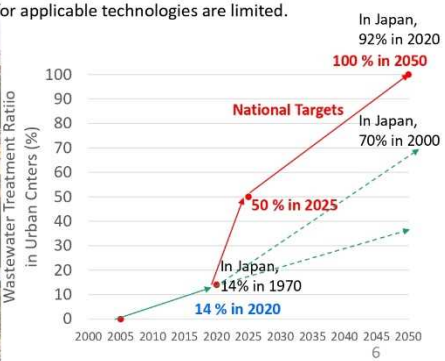
Data source: WEPA Outlook on Water Environmental Management in ASIA 2018
http://wepa-db.net/3rd/en/publication/2018_outlook/wepa_outlook_report_2018_en.pdf

5

Wastewater Treatment Ratio (Only 14% in 2020)

- About only 14% of urban wastewater volume is collected and treated, which is far behind from the national target to achieve wastewater treatment ratio in urban centres of 50 % by 2025 and 100% by 2050 respectively.
- It seems to be difficult to reach the target by continuing the current trajectory under the situation where investment resources and choices for applicable technologies are limited.

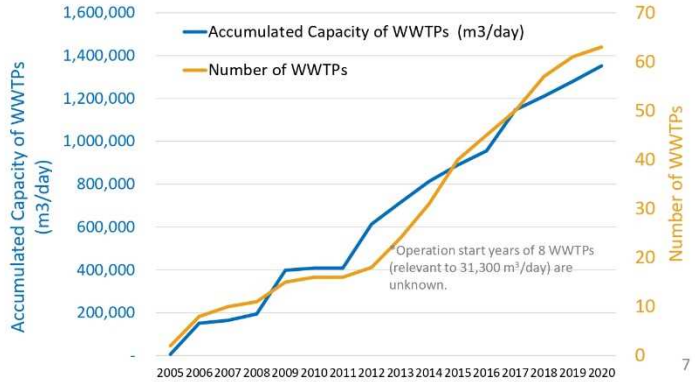

Wastewater is discharged through combined sewer system into rivers
(To Lich River in Hanoi City 9 Jan. 2019)



6

Development of Sewerage System (71 plants under operation)

- As of the end of 2020, 71 centralized WTTPs are under operation with total capacity of 1,383,000 m^3/day in 36 centrally run cities and provinces since the first small-scaled WWTP in Hanoi city started operation in 2005



7

Projects Under Construction (80 plants under design/construction)

- About 80 WWTPs are under design/construction; it is expected that total capacity of wastewater treatment would increase by 3 million m^3/day.

- Yen Xa WWTP in Ha Noi City
- CAS, 270,000m^3/day, JICA, Under construction
- Pipe jacking is adopted

(Photo: JFE Engineering, 2022)

- Binh Hung WWTP in Ho Chi Minh City
- CAS, 141,000 +**328,000** -> 469,000m^3/day, JICA
- Pipe jacking is adopted

(Photo by : Mr. Ibaraki, JICA Expert, Feb. 2019)

8

Difficulties and Challenges in Wastewater Management in Vietnam

1. **Poor qualities of sewer network and House connection**

   Causing inefficient wastewater collection, ineffective water environment improvement and less volume and concentration of Inflow leading poor performance of invested WWTPs.

2. **Poor sludge and septage management**

   The volume of sludge are estimated to rapidly increase.

3. **Lower pollution load in influent to WWTP**

   Use of septic tanks and poor quality of sewer networks make the pollution load lower, and difficult to estimate the pollution load.

4. **Requirement of Wastewater treatment level**

   Removal of Nitrogen and Phosphorus is required for every WWTP.

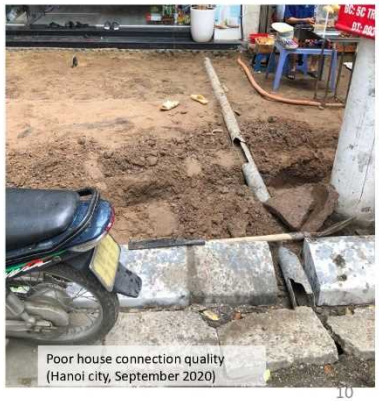
5. **Application of Drainage Service Price**

   Expected to be accelerated to improve financial condition of sewerage management.

