

Directorate General of Water Resources,
Ministry of Public Works and Housing

Summary Report

Indonesia

Verification Survey with the Private Sector
for Disseminating Japanese Technologies
for Building the Rainwater Runoff Control
System Using Plastic Rainwater Infiltration
and Storage Facilities

September, 2016

Japan International Cooperation Agency

Chichibu Chemical CO., LTD.

1. BACKGROUND

The JABODETABEK (DKI Jakarta, Bogor, Depok, Tangerang, Bekasi) suffers from serious flood damages which frequently occur due to the expansion of the urban area and the ground subsidence by pumping up of the groundwater. In addition, it is difficult to drain rainwater because the sewage coverage of drainage system is low in JABODETABEK.

DKI Jakarta had serious flood damages in 2002, 2007, 2013 and 2014 and it is concerned that the damage will expand in the area. The local governments of Indonesia have tried to take actions against flood control, however, there still remain many challenges. On the other hand, the development and improvement of infrastructure is a pressing issue for the economic development of Indonesia and it causes the increase of runoff discharge.

2. OUTLINE OF THE PILOT SURVEY FOR DISSEMINATING SME'S TECHNOLOGIES

(1) Purpose

The main purpose is to reduce the inundation disaster and prevent ground subsidence in JABODETABEK (DKI Jakarta, Bogor, Depok, Tangerang, Bekasi) by introducing "PRISM" (PRISM: Plastic Rainwater Infiltration and Storage Method), which has the function of the dispersed rainwater storage and infiltration into the ground.

(2) Activities

Experimental proof for PRISF (Plastic Rainwater Infiltration and Storage Facility)

- ① Selecting the project site
- ② Basic Survey
- ③ Definition of structural specification
- ④ Procurement and installment
- ⑤ Manual preparation
- ⑥ Training for operation and maintenance officers
- ⑦ Evaluation

Promotion of PRISF

- ① Study on the establishment of regulations concerning the installation of comprehensive flood control facilities associated with development activities
- ② Study on future dissemination

Workshops in Indonesia and Activities Conducted in Japan

- ① Workshops in Indonesia
- ② Activities Conducted in Japan

(3) Information of Product/ Technology to be Provided

① New Trench-kun

This is a rainwater infiltration trench made of plastic. We started sale in 2003, and delivered it more than 1,000 measures in Japan.

② Pladam-kun

This is a void storage and infiltration facility made of plastic, and has been applied to more than 400 projects since first shipment in 2008.

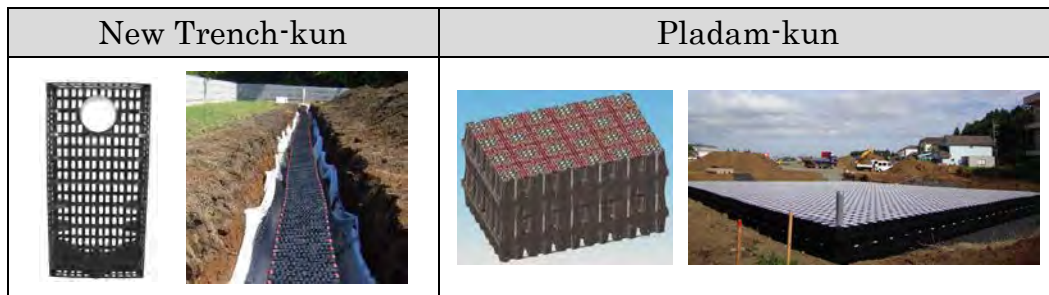
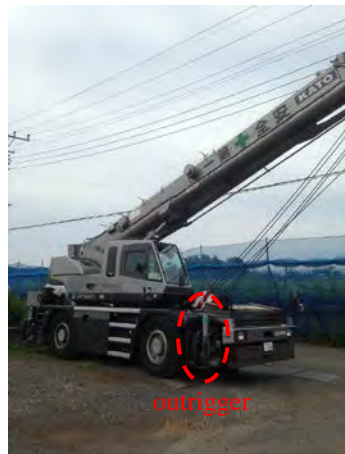


Fig. 1 Products of Chichibu Chemical CO., LTD.

Consideration

- Periodic inspection and cleaning to be implemented based on the Maintenance Guideline
- Upper load by vehicle to be less than T-25 ton. Especially, the outrigger of rough terrain crane not able to be directly placed on the surface pavement of New Trench-kun or Pladam-kun.



(4) Counterpart Organization

Directorate General of Water Resources,
Ministry of Public Works and Housing

(5) Target Area and Beneficiaries

Target Area: Underground of public facilities in Kota Bogor
Beneficiaries: Administrators and citizens of JABODETABEK

(6) Duration

January, 2015 ~ September, 2016

(7) Progress Schedule

The progress schedule is shown in Table 1.

(8) Manning Schedule

The manning schedule is shown in Table 2.

(9) Implementation System

The implementation system is shown in Fig. 2.

