

Technical cooperation

1. Introduction

The research policy of NILIM provides, as a basic attitude, "Aim at new technical development by implementing technical cooperation and integration widely among industry, university and government" and, as preparedness for research, "Establish an efficient research system in cooperation with external organizations while recognizing own strengths and weaknesses." Some examples of such cooperation are introduced as follows.

2. Examples of coordination / cooperation with administrative organs concerned

NILIM conducts many researches with project cost budget etc. that directly lead to policy development in cooperation with the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), etc. As examples that constitute a particularly large-scale research subject, there are comprehensive technical development project (comprehensive project) and administration cost itemized budget. Of the important research subjects concerning construction technologies, comprehensive projects address particularly urgent subjects covering wide target areas and conduct researches comprehensively and systematically in cooperation of industry, university and government under the leadership of administration departments in promoting projects. Administration cost itemized budget is directly assessed by the Ministry of Finance and is used to conduct comprehensive researches that lead to creation of new policies. **Table 1** shows the subjects of comprehensive projects implemented in fiscal 2019 and **Table 2** shows researches conducted using the administration cost itemized budget.

3. Examples of cooperation with private sectors, universities, etc.

Various cooperations are implemented, which are generally classified into the following types, including joint research, conducted by NILIM jointly with other organizations, and

contract research, outsourced by NILIM to other organizations that have already engaged in the research. Joint researches and contract researches conducted in fiscal 2019 are listed in **Table 3** and the following table, respectively. **Table 4** shows typical examples of cooperation with private sectors, universities, etc. including the researches above.

I. Researches established as a system in NILIM
(1) Joint research, (2) Contract research (research publicly offered by laboratory),
(3) Contract research (research publicly offered by council),
(4) Budget of other ministry / agency (PRISM)
II. Researches established as a system in other organizations
(5) Technical research association
III. Researches not established as a system but established to a certain extent
(6) Technical public offering, (7) Social experiment,
(8) Workshop / study group
IV. Research conducted by devising operation
(9) Cooperation with policy development by the Ministry,
(10) Cooperation with municipal projects, (11) Workshop with university / private sector

4. Conclusion

In addition to the above, there are also examples of working for research activities and revision of technical standards in industry-university-government cooperation as committee activity of academic societies and associations. We intend to continue researches while developing various technical cooperation among industry, university, and government.

Pattern	Name of the council, etc.	Number of cases
Research publicly offered by laboratory		2
Research publicly offered by the Ministry's council		
	New Road Technical Conference	22
	River works technology research and development	11
	Sewerage B-DASH	16

Table 1. Comprehensive technical development projects implemented in fiscal 2019

Subject	Research period	Department / center in charge
Technical development contributing to utilization of existing buildings by streamlining fire prevention / evacuation rules, etc.	2016-2019	Building / Urban
Research on construction productivity improvement with full utilization of ICT	2017-2020	Infrastructure management
Development of design / construction techniques for mixed structure buildings using new wood material	2017-2021	Building
Research on upgrading of construction production systems using AI	2017-2020	Infrastructure management
Development of suburban residential area revitalization techniques responding to mature society	2018-2022	Housing / Building / Urban

Table 2. Researches based on the administration cost itemized budget implemented in fiscal 2019

Subject	Research period	Department / center in charge
Research on flood prevention activity supporting technology	2017-2019	River
Development of equipment improvement technologies for securing the health and safety of disaster victims in shelters	2017-2019	Building
Research on facade design methods aiming to improve energy consumption performance in buildings	2017-2019	Housing
Development of urban structure analysis / evaluation techniques considering diversifying life support functions	2017-2019	Urban
Development of diagnostic techniques of trafficability in case of earthquake / fire	2017-2019	Urban
Research on prompt inspection / restoration methods for airport pavement in earthquake disaster	2017-2019	Airport
Research on comprehensive management of sewer pipelines	2018-2020	Sewerage
Development of pre-analysis method for sediment disaster caused by large-scale earthquake	2018-2020	Sabo
Development of existing RC member evaluation techniques contributing to life extension / improvement of exterior / waterproofing membrane of buildings	2018-2020	Building
Establishment of visualization method for barrier-free effect according to life stages	2018-2020	Housing
Research on quantitative evaluation method for urban environment improving effect of green space, etc.	2018-2020	Urban
Research on immediate damage estimation methods for port facilities in a major earthquake	2018-2020	Port and harbor
Research on collapse perception / flood situation forecast for communicating information that enables quick actions for evacuation / flood prevention	2019-2020	River
Development of techniques for quickly judging the soundness of base buildings damaged by earthquake	2019-2021	Building
Research on wide-area cooperation of urban functions in a local city	2019-2021	Urban
Development of an evaluation technique for efficient utilization of the environmental conservation technology in coastal area	2019-2021	Coastal, Marine and Disaster Prevention
Development of terminal congestion index contributing to improvement of the punctuality of container ships	2019-2021	Port and harbor

