

各国の水インフラ整備に貢献できる日本の技術

(国際会議配布資料)

MICROTUNNELLING

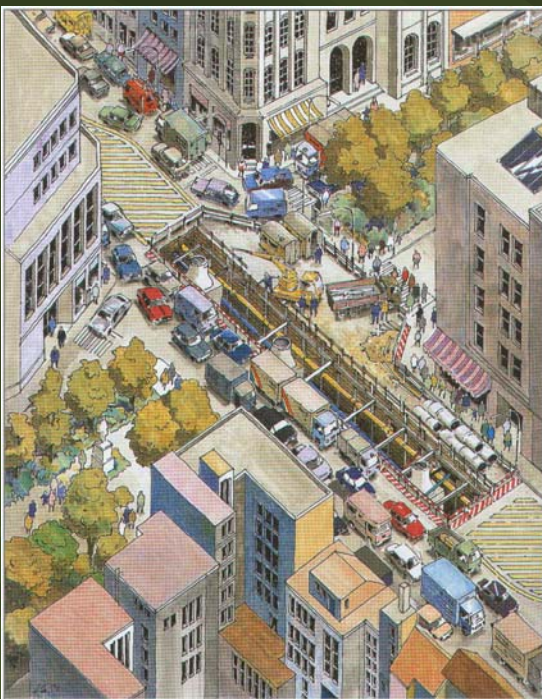
(Pipe Jacking Method)

COMPENDIUM

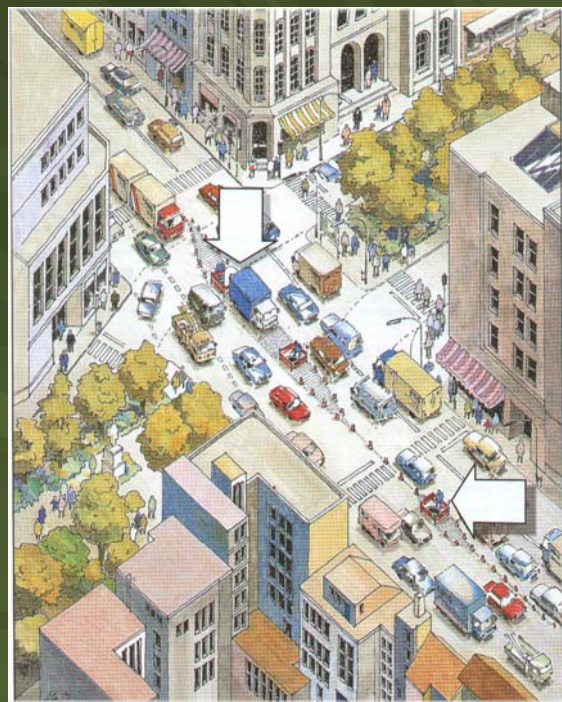
1

Open-cut vs Microtunnelling

(Pipe Jacking Method)



Open Cut



Microtunnelling

Courtesy: GSTT
2

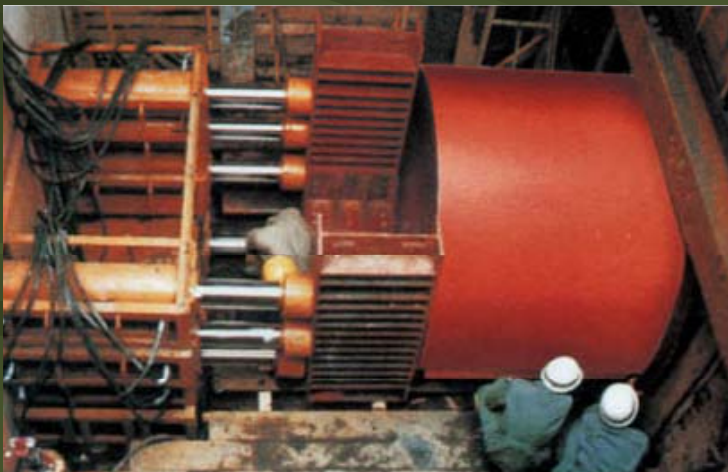
Problems with Cut-and-Cover

- Underground space in public right-of-way is heavily used
- Traffic congestion growing
- Street pavement damage
- Cost of surface restoration
- Direct and indirect business loss
- Great deal of spoil

3

MICROTUNNELLING (Pipe Jacking Method)

A system of directly installing pipes behind a Shield Machine by hydraulic jacking from a Drive Shaft such that the pipes form a continuous string in the ground