Issues of Sewer Networks and House Connection

- Existing sewer networks and house connection quality is poor, which cause wastewater infiltration into the ground and dilution of wastewater.

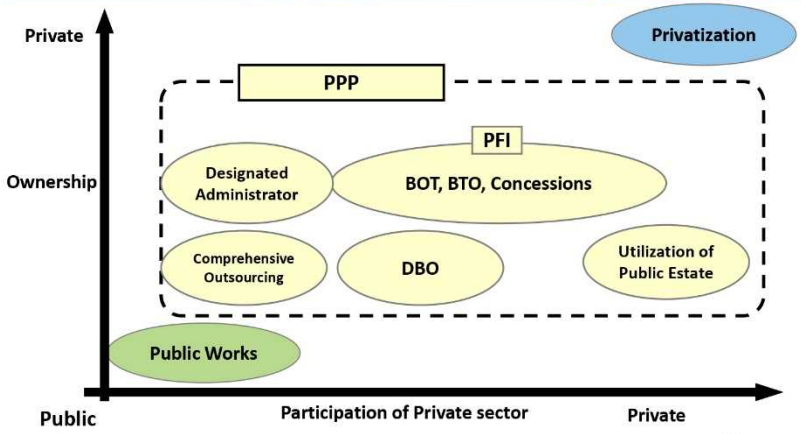
Street drain is used as a part of combined sewer network (Hanoi city, November 2020)



Poor house connection quality (Hanoi city, September 2020)

2. PPP projects in Japan

Forms of Private Sector Participation



Source: Ministry of Land, Infrastructure, Transport and Tourism of Japan (Translated by JICA expert)

Background of Promoting PPP Projects in Sewerage Sector in Japan

Decreasing Population and Tariff Income

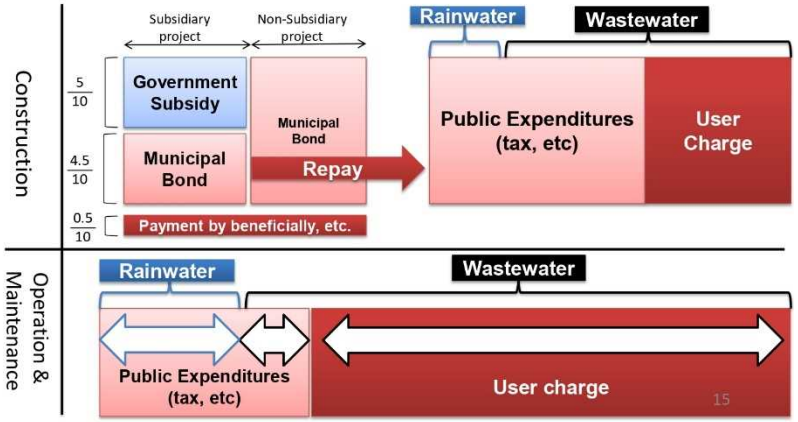
Decreasing Human Resources in Municipalities
(Number of employees is currently about 2/3 of those in 1997)

Large Demand for Replacement and Rehabilitation of Deteriorated Pipelines and Facilities

13

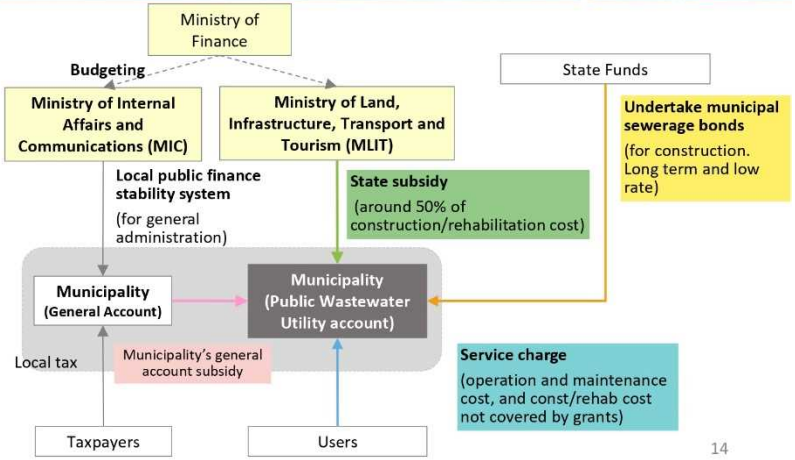
Financial system of sewage works in Japan

- Sewage works are implemented by the state and local budget, and user charge appropriately.



