

For Realization of Carbon Neutrality Technological Development in the Sewerage Field

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1. Introduction

In Japan, in order to reduce greenhouse gas ("GHG") emissions, which is a global issue, the "Act for Partial Revision of the Act on Promotion of Measures to Cope with Global Warming" was promulgated in June 2021. The Act stipulates the establishment of basic principles to realize a decarbonized society by 2050, the setting of targets for implementing measures in action plans to be formulated by local governments, etc. In October 2021, the Cabinet approved the Action Plan for Global Warming Countermeasures, which aims to reduce GHG emissions by 46% in FY2030 (compared to FY2013).

In view of the situation above, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) established the "Subcommittee to Study the Contribution to a Decarbonized Society in the Sewerage Policy Research Committee" (Sewerage and Wastewater Management Department of the MLIT, Japan Sewage Works Association) to study the ideal state of sewerage systems, necessary measures, roadmaps, and other matters for realizing a decarbonized society. In collaboration with this initiative, the Sewerage Technology Development Conference (hosted by the Water Quality Control Department of the NILIM),¹⁾ consisting of members from industry, government, and academia, has been working on "Re-organizing effective technologies on sewerage systems for the medium-term goal of FY2030" and "Examining technological development, etc. expected in future sewerage systems in response to the long-term goal of FY2050" in the Energy Subcommittee (the "Subcommittee"), which was established to study the utilization of resources and energy inherent to sewerage systems, the development of new technologies that contribute to the optimization of sewerage systems, and measures to promote their introduction.

2. Current status of GHG emissions in the sewerage field

About 6 million tons (CO₂ equivalent) (Fig. 1) of GHG were emitted from the sewerage field in FY2018, which corresponds to about 0.5% of total domestic emissions²⁾. This amount is relatively high as the amount emitted by individual local governments that formulate action plans, and reportedly accounts for 35% of the total³⁾. For this reason, it is also necessary

to reduce GHG emissions proactively in the sewerage field.

The majority of GHG emissions in the sewerage field are indirect emissions from the use of electricity and fuel at water treatment and sludge treatment facilities, followed by dinitrogen monoxide (N₂O) emitted from the sewage sludge incineration process, and methane (CH₄) and N₂O emitted from water treatment facilities. In recent years, electricity consumption has increased slightly, and electricity consumption per volume of treated water has temporarily decreased but is again on a slight upwards trend, and the factors behind this increase need to be analyzed. N₂O emissions from the incineration process are on a downward trend due to the progress of initiatives including the replacement of furnaces with lower emission models. On the other hand, GHG emissions from water treatment facilities have remained generally flat, and, particularly with regard to N₂O, there are many unclear points as to its generation mechanism, and there are no known measures to control the emissions.

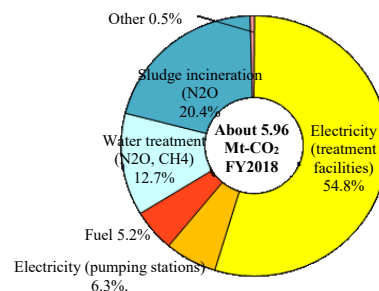


Fig. 1: GHG emissions from sewerage²⁾

3. For reduction of GHG emissions in the sewerage field

The time available to implement measures to achieve the 2030 target is limited. The main themes studied in the Subcommittee are 1) the reduction of electricity and fuel consumption in the sewage treatment process (energy saving), 2) the reduction of N₂O and other emissions from water treatment and sludge treatment facilities, and 3) the promotion of use of sewage sludge, which contains a large amount of organic matter, as an energy source (energy creation), which are all positioned in the Global Warming Action Plan as GHG emission reduction measures in the sewerage field. In addition, the "effectiveness as a system," by which the desired effect is demonstrated through the

close linkage of multiple processes between water treatment facilities and sludge treatment facilities, is also considered and evaluated.

The MLIT has been supporting the introduction of technologies to solve problems in the sewerage field through the Breakthrough by Dynamic Approach in Sewerage High Technology (B-DASH) Project, which began in 2011, and other projects, and has also been promoting the demonstration and dissemination of technologies related to energy conservation and generation. Discussions and considerations in the Subcommittee determined that GHG emissions could be significantly reduced through continued efforts in technological development, timely and accurate introduction of new technologies into sewerage projects, and appropriate implementation of operation and management that contribute to energy efficiency. For the realization of a decarbonized society by 2050, the need was indicated for initiatives from the perspective of the entire basin and encompassing social system, and ideas that are not bound by conventional stereotypes, including the development and proactive introduction of new technologies, the clarification of the phenomena of N_2O emissions from water treatment facilities and development of countermeasure methods, a shift of the core technical

concept from sewage treatment to resource and energy recovery, and collaboration with the waste, agriculture, energy, and other fields. (Fig. 2).