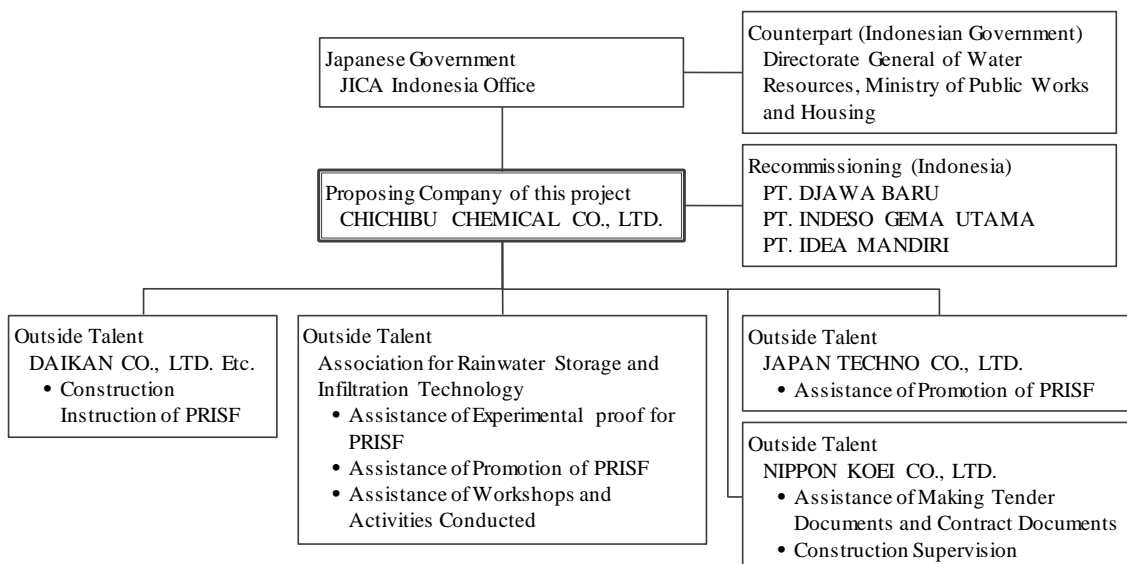


Fig. 2 Implementation System

Table 1 Progress Schedule

Year	2015												2016								
Month	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9
Period	1/3	2/3	3/3	1/3	2/3	3/3	1/3	2/3	3/3	1/3	2/3	3/3	1/3	2/3	3/3	1/3	2/3	3/3	1/3	2/3	3/3
Experimental proof for PRISF																					
Selecting the project site																					
Basic survey (Boring survey, Summary survey, In-situ permeability test)																					
Defined structural specification (Arrangement plan of PRISF)																					
Procurement and installment																					
Manual preparation																					
Training for operation and maintenance offers																					
Evaluation (Monitoring the effect of runoff control by PRISM)																					
Promotion of PRISM																					
Study on the establishment of regulations concerning the installation of comprehensive flood control facilities associated with development activities																					
Study on future dissemination																					
Workshops in Indonesia and Activities Conducted in Japan																					
Workshops in Indonesia																					
Activities Conducted in Japan																					
Summary Report																					

← Fasting Month
From June 18 to July 16, 2015 →

C/P : Counter Part

PRISM : Plastic Rainwater Infiltration and Storage Method

PRISF : Plastic Rainwater Infiltration and Storage Facility

■ : Work in Indonesia

□ : Work in Japan

■ : Rainy season

■ : Dry season

Table 2 Manning Schedule

Year		2015																								2016									MM										
Month		1		2		3		4		5		6		7		8		9		10		11		12		1		2		3		4		5		6		7		8		9		SUM	
Period		1/3	2/3	3/3	1/3	2/3	3/3	1/3	2/3	3/3	1/3	2/3	3/3	1/3	2/3	3/3	1/3	2/3	3/3	1/3	2/3	3/3	1/3	2/3	3/3	1/3	2/3	3/3	1/3	2/3	3/3	1/3	2/3	3/3	1/3	2/3	3/3	1/3	2/3	3/3	1/3	2/3	3/3	IDN	JPN
Role of this project	Name	Affiliation																																											
Working in Indonesia																																													
[Head of this project] Project Management	YOSHIDA Hisahito	CHICHIBU CHEMICAL CO., LTD.																																											31
Construction Plan, installing PRISF	MUROHUSHI Hideyuki	CHICHIBU CHEMICAL CO., LTD.																																											11
Counterpart hearing, Basic Survey, Procurement and installing, Evaluation.	OZAKI Takatsugu	CHICHIBU CHEMICAL CO., LTD.																																											154
[Chief adviser] Assistance to this project	IMBE Masahiro	Association for Rainwater Storage and Infiltration Technology																																											52
Assistance to Arrangement Plan, Evaluation, Workshops etc.	OKUI Hiroyuki	Association for Rainwater Storage and Infiltration Technology																																											35
Assistance to Basic Survey	MARUYAMA Toshio	Association for Rainwater Storage and Infiltration Technology																																											11
Assistance to Basic Survey, installing PRISF	MASUDA Munenori	Association for Rainwater Storage and Infiltration Technology																																											14
Leading of Promotion of PRISM	INOUE Yakuro	Japan Techno Co.,Ltd.																																											16
installing PRISF	TAGUCHI Tsukasa	DAIKAN CO., LTD																																											14
Construction supervision, Making Tender documents and Contract documents	KINOSHITA Masanobu	NIPPON KOEI CO., LTD																																											43
Working in Japan																																													
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3. ACHIEVEMENT OF THE SURVEY

(1) Outputs and Outcomes of the Survey

Experimental proof for PRISF

① Selecting the project site

Based on the result of the following “②Basic Survey”, the construction sites were selected to be BAPPEDA Kota Bogor Office and Kecamatan Bogor Utara Office.