15

Funds for managing sewerage works in Japan



14

Current Situation PPP Projects in Sewerage Sector in Japan

(As of JFY 2018)	WWTPs (2,166plats in Japan)	Pumping stations (3,676stations in Japan)	Pipelines (470,000km in Japan)
Comprehensive Outsourcing	471 plants (252cities)	652stns (124cities)	29 (20Cites)
Designated Administration	60 plants (20 cities)		
DBO	24 plants (20 cities)	1 station (1city)	
PFI (Conventional)	11 plants (7 cities)		
PFI (Concession)	2 plants (2 cities)	2 stations (1city)	1 (1city)

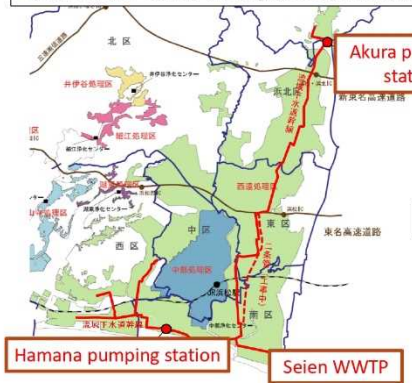
Example of DBO (Carbonized fuel production at Kosei WWTP in Shiga Pref.)

Example of PFI (Resource Recovering Project (Power generation and carbonized fuel production) in Toyohashi City)

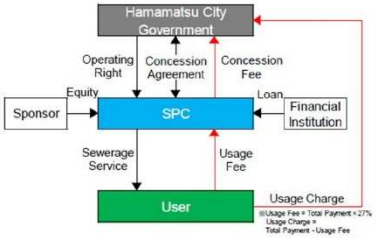
16

Sewage concession in Hamamatsu City (SEIEN WWTP)

- A 20-year concession of the plant and 2 pump stations is **the first case of water sector concession in Japan.(Concession operation started in April 2018)**
- SEIEN WWTP covers the largest treatment area that treat 60% of wastewater in the City.



-Project Scheme-



3. Challenges for PPP sewerage projects in Vietnam

Vietnam needs more private investment in Sewerage sector.
But is it attractive for investors?

SAIGON ONLINE

National | Ho Chi Minh City | International | Business | Health | Education | Sports | Culture/art | Law | Science/technolog

NATIONAL

Vietnam should use more PPP in wastewater treatment

SGGP - Monday, September 12, 2022 10:30

The promotion of public-private partnership (PPP) in wastewater treatment of Vietnam is a promising measure to address the limit of national budget and effectively mobilize rich resources in the private sector.

Nhieu Loc – Thi Nghe Wastewater Treatment in Binh Thanh District of HCMC

The Natural Resources and Environment Ministry has informed that the volume of household sewage in urban areas in Vietnam now is at 3,650m³ a day, yet only 12-14 percent of that amount is collected and treated properly. Among 846 urban areas nationwide, only 38 possess special facilities for sewage processing, accounting for 4.4 percent. The proportions of treated wastewater in Hanoi, HCMC, and Da Nang City are 22 percent, 21.2 percent, and 33 percent, respectively. 53 out of 69 sewage treatment facilities in Vietnam use the Official Development Assistance (ODA) capital and 2 follow the PPP model.