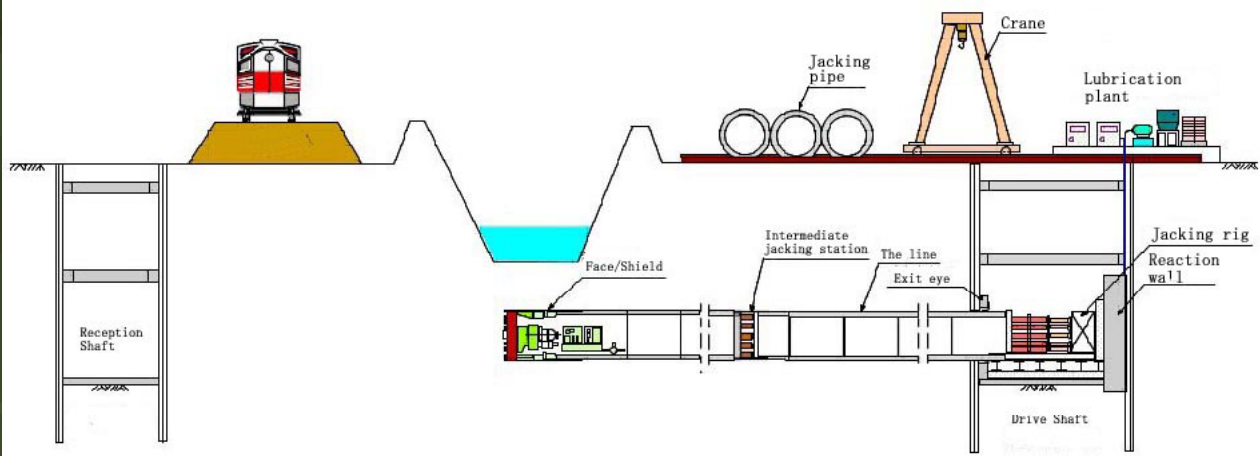


Used for places where;

1. Heavy traffic roads.
2. Utility pipes buried underground are congested and difficult to dig from the surface of the ground.
3. Crossing road and rivers, which means impossible to dig from above ground.
4. The level of the installation is deep and microtunnelling would be cost-effective.

4

Basic elements for microtunnelling



Shaft for Microtunnelling (Pipe Jacking Method)

Sheet pile



Liner plate sheeting



Steel casing



MICROTUNNELLING

(Pipe Jacking Method)

Procedure

Earth-Pressure-Balance (EPB) type
for 3.0m Concrete pipe

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Microtunnelling (Pipe Jacking Method)

Facilities installation (Drive shaft)



Exit eye

Reaction wall



Microtunnelling (Pipe Jacking Method) Facilities installation (Drive shaft)



support rails

Jacking rig



Microtunnelling (Pipe Jacking Method) Facilities installation (Drive shaft surface)

