



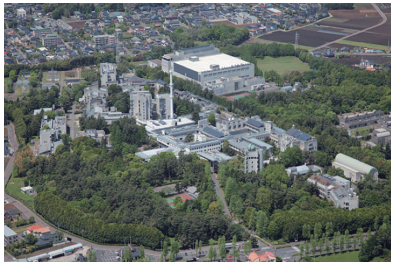

A Series of International Activity Reports in the Materials Cycles Division

Activities of Decentralized Domestic Wastetwater Treatment in ASEAN countries

National Institute for Environmental Studies

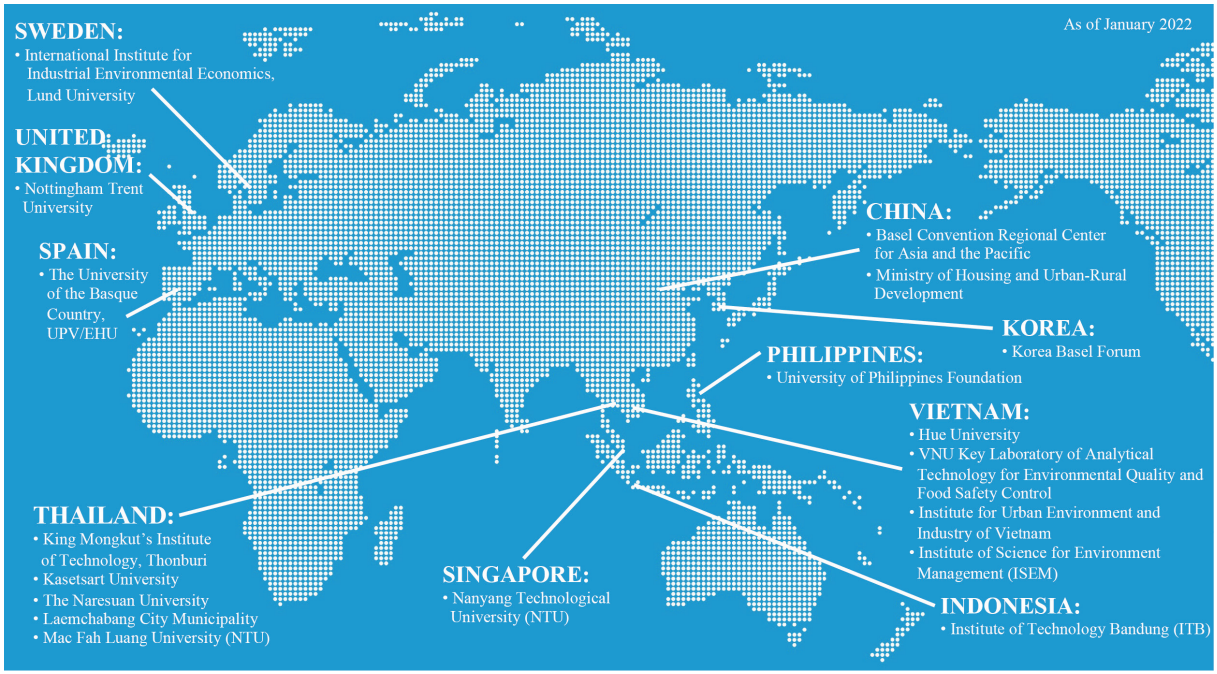
The National Institute for Environmental Studies (NIES) is the only institute in Japan that engages in a wide range of environmental research in an interdisciplinary and comprehensive manner. Our institute consists of eight areas, and since its establishment in 1974, we have been working in various ways on environmental issues in Japan and overseas.

Above all, in the Material Cycles Division, one of the goals is to solve the waste-oriented problem, which is a negative aspect of production and consumption activities, and we also take on the challenge of promoting the transition to a society where efficient use of resources and sound material circulation are ensured. International activities include research that contributes to the realization of a sustainable society in Asia and to the establishment of joint solutions to global environmental problems.