Saigon News
September 12, 2022
(https://www.sggpnews.org.vn/national/vietnam-should-use-more-ppp-in-wastewater-treatment-101849.html)

PPP projects in sewerage sector in Vietnam (as of 2021)

No.	Project name	Location	Total investment costs (billion VND)	Contract type
1	Wastewater treatment system of Tu Son town (phase 1) including Component 1 (wastewater treatment plant) and Component 2 (wastewater collection system)	Bac Ninh	902,730	BT
2	Construction of Van Mieu's reservoir	Bac Ninh	299,740	BT
3	Renovation and Upgrading the drainage system of Phu Hoa lake (Project proposed by the investor)	Binh Dinh	651	BT
4	Ha Thanh water treatment plant project (Project proposed by investor)	Binh Dinh	119,752	BOO
5	Wastewater treatment station in West Lake area	Ha Noi	600,280	BT
6	Yen So wastewater treatment station	Ha Noi	6,224.5	BT
7	Cau Nga	Ha Noi	N/A	BT
8	Project to solidify Hung Long Canal, Nga Son town, Nga Son District	Thanh Hoa	76,130	BT
9	Wastewater treatment station in Cua Lo town	Nghe An	59,440	BT
10	Tham Luong - Ben Cat canal wastewater treatment plant	Ho Chi Minh City	2,542	BT
11	Nam Viem (Phu My Hung) Wastewater treatment plant	Ho Chi Minh City	N/A	PPP
12	Canh Doi (Phu My Hung) Wastewater treatment plant	Ho Chi Minh City	N/A	PPP
13	Wastewater collection and treatment system in the tourist area north of Cam Ranh peninsula	Khanh Hoa	642.5	BT
14	Rainwater drainage system in Cam Ranh peninsula tourist area (phase 2)	Khanh Hoa	188.1	BT
15	Flood drainage canal in Hoa Lien commune area	Da Nang	N/A	BT
16	Upgrading centralized wastewater treatment plant in An Nghiep industrial park	Soc Trang	102,614	BOT

Source: Inspection Report of Survey on Promotion of Investment on Sewerage Development in Vietnam (JICA, 2022)

EX) Yen So WWTP in Hanoi

Source: Google Map

Photo by Tamoto (2015)

Ownership of sewerage facility

Japan	Vietnam
Sewerage Law **Article 3 (Management)** 1. Municipalities are to conduct installation, reconstruction, point repair, maintenance, and any other administrative operations of Public Sewerage Systems.	**Decree on the drainage and treatment of wastewater (No. 80/2014/ND-CP)** **Article 11 (Investors in drainage system)** 1. A competent People's Committee or a drainage unit shall be designated as an investor to construct drainage system with support from the State budget of the administrative division. 4. Investors in drainage systems are their owners.

Law on Public-Private Partnership Investment (Law No.64/2020/QH14)

Types of contracts of PPP (Article 3)

- BOT, BTO, BOO, O&M contract, BTL, BLT, Mixed contract

Investment sector of PPP projects (Article 4)

- Transportation;
- Power grids, power plants, except hydropower plants and those subject to the state monopoly requirement as provided in the Law on Electricity;
- Water resources and irrigation; clean water supply; water drainage and wastewater treatment; waste management and disposal;
- Healthcare; education – training;
- Information technology infrastructure.

Decree on the drainage and treatment of wastewater (No. 80/2014/ND-CP)

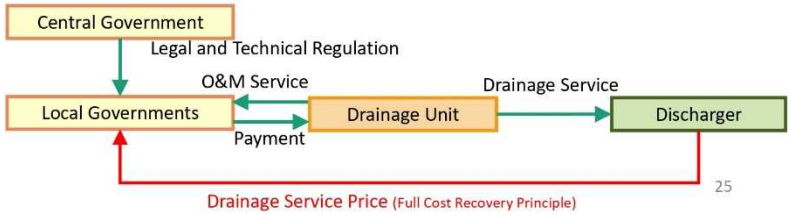
- **Pricing drainage service (Article 38)**
  - In case drainage service price decided by the PPC is lower than that calculated taking into account accurate and full costs of drainage and wastewater treatment and reasonable profit level, the PPC shall compensate from local budget to ensure the legal rights and benefits of the drainage entity.
- **Formulating, assessing and approving the price of drainage service (Article 41)**
  - (For drainage systems invested by the State budget)
    The DOC shall take charge and cooperate with relevant agencies to formulate plans for pricing the drainage service, the DOF shall assess the plan and submit it to the PPC for consideration.
  - (For drainage systems invested by other sources)
    The owners of the drainage system shall formulate plans for pricing the drainage service, the DOF shall take charge and cooperate with the DOC to assess the plan and submit it to the PPC for consideration.