② Basic Survey

A) Groundwater Level Survey

Based on the result of groundwater level survey in Table 3, the heights of Pladankun were set to be 0.6m.

Table 3 Result of Groundwater Level Survey

Location	Date	Groundwater Level
BAPPEDA Office	11 th February, 2015	G.L. – 1.25m
Kecamatan Bogor Utara Office	5 th March, 2015	G.L. – 1.51m

B) Bearing Capacity Survey of soil

Based on the result of bearing capacity survey in Table 4, the bearing capacity of the construction sites were judged to be strong enough according to the guideline published by the Association for Rainwater Storage and Infiltration Technology.

Table 4 Result of Bearing Capacity Survey of soil

Location	q_c ※ ¹	Bearing Capacity ※ ²
BAPPEDA Office	62 kg/cm ²	1,500 kN/m ²
Kecamatan Bogor Utara Office	19 kg/cm ²	475 kN/m ²

※1: Average from Depth 20cm to 160cm

※2: Safety Factor = 4.0

C) In-situ Permeability Test

According to the result of in-situ permeability test in Table 5, the permeability of the soil was judged to be very small.

Table 5 Result of In-situ Permeability Test

Location	Saturated Hydraulic Conductivity
BAPPEDA Office	4.98×10^{-5} cm/s
Kecamatan Bogor Utara Office	6.22×10^{-5} cm/s



Photo 1 In-situ Permeability Test in BAPPEDA Office[left] and Kec. BOUT Office[right]

③ Definition of structural specification

The infiltration type was adopted even if the permeability of the soil is small. Since the sufficient infiltration volume was not expected, it was necessary to install orifice to drain gradually the stored rainwater to outside.

④ Procurement and installment

The Approval Letter was submitted in June, 2015 in order to get the signature by persons concerned and to get the permission of the execution of the facilities. The Preconstruction Meeting was held at each office of BAPPEDA and Kecamatan Bogor Utara respectively to explain Construction Schedule and Working Drawing (Fig. 3).

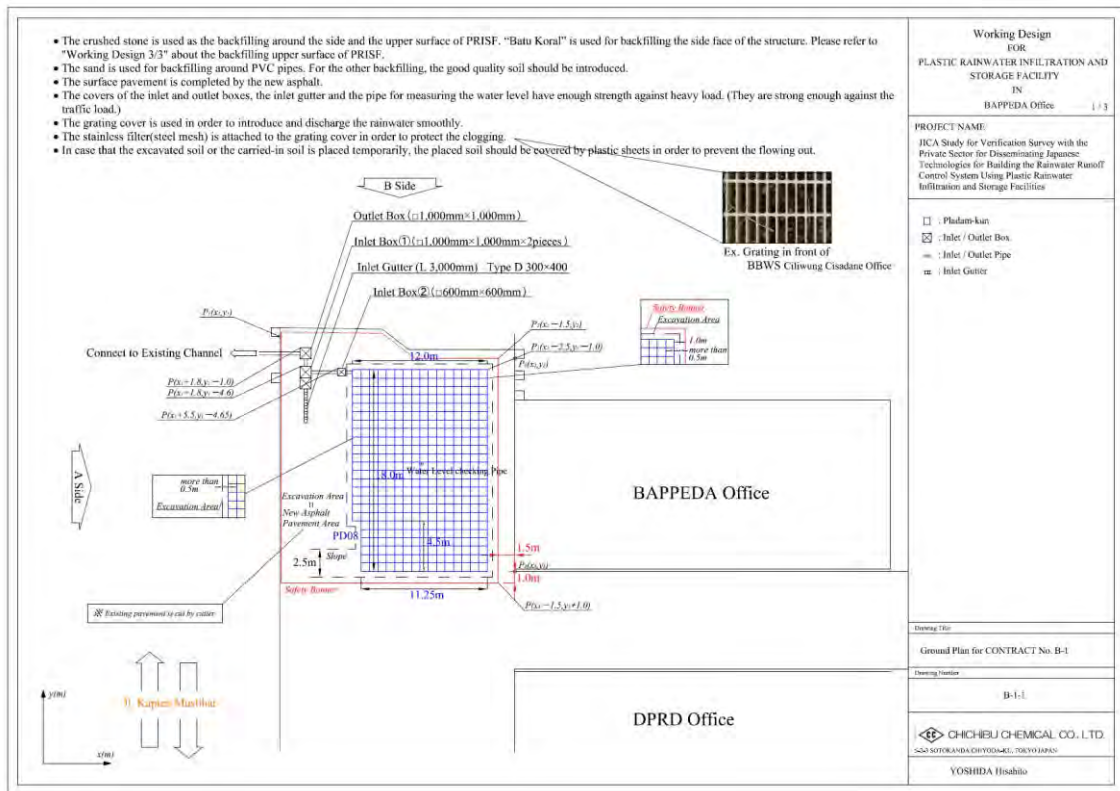


Fig. 3 Example of Working Drawing (BAPPEDA Office)



Photo 2 Preconstruction Meeting in BAPPEDA Office[left] and Kec. BOUT Office[right] (Aug.-4)

The construction work was ordered to the local company (PT. IDEA MANDIRI) and supervised by JICA Study Team. It was confirmed that the local workers are able to assemble PRISF of more than 100 m³ within one day.