Waste management research collaboration and research into practice projects with Asian countries (～FY2020)

Until FY2020, the International Support Office for Resource Recycling and Waste Research has been conducting research on waste and resource management in collaboration with Asian researchers and building a foundation for disseminating the outcome as an international collaboration. As a major contribution, the findings and knowledge obtained were efficiently provided to international organization (IPCC, UNEP, etc.) activities, and contributed to the issuance of policy proposals and guidelines. In addition, through participation in international standardization activities at ISO, we have formed a team that is at the core of a series of work aimed at the implementation and establishment of research results in society. In cooperation with local researchers, we have delivered proposals and reports to government officials, published technical guidelines, and carried out public relations activities related to improvement of waste management in Asian cities (Bangkok, Jakarta, Hanoi, etc.).



International Partners with MOU agreement (2001-Present)

International Waste Management Research Administration Office (FY2021～)

Under the new institutional framework from FY2021, we will further strengthen strategic partnerships with related organizations in Japan and overseas, and accumulate knowledge and experience on methods for social implementation and dissemination of research outputs in the Asian region. This will contribute to the development of policies and technologies in the region based on scientific evidence in the area of material cycles and waste management. The specific activities are as follows.

1) Building an international cooperation/collaboration network
By collaborating with international organizations and overseas institutions and local governments, we identify needs for the involvement of academic experts at an early stage, and aim to increase opportunities for substantial policy contributions.
2) Coordinating international joint research projects
We support the smooth implementation of research activities in their entirety, such as the start-up process, research progress management, and dissemination of outputs, for joint projects with overseas universities, institutions, and international organizations.
3) Supporting social implementation of international research results
The office serves as a liaison for promoting the implementation of research output, such as contributions to international standardization activities, issuance of technical guidelines or policy briefs, and technical support for Japan infrastructure exports by combining researchers' scientific expertise.
4) Disseminating and publicizing research output
By hosting and co-sponsoring international events, we encourage dissemination of research results effectively. Academic papers, reports, and policy briefs are publicized via official press release and social media. We also expand the use of digital deliverables such as databases and application software that are developed through the research activities.

PODIWM

Policy Dialogue and Network Building of Multi-stakeholders on Integrated Decentralized Domestic Wastewater Management in ASEAN Countries

Dr. Masahiro Osako, Dr. Masato Yamada, Dr. Tomonori Ishigaki, Dr. Yoshitaka Ebie, Ms.Rieko Kubota
Dr. Kazuaki Syutsubo, Dr. Tomohiro Okadera

Secretariat team
Mr. Koji Otsuka, Mr. Atsuhiko Yoshimura, Ms. Risako Nogami, Ms. Yoko Hagiwara,
Ms. Kikuko Muroya, Ms. Kae Inaba, Ms. Itsuko Saito, Ms. Akemi Koike

About PoDIWM

To obtain the detail of the project
https://www-cycle.nies.go.jp/eng/report/pdf/podiwm.pdf

PoDIWM, which stands for Policy Dialogue and Network Building of Multi-Stakeholders on Integrated Domestic Wastewater Management in ASEAN Countries, is a project jointly operated by the Ministry of Public Works and National Housing of the Republic of Indonesia and NIES. It aims to serve as the basis for policy and institutional design and development for multiple stakeholders regarding the introduction of decentralized management and treatment technology for domestic wastewater. Nine countries among ASEAN Member States (AMSs), excluding Singapore, have been participating in this project to improve the AMSs' domestic wastewater management. Rapid population growth and changes in people's lifestyles and behaviors have deteriorated water quality and ecosystems, resulting in a serious negative impact not only on public health, but also on the aquatic environment, including groundwater, surface water, and coastal and marine water. Inappropriately discharged domestic wastewater can cause enormous damage to industries such as fisheries, water transportation, and tourism, yet national and local governments are not very conscious of the urgent need for appropriate management. This has led to a lack of institutional, economic, social, and technological development in this field in AMSs.

To address these problems, PoDIWM conducted an assessment survey of the legal policy system and technical status of domestic wastewater management in participating countries. Through successive meetings, workshops, and dialogues in each country and regional events, invited national and local stakeholders and experts have enhanced understanding of the results of local evaluation and have improved communication on the effectiveness of a decentralized system for domestic wastewater management in this region. Outputs were delivered to develop a selection tool of sustainable treatment technology for domestic wastewater. Performance testing methods for decentralized facilities in the ASEAN region are being harmonized by a round-robin test that took place in different conditions in participating countries. All members from AMSs and other international/regional stakeholders collaboratively made proposals for policy drafts and action plans tailored to each country's situation. At the end of the project, all project members agreed to issue a regional policy recommendation and collective commitment to achieve sustainable and integrated domestic wastewater management.