Drainage Service Price vs. Environmental Protection Fee

10% of Water Price

- **Payment method for drainage service (Article 43)**
  - The entities providing the water supply service shall collect payment for drainage service according to the water bill from the discharging entities that use water from the common water supply system, and receive payment for collection service;
  - The discharging entities that paid for drainage service are exempt from the fee for environmental protection according to current regulations on fee for environmental protection on wastewater.

Typical Structure in Sewerage Management by Using Drainage Service Price in Vietnam



25

Drainage Service Price

- "Drainage Service Price" which is stipulated in Decree 80 (2014) is gradually replacing "Environmental protection fee" to realizing "Polluters pay principle" and "Full cost recovery."
- For example, drainage service price in Ho Chi Minh City will increase up to 30% of drinking water price in 2025.
- According to survey by JICA expert and MOC in 2020, 38% (24/63) of local governments have issued their Drainage Service Prices, including Ho Chi Minh City and Hai Phong. (The others still charge only 10% of the drinking water price.)
- Application of Drainage Service Price is expected to improve financial conditions.

Example: Drainage Service Price in Ho Chi Minh City

Item	2022	2023	2024	2025
Average Drinking Water Price Vietnamese Dong/m^3 (USD/m^3)	9,590 (0.42)	10,165 (0.44)	10,775 (0.47)	11,422 (0.50)
Drainage Service Price/Drinking Water Price	15%	20%	25%	30%
Average Drainage Service Price Vietnamese Dong/m^3 (USD/m^3)	1,439 (0.06)	2,033 (0.09)	2,694 (0.12)	3,426 (0.15)

Institutional Framework of Sewerage Sector in Vietnam

Tasks	Key central agencies	Key local agencies
Sector policies and regulation	Ministry of Construction (MOC) Ministry of Natural Resources and Environment (MONRE) Ministry of Science and Technology (MOST) Ministry of Finance (MOF)	Departments of Construction (DOC) Departments of Natural Resources and Environment (DONRE) Departments of Science and Technology (DOST) Departments of Finance (DOF)
Master planning	Ministry of Construction (MOC)	Provincial People's Committees (PPC) Departments of Construction (DOC) Departments of Planning and Investment (DPI) Departments of Finance (DOF)
State budget allocation and management	Ministry of Planning and Investment (MPI) Ministry of Finance (MOF)	Departments of Planning and Investment (DPI) Departments of Finance (DOF)
Project preparation	Ministry of Planning and Investment (MPI)	Departments of Planning and Investment (DPI)
Design and construction	Ministry of Construction (MOC)	Provincial People's Committees (PPC) Departments of Construction (DOC)
Operation and management	Ministry of Construction (MOC) Ministry of Natural Resources and Environment (MONRE)	Departments of Construction (DOC) Departments of Natural Resources and Environment (DONRE) Departments of Science and Technology (DOST)

26

Source: Inspection Report of Survey on Promotion of Investment on Sewerage Development in Vietnam (JICA, 2022)

Conclusion

- At this moment, the followings are risk for investors and should be addressed to promote PPPs in Vietnam, whereas there is large demand for wastewater management;
  1. Lack of regulations or toolkits for PPPs
  2. Lack of guidance on management of fiscal risks
  3. Limited capacity of both central and local governments (no experience in sewerage sector after promulgation of new PPP law)
  4. Low tariffs in wastewater
- Besides the promoting private investment, there are many problems in sewerage works in Vietnam in terms of technical and management aspect.
- International assistance is still needed to breakthrough above issues.