The outline of construction of PRISF is summarized as follows.

BAPPEDA Office

Assumed Catchment Area: 5,542 m²
Effective Storage Volume: (PD08) $196.3 \text{ m}^2 \times 0.6\text{mH} \times 95\% = 118.8\text{m}^3$
(Base Area of Facility (m²) × Facility Height (m) × Void Ratio (%))
Effective Storage Height: $118.8\text{m}^3 / 5,542\text{m}^2 = 21.4\text{mm}$
(Effective Storage Volume (m³) / Assumed Catchment Area (m²))

Kecamatan Bogor Utara Office

Assumed Catchment Area: 3,417 m²
Effective Storage Volume: (NT125) $16.75\text{m}^2 \times 1.0\text{mH} \times 95\%$
(PD08) $348.75\text{m}^2 \times 0.6\text{mH} \times 95\% + = 214.7\text{m}^3$
(Base Area of Facility (m²) × Facility Height (m) × Void Ratio (%))
Effective Storage Height: $214.7\text{m}^3 / 3,417\text{m}^2 = 62.8\text{mm}$
(Effective Storage Volume (m³) / Assumed Catchment Area (m²))

PD08: Pladam-kun

NT125: New Trench-kun

BAPPEDA Office



Excavation Work (Aug.-30,2015)



Foundation Work (Sep.-1,2015)



Sheet Laying Work (Sep.-1,2015)



Building Work of Pladam-kun (Sep.-2,2015)



Building Ceremony of Pladam-kun (Sep.-3,2015)



Backfilling Work (Sep.-6,2015)



Site Inspection by Bogor Staff (Sep.-26,2015)



Final Site Inspection by PU Staff (May.-11,2016)

Photo 3 Construction at BAPPEDA Office

Kecamatan Bogor Utara Office



Excavation Work (Aug.-27,2015)



Foundation Work (Aug.-29,2015)



Building Work of Pladam-kun (Sep.-1,2015)



Building Work of New Trench-kun (Sep.-1,2015)



Setting Work of Root Barrier Sheet (Sep.-2,2015)



Concrete Block Pavement Work (Sep.-13,2015)



Site Inspection by Bogor Staff (Sep.-26,2015)



Final Site Inspection by PU Staff (May.-11,2016)

Photo 4 Construction at Kecamatan Bogor Utara Office

⑤ Manual preparation

The exchange of opinions was conducted using the Construction Manual in order to confirm the execution method of PRISF among the relevant officers from both BBWS Ciliwung Cisadane office and Kota Bogor.

In order to maintain the function of PRISF, the maintenance guideline was drawn up to confirm the periodic maintenance by the relevant officers from both BBWS Ciliwung Cisadane office and Kota Bogor.

Table 6 The contents of maintenance in BAPPEDA Office

Contents		Type	Checking of Function	Checking of Safety
<i>Checking</i>	Items		<ul style="list-style-type: none"> ✓ Deposit of sediment, garbage and fallen leaves on the inlet/outlet box ✓ Clogging of stainless-steel filter ✓ Water level of the checking pipe 	<ul style="list-style-type: none"> ✓ Disconnect of inlet/outlet box cover ✓ Broken and deformation situation of facilities ✓ Subsidence and depression of ground surface
	Methods		<ul style="list-style-type: none"> ✓ Visual checking for inlet box, water level checking pipe and outlet box ✓ Measuring of deposit quantity ✓ Infiltration situation during rainfall 	<ul style="list-style-type: none"> ✓ Visual checking of surface appearance of facilities
	Period (Frequency)		<p><u>Regular checking:</u> Every rainfall (At least one time for 1 week during rainy season)</p> <p><u>Irregular checking:</u></p> <ul style="list-style-type: none"> ✓ Before the rainy season ✓ Before the forecasted heavy rainfall ✓ In case that the user reports the defects 	
<i>Cleaning</i>	Simple		<ul style="list-style-type: none"> ◆ Removal of deposit of garbage and fallen leaves on the cover of inlet box, water level checking pipe and outlet box by broom etc. 	
	Middle		<ul style="list-style-type: none"> ◆ Removal of deposit of garbage and fallen leaves on the cover of inlet box, water level checking pipe and outlet box completely ◆ Cleaning of stainless-steel filter 	
	Full		<ul style="list-style-type: none"> ◆ Removal of deposit of sediment inside inlet box, water level checking pipe and outlet box 	
	Period (Frequency)		<p><u>Simple cleaning:</u> Every rainfall (At least one time for 1 week during rainy season)</p> <p><u>Middle cleaning:</u> Every heavy rainfall (In case of clogging of inlet/outlet box cover)</p> <p><u>Full cleaning:</u> At least one time for a few month during rainy season (In case of deposit depth of sediment in inlet/outlet box more than 15cm)</p>	