Decentralized domestic wastewater treatment

Domestic wastewater contains undesirable contaminants and unsafe biological pollutants in terms of public health and environment and typically exhibits different features from commercial and industrial wastewater. Regardless, many potential pollutants can be present in domestic sewage, from domestically available chemical products or pharmaceuticals that can be easily disposed of via toilets, sinks, drains, etc.

When the domestic wastewater issue is discussed, we should take into consideration both blackwater and greywater, which are different in nature. Blackwater is wastewater that has come into contact with human waste, whereas greywater is defined as untreated wastewater that has not come into contact with human waste. Sources of greywater include wastewater from bathtubs, showers, clothes washing, etc. In general, urban facilities that treat domestic wastewater firstly target blackwater because of the strong unpleasant feeling people have for it, though greywater also possesses a nonnegligible impact.

A decentralized treatment facility purifies wastewater by using microbial activities to make it clean to discharge. It is the most familiar type of treatment facility and is compact, allowing it to be installed on the premises of households.

A decentralized system offers the following advantages:

1. Less costs required; in terms of investment cost and operation and maintenance costs.
2. Better protection of water resources, less impact in case of accident (risk minimization)
3. Better adjustment to the individual quality of wastewater
4. Flexible (expandable) and adaptable to changing operational conditions
5. Providable tailor-made solutions for environmentally sensitive areas
6. Better fit into the landscape
7. Easier management and reuse of treated water and nutrients (e.g. nitrogen and phosphorus)

Development of stakeholders network

Since issues related to domestic wastewater management are varied and cross several related domains, it has been difficult to realize a shared sense of them among relevant stakeholders, especially government officials. PoDIWM addresses such coordination between line ministries and related stakeholders by organizing a task force team in each AMS, consisting of various officials in the related sections from national to local levels, as well as academic experts. The task force team members are mainly called from the respective parties, including those responsible for national development plans; those responsible for domestic wastewater treatment; those responsible for the environment; those responsible for construction standards; standardization organizations; local government representatives; academic researchers in the field of domestic wastewater treatment; plant manufacturers, etc. Domestic task force teams hold regular meetings to share the findings and to discuss future directions. The common understanding and synergies among task force members thus serve to strengthen the foundation for collective policy proposals from respective member states and contribute to leveling.

Capacity-building activities

Implementation of new technology is not only limited to introducing and starting a facility but also includes operation and management schemes required for maintaining performance capabilities. Development of administrative direction (governance) capacity and operational testing skills is necessary for sustainable management of urban domestic wastewater. To raise awareness of each country's task force (CTF) members and to develop human resources, we provide training opportunities in Japan to deliver lectures on the dissemination of domestic wastewater management policies, systems, and technologies, to exchange opinions among related parties, and to visit decentralized facilities and laboratories where performance tests are conducted. About 60 CTF members gathered at the training site from the ASEAN region and engaged in capacity development training over a one-week period. The intensive training provided up-to-date information on the national policy framework of domestic wastewater management, the essential mechanisms guaranteeing the performance of decentralized facilities, the practices of implementation and practical operation of the decentralized systems in the local government, and international cooperation to distribute rational technology and schemes. In parallel with the training, we held periodic domestic CTF meetings to update individual knowledge by sharing data obtained from field surveys in each country and for opinion exchange among stakeholders. This also led to the effective compilation of policy recommendations as well as human resource development in each country.

Regional policy dialogue

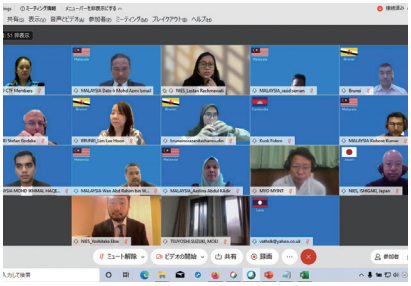
Two policy dialogues were organized as part of the project, with participants including CTF members and invited international experts to discuss the future of domestic wastewater management and the measures needed in the ASEAN region.