28


Ideal Future Circulation in Wastewater Management for Sustainable Society
Sludge Reuse
Biogas
Electricity or Fuel
Dewatered Sludge
Septage, Other Biomass
Sewage Sludge
Digestion
Other Biomass
Jokaso (decentrali
Syste
Factories, Hotels
HOTEL
Fertilizer, Agricultural use
Financial Sustainability
ops
Water Reuse
29


Thank you for your attention!
Ha Long Bay, Vietnam (2019)
30

7.3.9. 第 10 回ワークショップ参加登録者リスト

No.	姓	名	組織	国
1.	Abd Rahim	Aliah Syafiqah	Galaxy Tech Solutions	マレーシア
2.	Aguilar	Lea Yvette	Department of Public Works and Highways	フィリピン
3.	Aiguchi	Miho	株式会社地球システム科学	日本
4.	Alexander	Rasika	Central Enviorenmental AAuthority	スリランカ
5.	Amirudin	Amirah Soraya	Galaxy Tech Solutions KL Sdn Bhd	アメリカ合衆国
6.	Aquino	Rosemay	MWSS Regulatory Office	フィリピン
7.	Asayama	Yumiko	Japan Water Forum	日本
8.	Athukorala	Kusum	NetWwater	スリランカ
9.	Athukoralage	Priyanka	Central Environmental Authority	スリランカ
10.	Aung	Saw Sandar Aung	Daiki Axis Co., Ltd	日本
11.	Aung	Andy	ACR Thu Kha Chan Thar Co., Ltd.	ミャンマー
12.	aung	pyae phyo	Nishihara Neo Co., Ltd	日本
13.	Bandara	Senarath	Central Environmental Authority	スリランカ
14.	Baring	Fiameto Je	MWSS Regulatory Office	フィリピン
15.	Boontanon	Suwanna	Mahidol University	タイ
16.	Bopage	Nisansala	Central Environmental Authority	スリランカ
17.	Bungay	Israel	Metropolitan Waterworks and Sewerage System - Regulatory Office	フィリピン
18.	Chakraborty	Debarati	Central Public Works Department	インド
19.	Changlor	Tatinee	Chulalongkorn university	タイ
20.	Chen	Meixue	RCEES	中国
21.	CHINH	PHAM	Ritsumeikan University	日本
22.	CHUA	EDUARDO	Department of Public Works and Highways	フィリピン
23.	Clarke	Ian	Water & Sewerage Corporation	バハマ
24.	Coorey	Lorrain	Central Environmental Authority	スリランカ
25.	Davaa	Basandorj	MWP-CACENA	モンゴル
26.	Dhanayake	Prabath	Daiki Axis Environment (Pvt) Ltd	スリランカ
27.	EBIE	YOSHITAKA	National Institute for Environmental Studies	日本
28.	fernandes	januario	AIFAESA, IP	ブラジル
29.	Fernando	Lukshmi Fernando	Central Enviromental Authority	スリランカ
30.	Fernando	Jeewanee	Toyo university	日本
31.	Fitzgerald	Chris	Company	アメリカ合衆国
32.	FUJIMURA	Toshiki	JICA	日本
33.	GONZALES	ERLINDA	Department of Environment and Natural Resources	フィリピン
34.	Grigoryan	Hayk	JINJ Ltd	アルメニア
35.	Gunaratne	Lakshika	Central Environmental Authority	スリランカ
36.	Gupta	Surya Dev	Water and Energy Commission Secretriat	ネパール
37.	Gurung	Pabitra	IWMI	ネパール
38.	Halder	Sayani	United Nations University	日本
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No.	姓	名	組織	国
40.	hastuti	elis	Ministry of public works and housing	インドネシア
41.	Hathairat	Atiporn	chulalongkorn university	タイ
42.	Hayashi	Shunichiro	JICA	ラオス
43.	He	Li	FAO	タイ
44.	Huseynova	Narmin	"Azersu" OSJ "Sukanal"	アゼルバイジャン
45.	Ikeda	MICHIO	Nomura Trading Vietnam LLC	ベトナム
46.	Inamori	Makiko	JICA Vietnam Office	ベトナム
47.	ISHARA	KAHAWA DHADALLA HEWAGE DINUKI	Central Environmental Authority	スリランカ
48.	İsmayilov	Rashail	State Water Company "Azersu" “Sukanal” Scientific-Research and Design Institute	アゼルバイジャン
49.	ittisupornrat	suda	Environmental Research and Training Center	タイ
50.	JAIN	AKSHAY	WASH INSTITUTE	インド
51.	Jayathilake	Dimuthu	NWSDB	スリランカ
52.	Jha	Janak	WECS	ネパール
53.	Kant	Dr. Rama	Ministry of Housing and Urban Affairs, Govt. of India	インド
54.	Karimova	Gulnar	"Azersu" Open-Joint Stock Company	アゼルバイジャン
55.	Karunaweera	Himali	Central Environmental Authority	スリランカ
56.	Khalkabay	Bostandyk	Satbayev University	カザフスタン
57.	Khin	Mya Thandar	Environmental Conservation Department	ミャンマー
58.	Kinoshita	Kazuma	大栄産業㈱	日本
59.	Kondo	Takashi	JICA	スリランカ
60.	Koottatep	Thammarat	Asian Institute of Technology	タイ
61.	Kyaw	LinNaing	ACR	ミャンマー
62.	Le	Diep	JICA Vietnam Office	ベトナム
63.	Li	Ao	RCEES, Chinese Academy of Sciences	中国
64.	Liu	Chao	Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences	中国
65.	Livara	Cheryl	DPWH	フィリピン
66.	LOCH	SOKLEANG	Toyo University	日本
67.	Lubang David Lodu	Lopia	Juba city council	南スーダン
68.	Lwin	Ngu Wah Wah	Environmental Conservation Department	ミャンマー
69.	Madushanka	Ishan	Daiki Axis Environment Pvt Ltd	アメリカ合衆国
70.	MAEDA	LEONARDO	AGUAPÉ ENGENHARIA	ブラジル
71.	Maina	Jane	Kenya Bureau of standards	ケニヤ
72.	Majeed	Shameera	H2O DataTech Sdn Bhd	マレーシア
73.	MANVI	VENKATESH	YUASA TRADING INDIA PVT LTD	インド
74.	Matsuda	Kensuke	Phil-Japan Worldwide Management	フィリピン