⑥ Training for operation and maintenance officers

The each relevant officer from BAPPEDA office and Kecamatan Bogor Utara Office was appointed to be the maintenance officer. The chief maintenance officer was appointed from the Dinas Bina Marga Dan Sumber Daya Air of Kota Bogor which is supposed to inspect and supervise the civil engineering materials for road and channel etc.. They are supposed to understand how to maintain the installed facilities by working for the maintenance together with the maintenance expert from Chichibu Chemical CO., LTD during the project. Furthermore, the maintenance meeting (Photo 5) was held in order to exchange opinions and to discuss towards the self-reliant maintenance management.



Photo 5 Maintenance Meeting in BAPPEDA Office[left] and Kec. BOUT Office[right] (Feb.-4)

⑦ Evaluation

Monitoring on rainfall, water level of inlet/outlet box and storage tank was done at Kecamatan Bogor Utara Office as shown in Fig. 4. At BAPPEDA Office water level of inlet box and storage tank was monitored shown in Fig. 5. Also water quality was monitored at inlet box shown in Fig. 6.

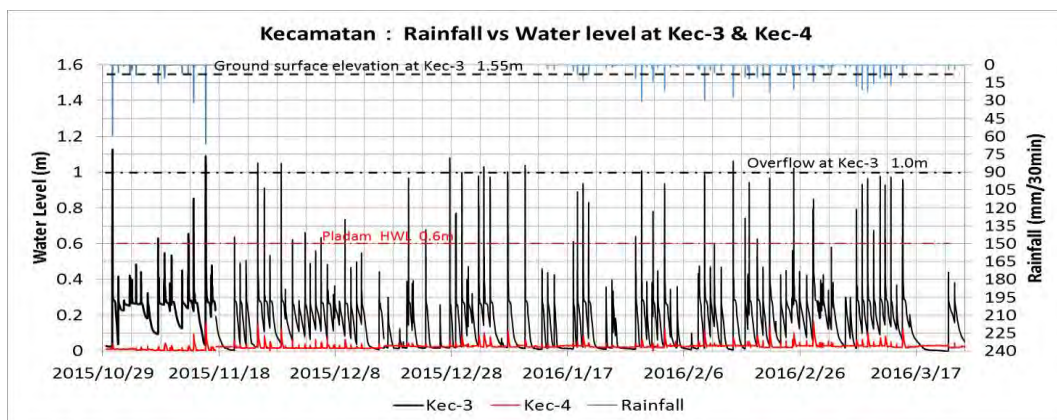


Fig. 4 Relationship between Rainfall and Water Level in Outlet Box (Kec-3) and Storage Tank (Kec-4) at Kecamatan Bogor Utara Office

- Rainfall data from November 21, 2015 to January 12, 2016 were not obtained due to the electricity problem caused by power outage or thunder.
- Each water level is the height from the bottom of the box and storage tank (Pladam-kun).
- It is found that there is no inundation at Kec-3 so far because water level of Kec-3 did not exceed ground surface elevation.
- Since overflow from outlet box (Kec-3) occurred sometimes even if there is room in the storage capacity of Pladam-kun, it is desirable to improve the way of inflow to Pladam-kun.

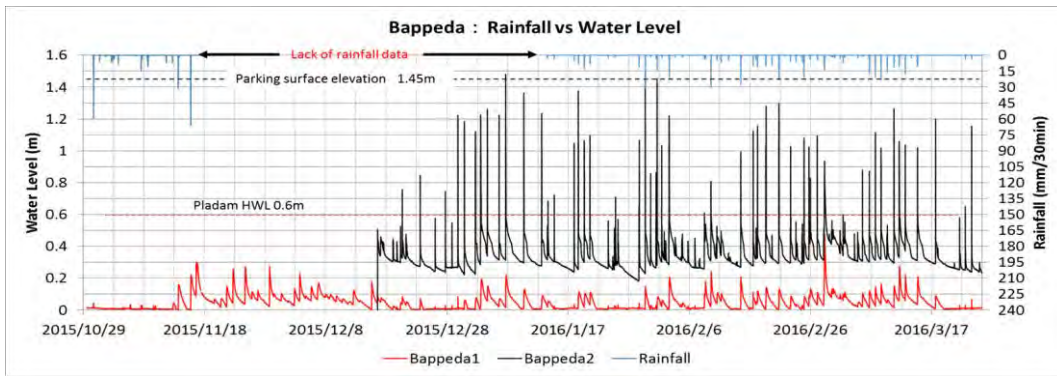


Fig. 5 Relationship between Rainfall and Water Level in Inlet Box (Bappeda2) and Storage Tank (Bappeda1) at BAPPEDA Office

- Water level of Bappeda2 exceeded ground surface elevation one time on January 6th. Inundation height was only 3 cm.
- Since water level did not return to the beginning level often even after the rain stopped, it is considered to be the backwater influence from the existing channel.