In the first dialogue, which was held in Jakarta, Indonesia, the participants discussed the common and unique features of domestic wastewater management. Workshops by the breakout group deepened the discussion toward the preparation of policy proposals and regional policy roadmaps for the dissemination of decentralized wastewater management in each country.

In the second policy dialogue, which was held online due to the influence of the COVID-19 crisis, the policy recommendations and regional policy roadmap were finalized. ASEAN stakeholders had opportunities to communicate with international donors to learn how to attract investment in infrastructure development in the domestic wastewater management field.

It is the nature of this project that multi-stakeholders from different countries and affiliations, who cannot usually meet, gather and engage in communication beyond the stovepiped administration in this field.

This network of multiple stakeholders will enhance the collection, knowledge, and sharing of up-to-date data on domestic wastewater and sanitation in the ASEAN region. Policymakers will receive valuable information that can serve as a basis for decisions. This is expected to yield environmental benefits in both the social and economic / public and private sectors.



Outlook report by country

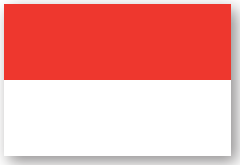
Brunei

Although 59% of the population uses a centralized sewerage system, areas outside urban centers are so remote that they do not have access to the centralized system. Therefore, implementation and proper management of a decentralized system are required. The Authority for Building and Construction Industry has issued a guideline for sanitation facilities for buildings to curb aquatic pollution by domestic wastewater. In the future, it will be necessary to develop a public–private partnership scheme to spread and to promote regular maintenance of decentralized facilities, such as sludge removal and performance assurance with standard testing methods. The state's immediate goal is the integration of a decentralized system in suburban and rural areas with an existing centralized system.

Cambodia

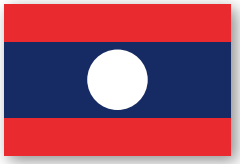
Since the administration of decentralized domestic wastewater management crosses multiple ministries and departments, lack of information sharing and inadequate discussion on policymaking are concerns. This is a typical and representative problem of the stovepiped administration (segmentation). Sub-decree No. 235 is an important regulation of Cambodia enacted to clarify the role of each ministry, delegate operations to local governments, secure the rationale and safety of treatment systems, promote public understanding and participation, and promote investment by development donors and the private sector. Although building permits based on the construction law regulate the requested sanitation capacity, this does not harmonize with sub-decree 235. In the future, it will be necessary to make adequate use of the existing law of sub-decree 235.

Outlook report by country



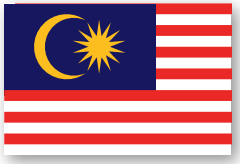
Indonesia

Access to sanitary management had already been improved, with about 75% having decent access, 16% basic access, and 9% no access to wastewater treatment. The wastewater treatment system is defined as on-site and off-site, rather than decentralized and centralized. Based on the Ministry of Public Works and Housing's Regulation No. 04/2017, the on-site system is classified into individual and communal scale, while communal is divided into 2–10 houses and a public toilet. In terms of sludge treatment, there are public septage treatment facilities in 281 regions/cities out of a total 514 regions/cities in Indonesia. Also, after the central government has issued new and strict regulations on effluent standards, the local government needs to update technologies, increase the O&M budget and number of skilled human resources, and introduce maintenance procedures.



Laos

Building permits including those for sanitation facilities need to be obtained from the Provincial Department of Public Works and Transport according to the New Agreement on Building Management No. 2241/ PWT, 2019. Decentralized systems have been installed in 25 regions in Laos. The coverage area for improving domestic wastewater management needs to be increased. As one of the most important policy recommendations, the program on capacity development and awareness raising for policymakers strongly advised full-scale development of training mechanisms to enable total system design including maintaining wastewater treatment performance and enhancement of wastewater discharge standards.