Table 3. Joint researches conducted in fiscal 2019

Subject of joint research	Partner organization	Research period	Department / center in charge
Research on early detection of sediment disasters using observation / monitoring data of mountainous watershed	National Institute of Advanced Industrial Science and Technology	2016-2020	Sabo
Research on technical standards etc. in building, housing, and urban fields	Building Research Institute	2016-2021	Building / housing / urban
Joint research on development of sediment disaster monitoring methods using Advanced Land Observing Satellite No. 2 "Daichi No. 2"	Japan Aerospace Exploration Agency	2017-2021	Sabo
Joint research on technological development for practical use of the next-generation Cooperative ITS	29 entities and 32 organizations including automakers, electrical equipment manufacturers, related foundations, and expressway companies	2017-2020	Road Traffic
Joint research on seismic performance verification experiment of mixed structure buildings using new wood material	National Research Institute for Earth Science and Disaster Resilience	2017-2021	Building
Joint research on utilization of AIS data for port maintenance / use	Service Center of Port Engineering (SCOPE)	2017-2019	Port and harbor
Joint research on utilization of construction management record obtained in seismic restoration of bridges for maintenance	Japan Bridge Association Inc., Japan Prestressed Concrete Contractors Association	2017-2019	Infrastructure management
Joint research on life extension of weather proof steel bridges	Public Works Research Institute (PWRI), Japan Bridge Association Inc., Japan Iron and Steel Federation, Nagaoka University of Technology, Nippon Steel Anti-corrosion Co., Ltd.	2017-2019	Road Structures
Joint research on maintenance of concrete floor slab bridges	PWRI, Japan Prestressed Concrete Contractors Association	2018-2021	Road Structures
Joint research on inundation forecast system in Tokyo	Waseda University	2018-2021	River
Joint research on ETC 2.0 data distribution service	ITS Technology Enhancement Association	2018-2020	Road Traffic
Joint research on upgrading steel bridge performed evaluation / restoration techniques	PWRI, Japan Bridge Association Inc., Japan Iron and Steel Federation, Nagaoka University of Technology, Waseda University	2018-2021	Road Structures
Joint research on accuracy upgrading of the liquefaction damage estimation method for infrastructure facilities	PWRI	2018-2019	Planning, Sewerage, Road Structures
Joint research on real-time data utilization of strong motion index	National Research Institute for Earth Science and Disaster Resilience	2019-2020	Road Structures
Joint research on evaluation technology for road bridge performance	Japan Civil Engineering Consultants Association, Japan Federation of Construction Contractors, Japan Bridge Association Inc., Japan Prestressed Concrete Contractors Association	2019-2020	Road Structures
Joint research on management of special / huge bridges	Honshu-Shikoku Bridge Expressway, Kyoto University, Osaka University, PWRI, Tokyo Rope Mfg. Co., Ltd, Shinko Wire Company, Ltd	2019-2021	Road Structures
Joint research on the continual improvement of maintenance plans for existing road bridge groups	Japan Civil Engineering Consultants Association, Kyoto University, Osaka University, Kyoto-fu, Ibaraki-ken	2019-2021	Road Structures
Joint research on sediment / flood control technology	University of Tsukuba	2019-2021	Sabo

Table 4. Example of cooperation with private sectors, universities, etc. implemented in fiscal 2019

Pattern	Subject	Purpose and form of cooperation	Participants	Research period	Department / center in charge
(3)	Breakthrough by Dynamic Approach in Sewage High Technology Project (B-DASH Project)	Utilize local governments, private enterprises, a universities, etc. for practical use of innovative techniques that are not generalized in sewerage	Joint Research Organization (universities, private enterprises, other national research centers, local governments, etc.)	2011-	Sewerage
(6)	Project for introduction / utilization of innovative technologies for drastic improvement of productivity in construction site	Publicly offer a project for improving productivity with new technologies such as IoT and AI by obtaining real-time digital data from construction sites.	Consortium consisting of private enterprises, universities, etc. (33 entities)	2018-	Infrastructure management
(8)	Local Road Economic Strategy Workshop and local workshops	- Discuss issues specific to regions and utilize needs of administration and wisdom of university. - Match with administrative needs to promote innovation of road policy.	University, MLIT, Regional Development Bureau	2015-	Road Traffic
(9)	Cooperation with local governments that implement area measures in research on traffic safety measures for community roads	Technical cooperation in effective implementation of traffic safety measures (local government: Implement measures, NILIM: analysis, technical consultation, etc.)	Yokohama-shi, Hamamatsu-shi, Kurume-shi	2016-	Road Traffic
(10)	Cooperation with local governments in research on grasping road traffic situation	- NILIM conducts transportation analysis etc., and local government (road administrator) conducts the project and consultation with organizations concerned to solve issues in proper sharing of roles.	Ibaraki-ken	2013-	Road Traffic
(1)(7)	Examination of new services using ETC2.0 data	- In order to strengthen the mobility of communities, solicit new service proposals using ETC2.0 data from the public. Provide ETC2.0 data to private enterprises that made a proposal for verification leading to practical use.	Private enterprises	2018-	Road Traffic