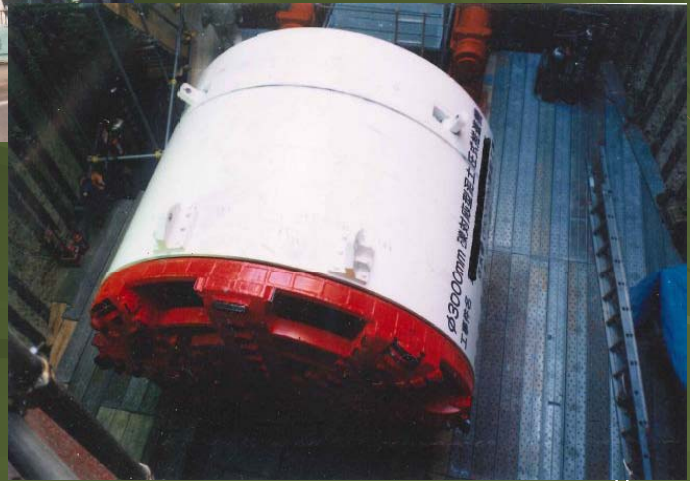


Lubrication & Backfill grouting
Plant

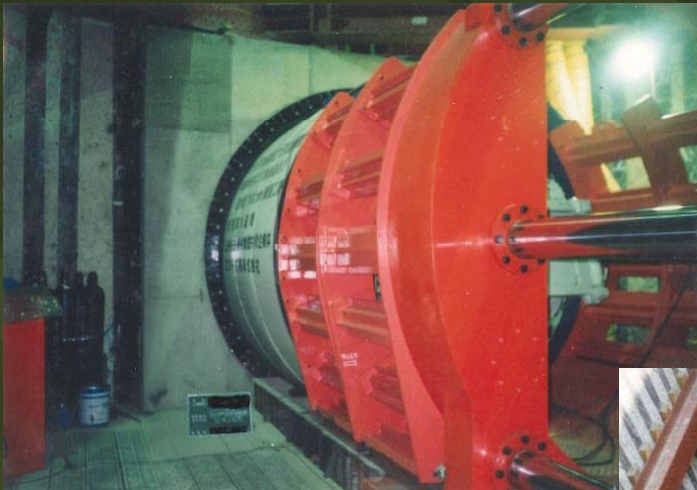
Muck pit



Installation of Shield machine



Start pipe jacking

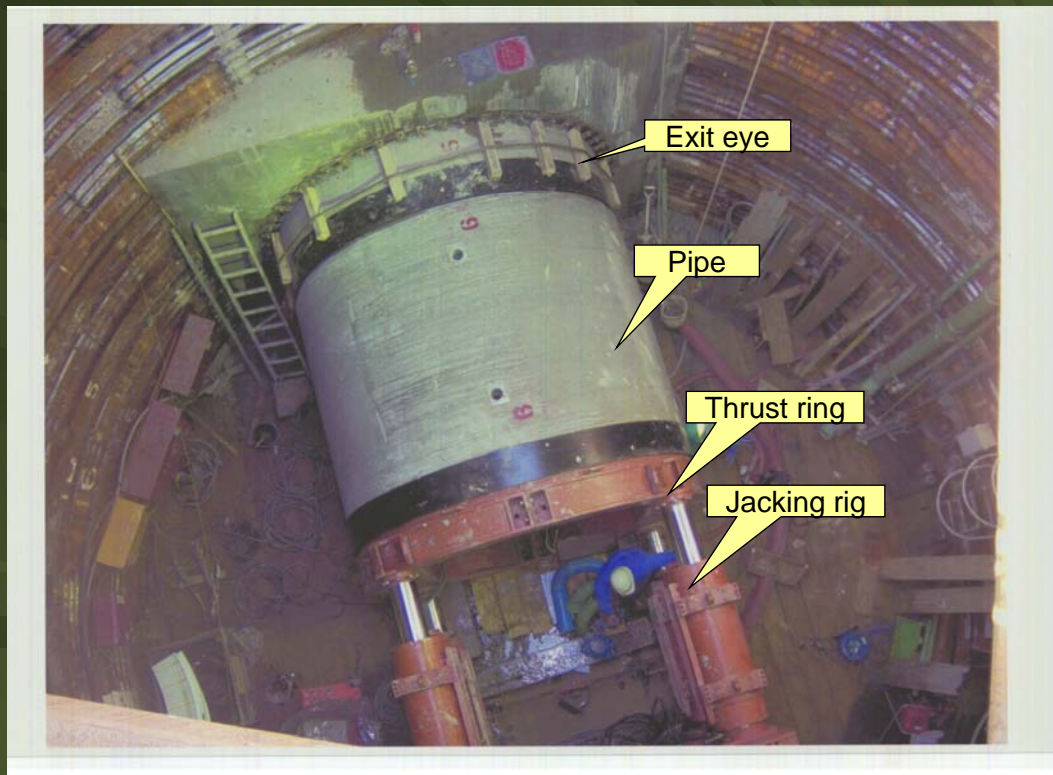


Launch of microtunnelling

Jacking pipe is dropped into the shaft and placed on the support rails.



Pipe Jacking



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Measurement

Confirm the line and level by measurement. Make sure the installation is within close limits of the target.



14

Muck transportation and discharge



Muck discharge
(behind the shield)

Muck transportation
(by muck wagon)



15

Muck transportation and discharge



Muck wagon being lifted
and discharged into the
muck pit



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Reception of microtunnelling



After reception, backfill grouting is carried out



Thank you

Japan Microtunnelling Association

[http : //www.suisinkyō.or.jp/](http://www.suisinkyō.or.jp/)

The Activity of Asia PPP Promotion Conference (APPC)

30 January, 2014

**Engineering and Consulting
Firms Association (ECFA), Japan**

1

Asia Public-Private-Partnership (PPP) Promotion Conference (APPC)

Established in January 2006;

- among **Japanese leading private companies**
- with support of Ministry of Economy, Trade and Industry (METI)

For the purpose of promoting PPP across Asian countries

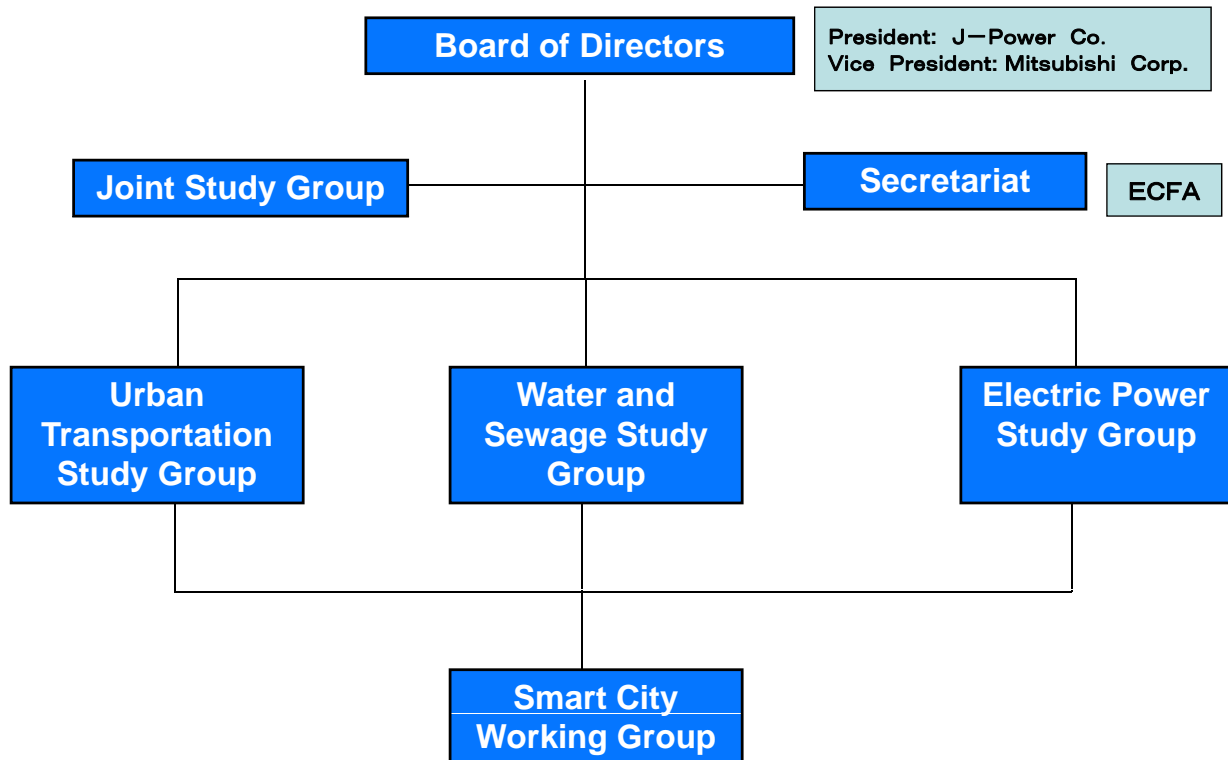
Covering **any infrastructure projects**