4. Conclusion

Although sewerage administrators have a lot to work on and cannot focus solely on GHG emission reduction, GHG reduction is considered necessary to maintain a sustainable world, and we all need to work on it in cooperation with each other. I would like to take this opportunity to thank the Subcommittee members for the many ideas they gave us, and we would like to continue discussion and consideration with the understanding of many people.

See the following for details.

- 1) Sewerage Technology Development Conference: <http://www.nilim.go.jp/lab/eag/gesuidougijyutsukaihatsukaigi.html>
- 2) NILIM: The Energy Subcommittee's Report on Sewerage Technology Development, etc. for the Realization of Carbon Neutrality (Proposal) http://www.nilim.go.jp/lab/eag/pdf/20220113_2-3houkokusyo.pdf
- 3) Bureau of Sewerage, Tokyo Metropolitan Government: Earth Plan 2017, p. 7, March 2017.

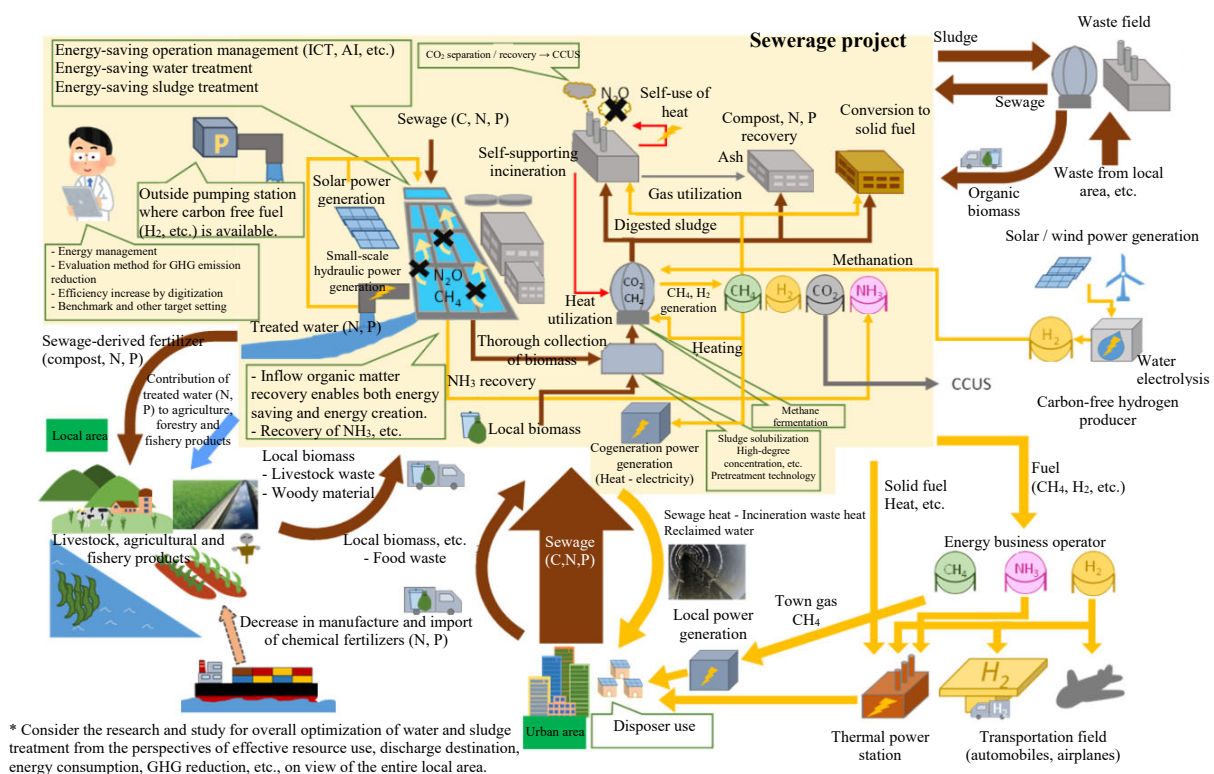


Fig 2: Image of technologies that contribute to carbon neutrality (from Subcommittee Document 2)