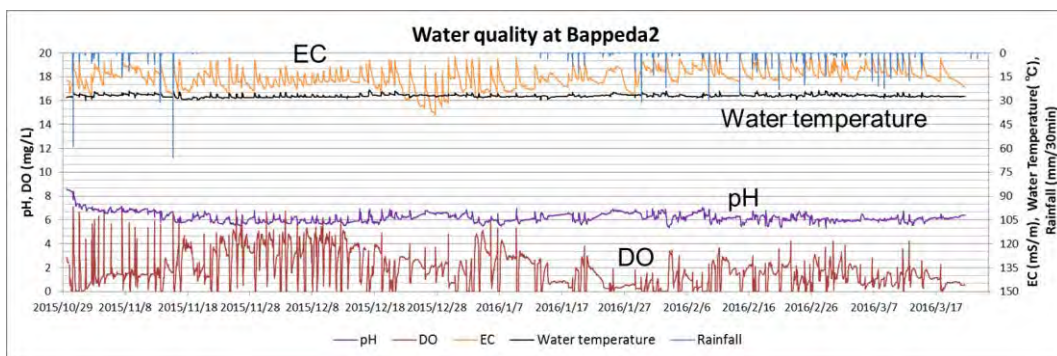


Fig. 6 Water Quality in Inlet Box (Bappeda2) at BAPPEDA Office

- pH was a little high by the concrete box at the beginning. Then it gradually was neutralized. Rain itself seems to be acidic.
- DO sensor showed the very low value without turbulence of water due to sensor's characteristics. Once turbulence was generated by the inflow of stormwater, its value was increased.
- As for EC, its value was not so high compared with other country data.

In order to evaluate the runoff effect of PRISF, simulation model is set up by using the monitoring data as shown in Fig. 7.

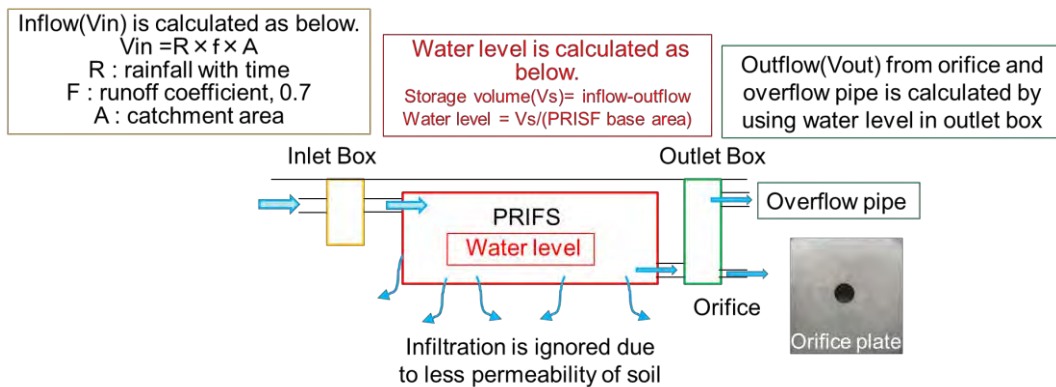


Fig. 7 Outline of Simulation Model

Validity of the simulation is checked by comparing the calculated water level and observed water level in PRISF as shown in Fig. 8.

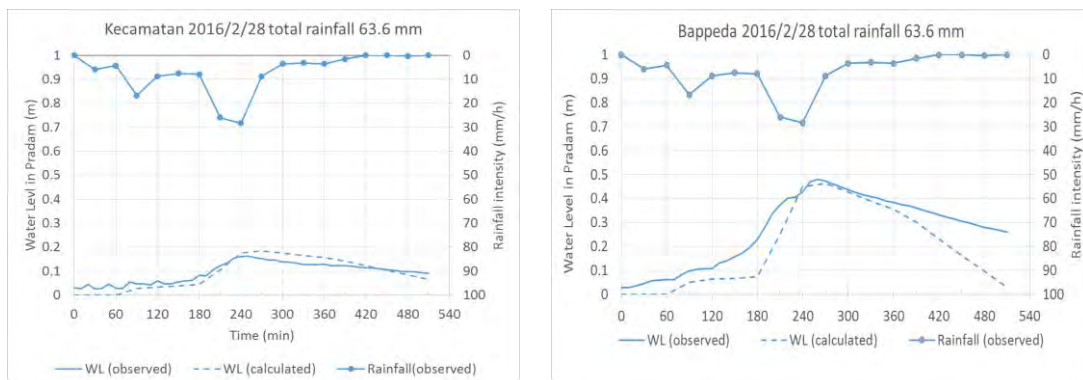


Fig. 8 Comparison between observed and calculated water level in Pladam-kun

Against the past heavy rainfall of Bogor when the severe flooding occurred in Jakarta, the runoff effect of PRISF is evaluated by the simulation as shown in Fig. 9 and Fig. 10. PRISF is expected to be possible in a good performance on runoff control in the scale of Kecamatan Bogor Utara installation.