- power, water supply and railway, etc

Under PPP scheme

- for sustainable economic growth and poverty reduction mainly in Asian countries

2



Member Companies

<p>Trading Companies ITOCHU CORPORATION MARUBENI CORPORATION MITSUBISHI CORPORATION MITSUI & CO.,LTD. SOJITZ CORPORATION SUMITOMO CORPORATION TOYOTA TSUSHO CORPORATION</p> <p>Electric Power Companies CHUBU ELECTRIC POWER CO.,INC. THE CHUGOKU ELRCTRIC POWER CO.,INC. ELECTRIC POWER DEVELOPMENT CO.,LTD. HOKURIKU ELECTRIC POWER COMPANY THE KANSAI ELECTRIC POWER CO.,INC. KYUSHU ELECTRIC POWER CO.,INC.</p> <p>Consulting Engineers ALMEC CORPORATION AZUSA SEKKEI CO.,LTD. DELOITTE TOHMATSU CONSULTING CO.,LTD. ERNST & YOUNG SHINNIHON LLC KOKUSAI KOGYO CO.,LTD. NJS CONSULTANTS CO.,LTD. NIPPON KOEI CO., LTD. ORIENTAL CONSULTANTS CO.,LTD. ORIGINAL ENGINEERING CONSULTANTS CO.,LTD. PACIFIC CONSULTANTS CO.,LTD. PADECO CO.,LTD. YACHIYO ENGINEERING CO.,LTD.</p>	<p>Construction KAJIMA CORPORATION KUMAGAI GUMI CO.,LTD. MAEDA CORPORATION TOYO CONSTRUCTION CO.,LTD. TOYO ENGINEERING CORPORATION</p> <p>Manufacturers FUJI ELECTRIC CO.,LTD. HITACHI, LTD. HONDA MOTOR CO.,LTD. IHI CORPORATION METAWATER CO.,LTD. NEC CORPORATION JAPAN TRANSPORT ENGINEERING COMPANY SHARP CORPORATION SWING CORPORATION TORAY INDUSTRIES,INC. WATER AGENCY INC.</p> <p>Information Technology NTT DATA CORPORATION</p> <p>Banks MIZUHO BANK, LTD. THE BANK OF TOKYO-MITSUBISHI UFJ,LTD.</p> <p>Law Firm BAKER & MCKENZIE</p>
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Government

Ministry of Economy, Trade and Industry Japan (METI)

Ministry of Land, Infrastructure, Transport and Tourism Japan (MLIT)

Government Agency

Development Bank of Japan Inc.

Japan Bank for International Cooperation (JBIC)

Japan External Trade Organization (JETRO)

Japan International Cooperation Agency (JICA)

Japan Sewage Works Agency

Nippon Export and Investment Insurance (NEXI)

The Overseas Human Resources and Industry Development Association

Municipal Government

City of Yokohama

Multilateral Organization

International Finance Corporation (IFC)

Industrial Organization

Engineering Advancement Association of Japan

Engineering and Consulting Firms Association (ECFA), Japan

Institute for International Trade and Investment

Japan Consulting Institute

Japan Economic Research Institute Inc.

Japan Electric Power Information Center, Inc.

Japan Foreign Trade Council, Inc.

Japan Institute for Overseas Investment

Japan Machinery Center for Trade and Investment

Japan Overseas Rolling Stock Association

Japan Project-Industry Council

Keidanren (Japan Business Federation)

Pacific Resource Exchange Center

The Overseas Construction Association of Japan, Inc.

Tokyo Metro Co., Ltd.

