Aiming to establish a method to visualize barrier-free effects based on life stage

We are examining technologies that may lead to barrier-free solutions based on citizens' life stages, visualizing the ease of performing activities in the living environment while using the amount of physical activity as an indicator.

With a super-aging society, making homes barrier-free has become a pressing matter in Japan. In reality, while quite a lot of progress toward barrier-free designs can be seen in new buildings in recent years, existing homes, on the other hand, tend to undergo only individual repairs, with even the installation of simple handrails being covered by nursing insurance (10% of 200,000 yen), for example.

Additionally, for repair works that are reasonable from the point of view of barrier-free designs, it is indispensable that their results can be visualized as they alleviate activity and nursing burdens in daily life, as well as repair and nursing costs. This work allows us to find evidence for the subject under the title "Establishing a method to visualize barrier-free effects based on life stage".

The aim is to evaluate the barrier-free capacities of homes, using METS (metabolic equivalents) as an indicator of the amount of physical activity to visualize the ease of performing activities in the living environment.

We have gathered and published the latest survey results (as of March 31, 2017) regarding the current state and changes in roadside trees across Japan.

In order to sustain road green meanings that address the state of times we live in, with the diversification of Japanese citizens' needs and vast changes in socioeconomic conditions, the NILIM has conducted a nationwide survey every 5 years since 1987 to grasp the actual situation of road greening. The total number of roadside trees in Japan is around 6,700,000 (trees managed to grow to 3 meters or taller). Looking at the changes every 5 years, we can see this number has grown consistently between 1987 and 2002, leveling off thereafter (Fig. 1). Analyzing the data by prefecture, Hokkaido, which has an extensive road network, has the largest amount of trees, followed by the metropolitan areas of Tokyo, Hokkaido, Aichi, and Osaka, making apparent the results of the strong demand for road greening functions (landscape improvement, shade tree formation, environmental preservation, etc.) in urban areas with many pedestrians and intense road traffic.

As for the number of trees by species, among the 545 species found across Japan, ginkgo is the most numerous, followed by different types of cherry trees, and then by Japanese zelkova, flowering dogwood, and Trident maple (Fig. 2). These species likely appear at the top of the list because of their strength, for example, seeing how they grow relatively easily even in places unsuitable for plant development as alongside urban roads, and how they can germinate even after the heavy pruning that may occur in order to bring them in line with the space allowed for growth, or because of the beauty of their flowers or autumn foliage, which can add color to the cityscape.

Based on the results of this survey, we hope to optimize and effective methods to manage and maintain roadside trees, and to continue contributing to urban planning that is greener and more pleasant.


We are conducting an investigation by using a physical activity monitor and biometrics, a device that records where residents are at any given moment as well as the time, to monitor the actual state of their daily lives (places where they stay, period of stay, number of visits to the places, physical activity, etc.). This research is currently a preliminary experiment at the house of this article's author.

In the second year, we plan to build a barrier-free environment evaluation program from the monitoring data obtained, and to propose barrier-free repair projects that are based on life stage.

Also, in this research, we are working to efficiently spread the results by collaborating and sharing information with members of related academic societies, etc.
**Revolutionary wastewater management technology - With effective downsizing, cost and energy demands are greatly reduced**

We have performed empirical research on water treatment technologies that make it possible to reduce cost and energy demands in response to a reduced amount of inflow caused by population decline, and we have formulated draft guidelines for the introduction of this revolutionary technology.

The amount of wastewater produced by homes, etc. (volume of inflow to treatment facilities) has diminished due to population decline and current efforts to conserve water, which not only reduces revenue from wastewater fees, but also lowers treatment efficiency at wastewater treatment plants. This happens because the capacity of most municipal wastewater treatment facilities employed up to now is determined according to the volume of the water tank (civil engineering structure) used to treat sewage, and even if the amount of flow diminishes, it is difficult to reduce only the capacity of machinery when replacements are carried out, since their lifespan is shorter than that of civil engineering structures.

For this reason, as part of the B-DASH Project, we have conducted empirical research to evaluate wastewater treatment plant technologies by building and operating facilities of the same scale as actual plants as Soskey, Choshi, considering a “water treatment technology following water amount fluctuation and utilizing DHS system” (hereafter referred to as “revolutionary technology”).

The DHS system refers to water treatment technology that serves as an alternative to conventional activated sludge processes, combining a DHS (Down-flow Hanging Sponge) filter bed and a sand filter (filtration facility).