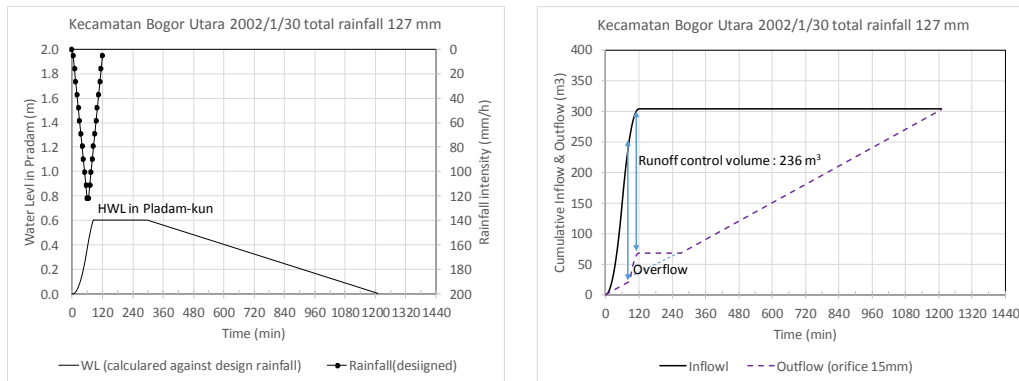


Fig. 9 Runoff Effect of PRISF against the past heavy rainfall at Kecamatan Bogor Utara

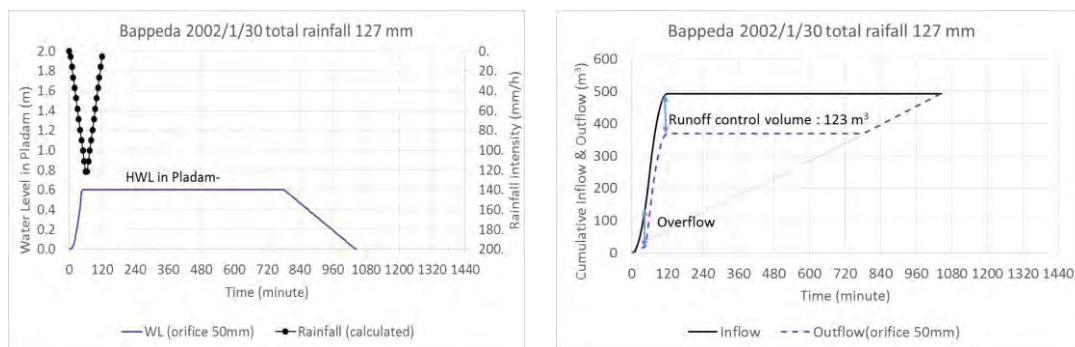


Fig. 10 Runoff Effect of PRISF against the past heavy rainfall at BAPPEDA

Conclusions of the evaluation are as follows.

- By the installation of PRISF, the inundation at the both office could be avoided judging from the monitoring data.
- Stormwater quality at Bappeda office was not so bad compared with other country data.
- Against the past heavy rain of Bogor when the severe flooding occurred in Jakarta in 2002, PRISF installed at Kecamatan Bogor Utara Office is expected to be possible in a good performance on runoff control.
- By this JICA project, facilities of 333.5m³ have been installed in Kota Bogor. It accounts for 6.5% of progress rate to target volume as shown in Table 7.

Table 7 Target Volume of Storage and Infiltration Facilities in City/Regency estimated by JICA

Item		Jakarta Pusat	Jakarta Timur	Jakarta Selatan	Kota Depok	Kab. Bogor	Kota Bogor	Total Basin
Target Volume (m ³)	Public facilities	41,890	35,530	88,560	18,310	13,970	5,140	203,400
	Private Facilities	0	59,500	49,400	501,000	1,754,000	310,700	2,674,600
	Total	41,890	95,030	137,960	519,310	1,767,970	315,840	2,878,000

Source: Comprehensive Flood Management Plan (Draft), JICA, October 2013

Promotion of PRISF

- ① Study on the establishment of regulations concerning the installation of comprehensive flood control facilities associated with development activities

The documentary investigation and arrangement concerned with existing regulation in Indonesia were done. Also counterpart hearing on existing regulation was done. According to those investigation and hearing, the following understandings were confirmed.

- The complete development permission system exists both in Jakarta Metropolitan District and Bogor City.
- There is no examination guideline to follow the permission system.
- The government officer in charge of the development permission checks the document submitted by the consultant firm without any examination guideline. So it is difficult for them to judge fairly.

- ② Study on future dissemination

The result of the study on the issues and adaptations for future dissemination is tabulated in Table 8 as follows;

Table 8 The result of study on future dissemination

Issue	Adaptation
There is no guideline for development.	It is necessary to establish the guideline in reference to Japanese guideline.
There is no authorized design criteria.	It is necessary to establish the design standard in reference to Japanese standard.
Qualification of PRISF is not written in SNI (Indonesia National Standard).	PRISF should be qualified by SNI. Qualification of PRISF should be written in SNI.
There is no authority and standard to check the quality of the facility.	The authority and standard should urgently be established in cooperation with ARSIT in Japan
If the material to be imported from Japan, the price becomes high and the price competitiveness becomes low.	The material should be produced in Indonesia. The sales network of the material should be constructed in cooperation with the Japanese-affiliated companies which have locally incorporated companies. The joint venture corporation should be established.
The appropriate usage and maintenance of the facilities handed over to the counterpart.	JICA staff are asked to check the counterpart occasionally whether they use and maintain the facilities properly. If the persons involved in this project have the chance to visit Jakarta, they will check the condition of the facilities.