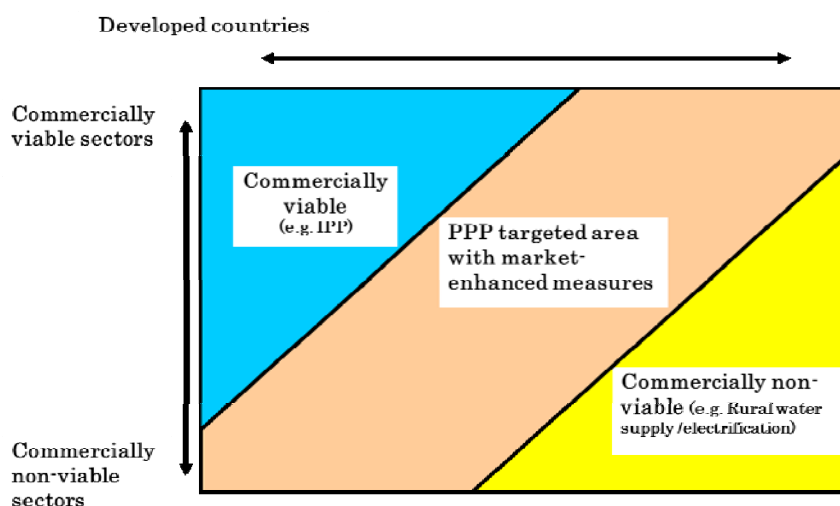
As of January, 2014

PPP Target

“An arrangement

- between public and private partners, where
- the latter develops, implements and operates infrastructure facilities
- by allocating tasks, obligations and risks among them in an optimum way”.

PPP Approach in Asian Countries



Provision of Infrastructure under PPP scheme

APPC Mission

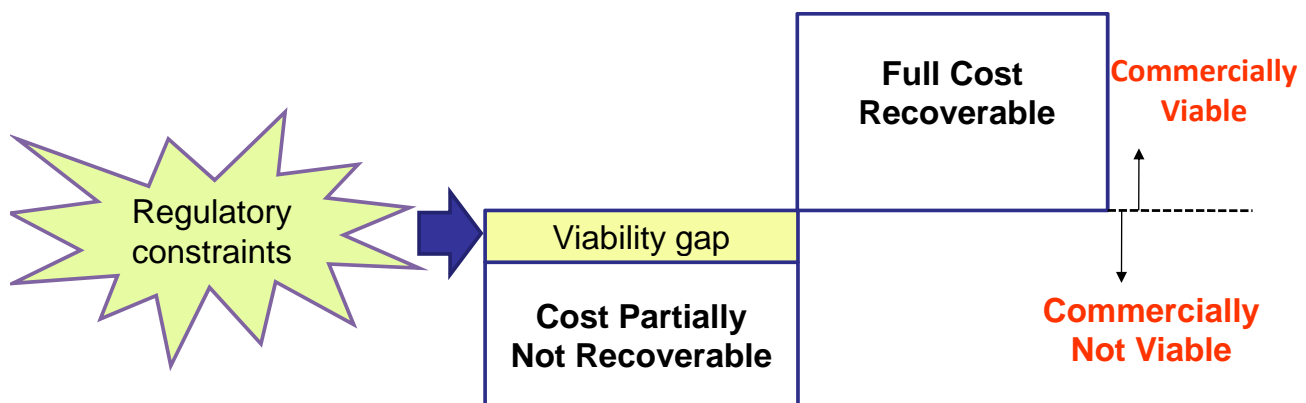
- Large demand for infrastructure development in ASEAN
- Categorized as those ;
 - i) Commercially viable ones (e.g. IPP)
 - ii) Government needs to invest by itself
 - iii) In-between i) and ii) above that cannot be fulfilled by private sector only
- Materializing iii) projects under PPP scheme would be a mission of APPC
- In order to facilitate above effort, APPC has been working in various field, including preparation of manuals for member companies.

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What is Viability Gap?

ECFA

Engineering and Consulting Firms Association, Japan



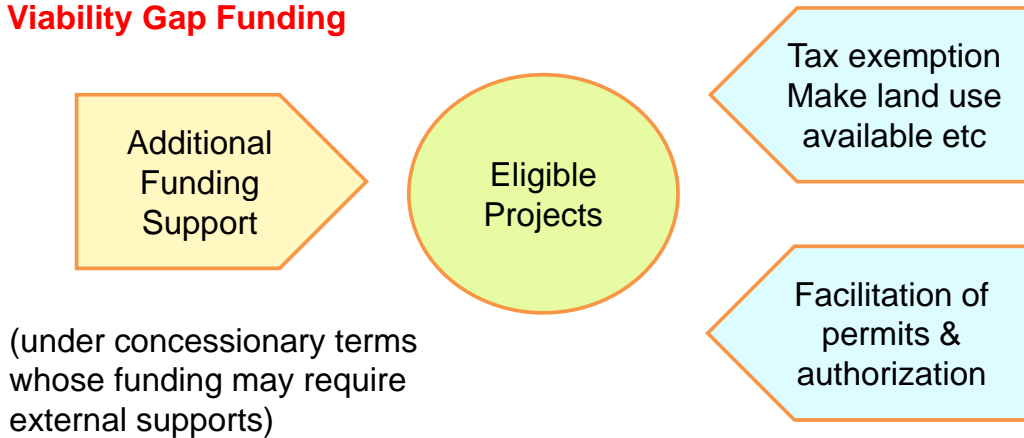
VGF can be caused by:

- ① Long duration of project requiring naturally high cost for risk hedging - nature of infrastructure development
- ② Tariff policy unable to reflect and recover invested costs or to allow front loaded tariff

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A concept to provide limited enhanced (financial and non-financial) supports for those projects where necessary...