No.	姓	名	組織	国
			Services Inc.	
75.	Matsuda	Kensuke	Phil-Japan Worldwide	アメリカ合衆国
76.	Mirzəyev	Vüqar	"Azersu" OJSC, "Sukanal" Scientific Research and Project Design İnstitute	アゼルバイジャン
77.	Mondal	Md. Shoriful Alam	Environmental Engineers Limited	バングラデッシュ
78.	muongpak	manavanh	ministry of health	ラオス
79.	Nakajima	Jun	Ritsumeikan University	日本
80.	Ngoc Bao	Pham	IGES	日本
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86.	Pannala	Chathuri	Central environmental Authority	アメリカ合衆国
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88.	Phan	Kim Anh	Chulalongkorn University	ベトナム
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106.	Siriwardhana Liyanage	Nadeeka Niroshanie	Central Environmental Authority	アメリカ合衆国
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114.	Tarikxazer	Zivar	"Azersu" OJSC "Sukanal" SRDİ	アゼルバイジャン
115.	Thant	Khin	AIT	アメリカ合衆国
116.	Thaung	Lay Lay	Daiki Axis- ACR Thu Kha Chan Thar Co., Ltd.	ミャンマー
117.	Theepharaksapan	suthida	Srinakharinwirot university	タイ
118.	TSUTSUMI	Ena	Pacific Consultants Co., Ltd.	日本
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120.	UMUHOZA	Marie Grace	Water and Sanitation Corporation (WASAC) Ltd	ルワンダ
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123.	Wangcharoenrung	Chayawee	Pollution Control Department	アメリカ合衆国
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125.	Wijayarathna	Dimuthu	Central Environmental Authority	スリランカ
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159.	是澤	優	JICA/Ministry of Interior, Thailand	タイ
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180.	野吾	奈穂子	JICA北陸	日本
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182.	雄高	吉識	有限会社環境情報	日本
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185.	松井	和彦	株式会社　日吉	日本
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