(2) Self-reliant and Continual Activities to be Conducted by Counterpart Organization

Workshops in Indonesia and Activities Conducted in Japan

① Workshops in Indonesia

1st seminar was held in Kota Bogor to explain the outline of our JICA project and discuss the comprehensive approach of flood mitigation for urban river basin in Indonesia and Japan. 2nd workshop was held in DKI Jakarta to explain the flood control effect by PRISF in Kota Bogor and discuss the regulation for flood mitigation and the technical design method of PRISF etc.

Table 9 Outline of Workshops

Main Theme	Photo & Date
<ul style="list-style-type: none"> • Issues and Comprehensive Flood Control on Rainwater Run-off in Ciliwung Cisadane Basin • Comprehensive Urban River Basin Management in Japan • Outline of JICA Project of Chichibu Chemical CO., LTD. 	 <p style="text-align: center;">September-3rd, 2015</p>
<ul style="list-style-type: none"> • Flood Control Effect by PRISF installed in Kota Bogor • Zero Delta Runoff System in Indonesia • Recommendation on Rainwater Storage and Infiltration Technology 	 <p style="text-align: center;">May-19th, 2016</p>

② Activities Conducted in Japan

The Activities Conducted in Japan were conducted for the selected member of counterparts. They were invited to Japan to visit the fields on the rainwater flood control facilities and PRISF and to exchange opinions with Japanese government officers (Ministry of Land, Infrastructure, Transport and Tourism, Japan and Tokyo Metropolitan Government etc.). Through those activities, they could understand the present situation of flood control measures in Japan and recognize the characteristics of PRISF which is one of the flood control measures.



Photo 6 Activities Conducted in Japan

③ Signboard

The signboards were built to notify and promote the Japanese PRISF as shown in Photo 7



Photo 7 Signboard in BAPPEDA Office[left] and Kec. BOUT Office[right]

4. FUTURE PROSPECTS

(1) Impact and Effect on the Concerned Development Issues through Business Development of the Product/ Technology in the Surveyed Country

For the issue of the inundation disaster in JABODETABEK, the function of the dispersed rainwater and storage and infiltration by introducing PRISF has become clear from the monitoring result. On the other hand, the volume of PRISF per one site is limited. Because, it is necessary to install PRISF in many sites.

Based on “The Project for Capacity Development of Jakarta Comprehensive Flood Management in Indonesia (JICA project)”, the target of Rainwater Infiltration and Storage Facilities (RISF) installation in the Ciliwung River Basin is totally 2,878,000m³ as shown in Table 7. At first we hope that the target of RISF is achieved. Then we expect the setup of the target of RISF and its action plan in other river basins.

(2) Lessons Learned and Recommendation through the Survey

Lessons Learned

- By the installation of PRISF, the inundation disaster at JABODETABEK could be reduced.
- The complete development permission system “Izin Mendirikan Bangunan etc.” exists in Indonesia.
- There is no examination guideline to follow the permission system.

Recommendation

We think that it is necessary to establish the guideline for runoff control measure for

the continuous spread of PRISF. Then it is necessary to establish the design standard to evaluate mechanical strength, durability and long term strain characteristics etc. of plastic unit.

We hope to reduce the inundation disaster and prevent ground subsidence by introducing PRISM all over Indonesia.

ATTACHMENT: OUTLINE OF THE SURVEY

Verification Survey with the Private Sector for Disseminating Japanese technologies for Building the Rainwater Runoff Control System Using Plastic Rainwater Infiltration and Storage Facilities

Chichibu Chemical CO., LTD., Tokyo, Japan

Concerned Development Issues in Indonesia

- Increase of Rainwater Runoff in DKI Jakarta
- External Water Flooding from River and Internal Water Flooding due to Poor Drainage
- Ground Sinking due to Excess Groundwater Intake

Implemented Activities in the Survey

- Installation of Plastic Rainwater Infiltration and Storage Facilities which has been promoted very much in Japan as a Cheap and Simple Construction Method
- Quantitative Estimation for Flood Control Effect by Monitoring the Effectiveness of Facilities
- Investigation towards Establishment of Law, Ordinance and Regulation etc. regarding Flood Control on Land Development

Proposed Products/Technologies



New Trench-kun



Pladam-kun

Survey Overview

Name of Counterpart:
Directorate General of Water Resources Development, Ministry of Public Works and Housing
Survey duration:
January, 2015 ~ September, 2016
Survey Area:
JABODETABEK, Indonesia

Impact on the Concerned Development Issues in Indonesia

- Mitigation of Inundation Damage by Flood Control
- Promotion of Understanding for Relevant People towards Continuous Improvement of Flood Control Measures
- Mitigation of Ground Sinking by Groundwater Recharge

Outputs and Outcomes of the Survey

- Opening up Market in Indonesia
- Promotion of Domestic Business by Cost down due to Establishment of Joint Venture Corporation
- Expansion of Market by Publicity and Public Relations on Experience of JICA Project