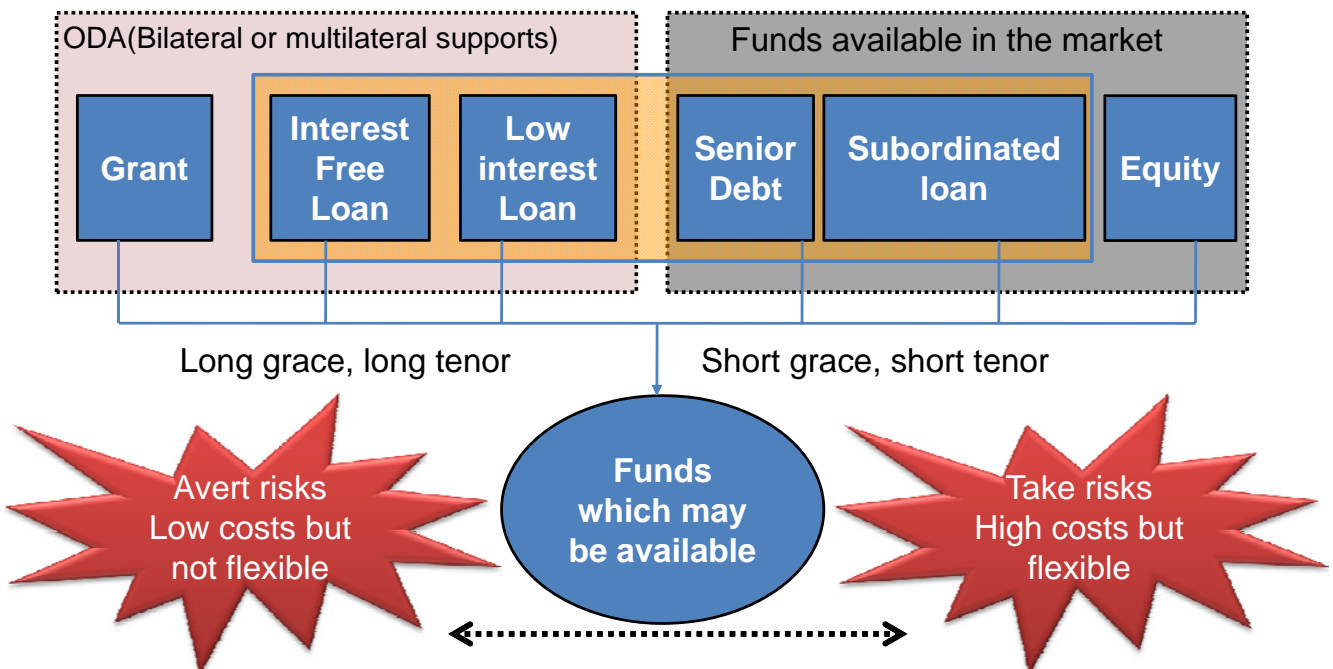
Viability Gap Funding



Whole purpose of the support is to make the project viable and let such project be materialized firmly and without delay