As a result of the NILIM’s empirical research, trial calculations have shown that it is possible to reduce life cycle cost by 37% and greenhouse gas emissions by 76% in comparison with the conventional activated sludge process, which is one of the conventional wastewater treatment methods, while securing standard quality for treated wastewater. Also, the experiments have shown that this revolutionary technology is easy to manage and maintain, making it an especially effective solution for suburban cities where the workforce has diminished noticeably due to population decline.

Furthermore, based on the empirical research results, in December of last year we formulated guidelines organizing contents regarding the consideration of simple introduction of the system, as well as its installation, maintenance and management, to serve as a reference for wastewater operators considering introduction of this revolutionary technology. By utilising these guidelines to foster the introduction of the technology, we expect to contribute to improvement of operation of sewage works.


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**NILIM Lecture Meeting 2018**

This year’s “NILIM Lecture Meeting” had “disaster prevention and mitigation” as its main theme, and included a special lecture by Mr. Takahito Hashitsumata, the Head of MHI’s Disaster and Weather Center, as well as a panel discussion by NILIM researchers, general lecturers, and poster exhibition.

The “NILIM Lecture Meeting” is held every year with the objective of introducing the public at large, via lectures and reports, the latest research results and research trends at NILIM.

The main theme this year was “disaster prevention and mitigation”, with the event being held on December 4, 2018 at the Japan Education Center [MITBBS Hall](http://www.nilim.go.jp/lab/bbg/kiyai/journal/kiyai20190110.pdf) in Chiyoda, Tokyo.

The special lecture entitled “The evolution of disaster management: Aiming for a system that protects lives and livestock” was given by the Head of MHI’s Disaster and Weather Center, Mr. Takahito Hashitsumata.

Afterward, research status on disaster prevention and mitigation technologies, as well as efforts toward disaster management at NILIM were introduced to the public in a panel discussion held under the title “How should we confront large-scale disasters?”

On the day of the event there were 757 participants, mainly consisting of people from private businesses and local public bodies involved in civil engineering or architecture.

The participants shared some of their own thoughts and insights about disaster management as follows: “The use of actual examples and videos made it easy to understand”, “Thanks to this lecture, I was able to start thinking about the type of information” that can be linked to the evacuation of citizens.” One participant commented on the panel discussion as follows: “It was easy to grasp the contents of the debate, since it followed a chronological order starting from the initial response system to disasters, and because the topics valid for experts were extremely well organized.”

Also, this lecture meeting saw the addition of a poster exhibit, where explanations regarding “the focus of NILM’s main efforts in 2018” were provided mostly by young researchers.

Videos of the lectures and presentation data (slides), along with the posters that were exhibited, are available on the NILIM’s website. Please feel free to take a look.

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**Overview of NILIM’s supplementary budget for 2018**

Planning and Research Administration Department, Planning Division

As the second supplementary budget of 2018, NILIM allocated a sum of 2.5 billion yen for expenses with, for example, investiga- tive research to improve national resilience based on the results of an emergency inspection of vital infrastructure.

Recent disasters such as the heavy rain of July 2018, Typhoon No. 21 of 2018, and the 2018 Hokkaido Eastern Iburi Earthquake led to damage caused by tsunami, flood and fire, by inundation due to high tides and waves, and by soil liquefaction resulting from sediment runoff.

List of implemented items

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
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| May 31, 2018 | Developed an experiment facility to foster the introduction of advanced technologies aimed at making ground support services more efficient. As one of these measures, efforts are being made to introduce self-driving technology to GSE as the buses and towing tractors that are necessary for aircraft operation. For this reason, the MIL’s Japan Civil Aviation Bureau (JACB) is working on public-private partnerships to introduce advanced technology aimed at making ground support services more efficient. Based on the state of implementation of the JACB’s practical experiments, the NILIM is currently developing self-driving simulation models in order to verify aspects such as the effects upon introduction, influence on other manned vehicles, facility structure, and safety in the case where self-driving GSE comes to be employed. This year we are utilizing actual operation data for each GSE to verify reproducibility of GSE operation simulations, and from next year we plan to impact in detail the effects of having self-driven vehicles alongside manned GSE being driven during operating hours at the airports of Sendai, Narita, and Chubu. Based on these findings, we are considering developing countermeasures which, as well as possible issues that may arise and relevant countermeasures.
<table>
<thead>
<tr>
<th>Institute of research (6 topics, budget of 1.519 billion yen)</th>
<th>Facility development (5 experiment facilities, budget of 984 million yen)</th>
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<tr>
<td>Facility to investigate the development of self-driving vehicles, facility structure, and safety in the case where self-driving GSE comes to be employed</td>
<td>Development of an experimental facility to enable the evaluation of the feasibility of introducing self-driving technology to runway by selecting the facilities for which the introduction is possible as well as the conditions of the GSE to be introduced.</td>
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