Malaysia

The national government has a target to distribute the central sewerage system nationwide, but the actual situation showed a reasonable development of a combination of centralized and decentralized systems. The centralized system, individual septic tanks, and traditional system accounted for 60.2%, 16.7%, and 14.1%, respectively, of person equivalent in 2017. The technologies currently used for decentralized systems are individual septic tanks and small-scale sewage treatment facilities. Decentralized systems are recommended in areas where households are not densely populated. Malaysian Sewerage Industry Guidelines Volume 5 – Septic Tank, 3rd edition, is the general standard for development of septic tanks, required for the design and construction of individual septic tanks. Standards on environmental quality, discharge acceptance, and analysis methods need to be improved, and technological guidelines to promote decentralized systems especially in the environmentally vulnerable water catchment areas and remote suburban/countryside need to be developed.

Myanmar

In Yangon, Myanmar's largest city, wastewater treatment facilities are being actively installed and adjusted technologically to suit local conditions. Several projects are underway such as the formulation of a master plan on domestic wastewater management and the expansion of a centralized sewerage system by 2027. But even in urban areas, the centralized system only covers 3.4%, and more than half the population uses pit latrines. The Myanmar National Building Code and Guidelines for High-Rise Building Construction Projects stipulate water quality standards for drainage and effluent. For local staff it is difficult to evaluate the effectiveness of the technologies in terms of contributing to solving local environmental issues in Myanmar. The capacity-building program for the stakeholders is therefore very important to realize proper assessment of the technologies and promotion of the introduction of the best available technologies in the country.

Outlook report by country

Philippines

Ninety-five percent of urban domestic wastewater flows directly into groundwater, drainage systems, rivers, and other watersheds, or after minor treatment in poorly functioning septic tanks, in the Philippines. To improve this situation, large urban centers have been working on the privatization of water supply and sewage systems for efficient operation. However, Metro Manila faces the difficulty of putting this into practice because it is not economically feasible for middle- to low-income households to pay for sewerage connection and the associated monthly charge. Municipalities with such financial constraints have seen increased interest in decentralized systems based on economic benefits such as affordable cost, environmental benefits such as functional and reliable performance, and social benefits such as sustainability. The National Building Code (Presidential Decree No. 1096) requires that domestic wastewater be discharged to the nearest sanitary sewer where available. If not available, it is to be disposed of into a septic tank / subsurface absorption field.

Thailand

Clean water and sanitation conditions have greatly improved overall in the past two decades. In contrast to considerable efforts to manage blackwater, about 70% of greywater is discharged into water bodies without appropriate treatment. Decentralized facilities are being installed nationwide to solve this situation. Ministerial regulations under section 8 of the Building Control Act addresses technical information regarding the wastewater system. However, the building codes are designed from a safety and civil engineering viewpoint and do not address the details of building occupancy and generated wastewater. The government will have to promote engagement of the community in domestic wastewater management through the development of programs that enable local governments to operate and maintain wastewater-related public services and to raise awareness of regular maintenance of decentralized facilities.

Vietnam

Vietnam has succeeded in providing improved drinking water and sanitary facilities to more than 90% of the population. To maintain the water environmental quality, a decentralized system is indispensable owing to the low availability of centralized systems in local areas. Based on Decree 80/2014 and earlier ones, every household in the service area of a sewerage network is obliged to connect to it. The Vietnam Building Code requires the installation of septic tanks for every household, resulting in on-site sanitation technologies being connected to the drainage network. Periodic emptying of septic tanks is also required. To ensure full access to sanitation, national and local governments need to prepare guidelines that cover various aspects of operation and maintenance, such as the removal and transportation of sludge/septage other than plant installation.

Development of sustainable decentralized domestic wastewater treatment technology selection tools for ASEAN countries

Today there are a wide variety of decentralized systems for residential, industrial, and commercial use. When choosing and installing such systems, several selection criteria need to be applied, including type of system, wastewater characteristics and extent of treatment, human health considerations, level of management and oversight required, and effluent standards to be met. In this project, we have prepared a guideline for the selection of decentralized domestic wastewater technology to cater to the needs of local government officials who are usually responsible for selecting the decentralized domestic wastewater technologies in infrastructure development for sanitation. The following is an overview of the guidelines.