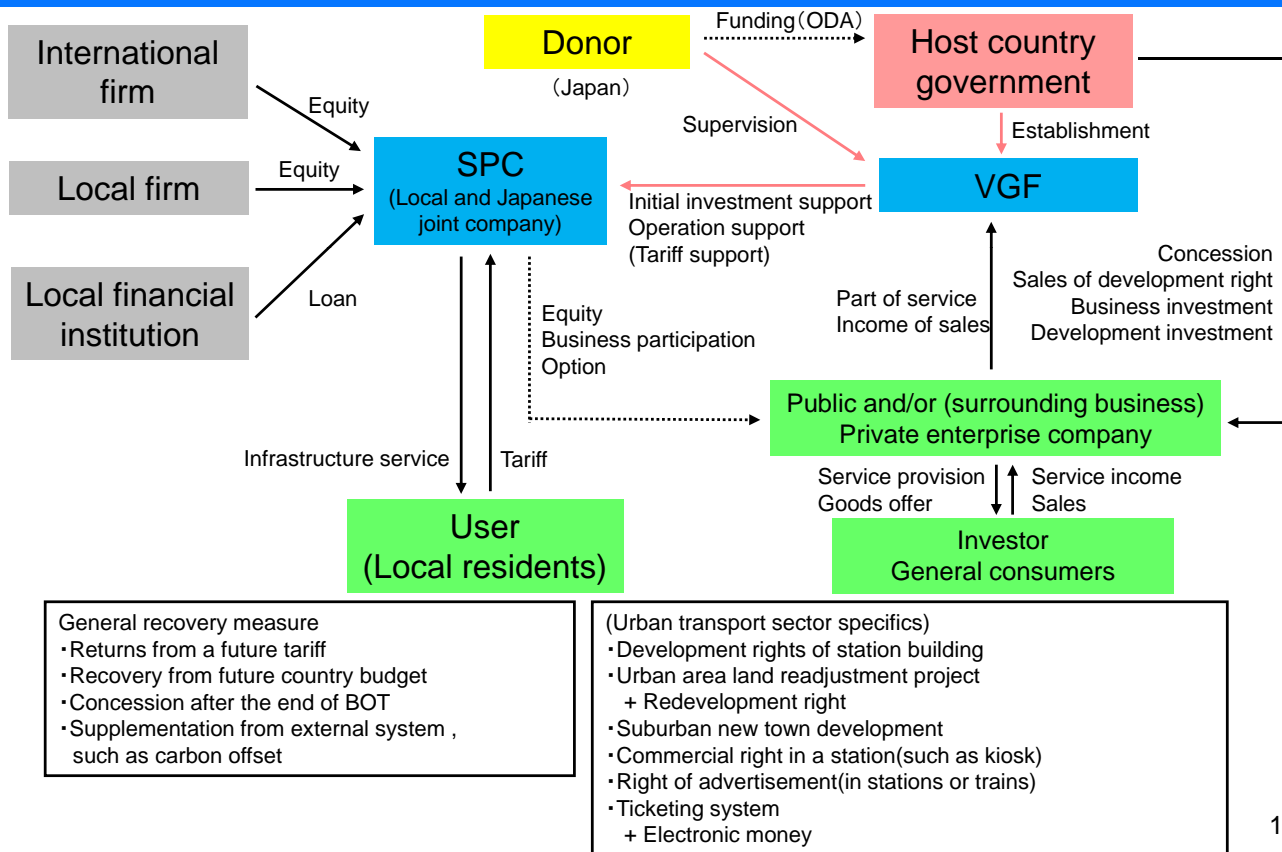
Various nature of potential funds

Different types of funds may be available from different sources



Fixed interest rate and guaranteed conversion of local currency to hard one would also be key issues.

Example – Source of VGF



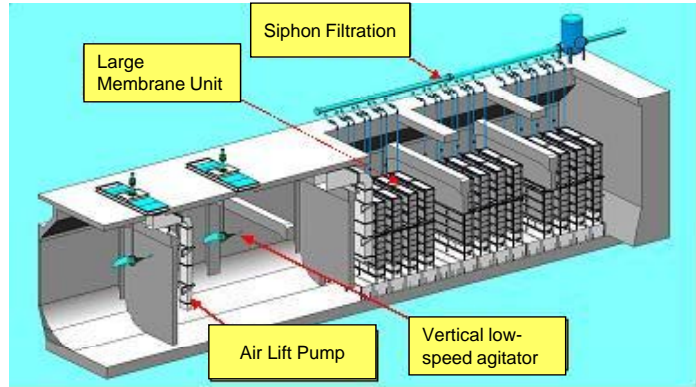
PPP Strategy Study Working Group

- **PPP Strategy Study Working Group** is studying PPP systems in Asian countries , such as India , Indonesia , Malaysia , Philippines , Vietnam , etc.
- **PPP systems** : Laws and Regulations for PPP , Governmental Organizations for promoting PPP , Project Development Fund (PDF) , Government Supports , Project Process , and so on.
- **Case Studies** and **discussion with PPP experts**.
- From now on, various **concrete proposals about PPP systems** will be prepared by APPC for **promoting PPP projects**.

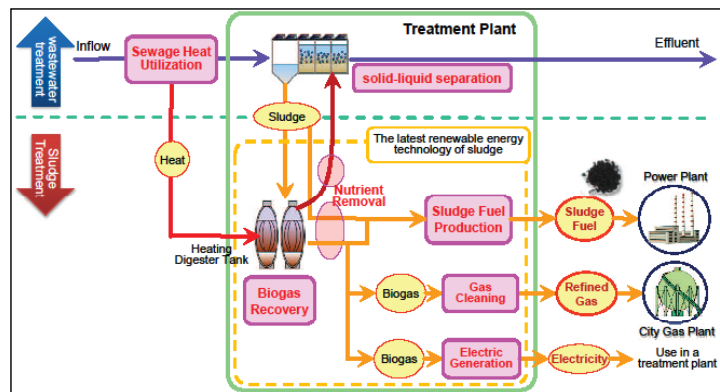
Sewage Treatment Working Group *ECFA*

Latest Development of Japanese technology *Engineering and Consulting Firms Association, Japan*

- A-JUMP : Advance of Japan Ultimate Membranebioreactor technology Project



- B-DASH : Breakthrough by Dynamic Approach in Sewage High technology project



By MLIT conducted

Sewage Treatment Working Group Low Cost Technology

ECFA

Engineering and Consulting Firms Association, Japan

Pre-treated Trickling Filtration process (PTF)