○ Decisions favoring a specific technical option in the early planning phase will strongly influence both investment and operating costs. To provide cost-effective and sustainable decentralized wastewater treatment, plants should take a holistic approach in selecting the treatment technology.
○ The selection of alternatives for new or upgraded decentralized wastewater treatment plants relies on consideration of economic and non-economic criteria. However, the challenge of this approach tends to lie in the difficulty of appropriate consideration for essential factors that are not readily quantifiable.
○ Economic criteria include parameters related to initial investment, operational, and maintenance costs. Regarding non-economic criteria, technical criteria include parameters on land space requirements, construction difficulty, operator technical skills, and ability to handle flow/quality variation. Environmental criteria include parameters on nitrogen removal, BOD removal, and energy type. Social-related criteria include air pollution.
○ During plan development, primary consideration is given by planners to the selection of treatment technology. Several key factors are typically taken into consideration by planners in designing wastewater treatment technology, such as land availability, capital, operational, and maintenance costs, and technical skill requirement. Additionally, the primary criteria are also supported by other technical criteria that allow planners to narrow down the technology options.

Regional policy recommendation on domestic wastewater management

At the end of the project, based on the knowledge obtained and communication through dialogues and periodic meetings among the stakeholders including Country Task Force team members, the following regional "ONE vision" in each policy domain were agreed on.

1. Technological development for decentralized domestic wastewater treatment systems
Vision: Fulfill technological needs for decentralized domestic wastewater treatment systems for integrated domestic wastewater management

2. Policy coordination on domestic wastewater management master plan
Vision: Reliable wastewater treatment system that is accessible to everyone

3. Potential financial mechanism and fee collection
Vision: Toward transparent, sustainable, and affordable financing mechanisms for decentralized domestic wastewater system in ASEAN

4. Policy implementation and capacity building at the local government level
Vision: Ensure national-level policy implementation through multi-stakeholder involvement at national and local levels for safely managed domestic wastewater

5. Standardization of treatment performance testing method for decentralized domestic wastewater management
Vision: Be accessible to reliable products of decentralized domestic wastewater treatment technology by harmonized testing protocols in ASEAN member states

Future outlook

Based on knowledge gained through the PoDIWM project, we will continue to collaborate with each institution aiming at the following six items.

1. COMMIT to continue dialogue through the framework of ASEAN Sectoral Bodies to enhance cooperation on approaches toward improved domestic wastewater management in the region.
2. COMMIT to continue and initiate the policy interventions specified in this Regional Policy Roadmap in each AMS
3. MAKE EFFORTS to achieve the goals and targets specified in ASCC 2025 and the Sustainable Development Goals.
4. ENHANCE the regional knowledge-sharing mechanism on practices of AMSs in domestic wastewater management through existing and potential platforms to accelerate the policy making on this agenda.
5. INVITE interested parties regardless of regional or non-regional bodies for support to reinforce domestic wastewater management in the AMSs.
6. MAINTAIN the established network of professionals/experts who have worked together through the project for knowledge/experience sharing.

Researcher's comment

Access to safe water and sanitation is indispensable to maintain a minimum standard of living. There is no exception to this principle, and no one should be left behind. In reality, unfortunately, many inhabitants in rural areas, and even people in urban areas, still have limited access to safe water and sanitation in Southeast Asia. The major source of water contamination in this region is domestic wastewater from households and commercial buildings. Since the aquatic environment is harmed and sanitation conditions for inhabitants are deteriorating, improving the situation whereby contaminated water flows into the environment is necessary to secure sanitation and hygiene.

A decentralized domestic wastewater management system is a sustainable and robust way of appropriately managing aqueous environments in Southeast Asia. It can contribute to improving the water environment quality when installed alone in individual residences or communities, and is expected to complement the centralized sewage management system. Decentralized systems are also attracting attention as a way to provide vulnerable populations access to safe water.

The aim of this project is to provide and share technical and institutional knowledge and to remove barriers to the adoption of decentralized systems in order to expand their applicability and feasibility in countries in the ASEAN region. We hope that this report will further strengthen collaboration among the stakeholders in the region.

Tomonori Ishigaki, Dr.,
Material Cycles Division
National Institute for Environmental Studies, Japan

Contact

National Institute for Environmental Studies
Material Cycles Division
International Waste Management Research Administration Office
intwaste_ra@nies.go.jp

National Institute for Environmental Studies, Japan

Published by National Institute for Environmental Studies, 16-2 Onogawa, Tsukuba-city, Ibaraki 305-8506, JAPAN