Overwhelmingly low in Life Cycle Cost

- Energy efficient : Power efficient system, considering power condition of developing countries
- Space saving : The compact layout with high efficiency
- Simple Operation and Maintenance : No need for trained engineer due to fully automatic system
- Stable Treated Water Quality : Securing approximately 15 mg/L for both BOD and SS

System, combining 3 distinctive technologies

Highly efficient solid-liquid separation tank

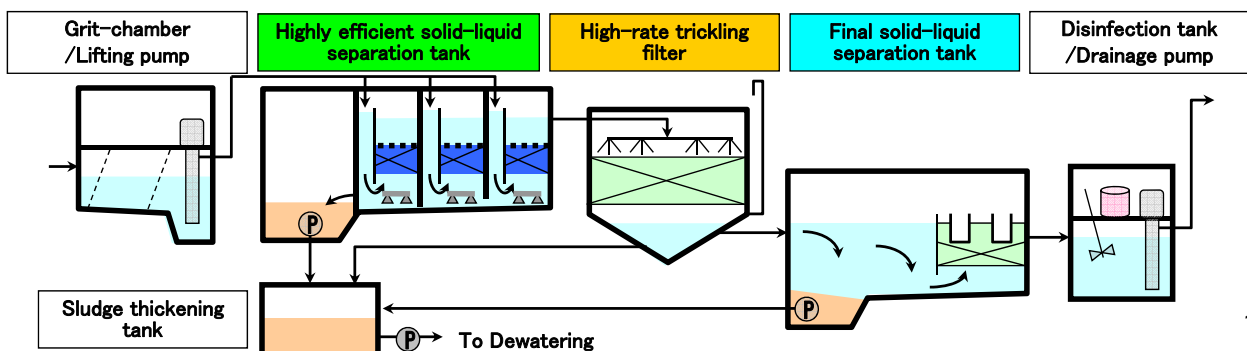
Removing particulate SS and BOD by filtration

High-rate trickling filter

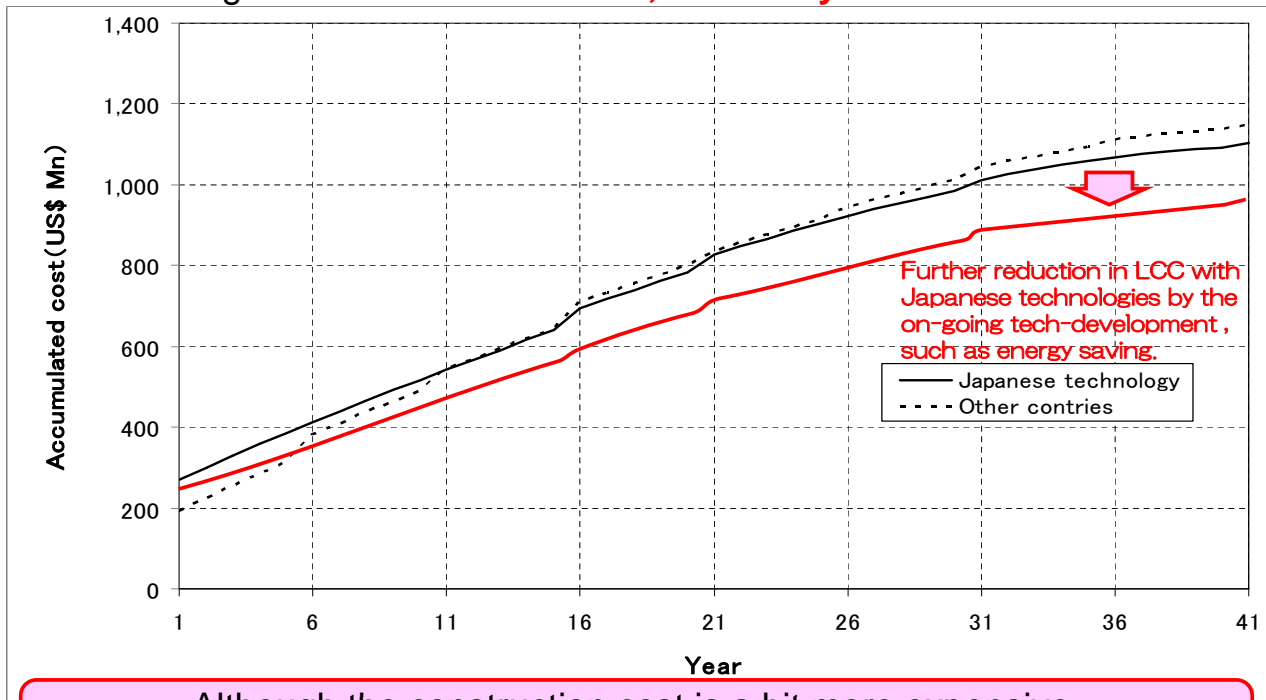
Mainly removing soluble BOD by bio-film

Final solid-liquid separation tank

Settling removal of tiny pieces of SS by Slough-off biofilm



Case : A large-scale **WWTP*** with **200,000m³/day**



Although the construction cost is a bit more expensive, the LCC will reverse in Japanese technologies.

*WWTP : Waste Water Treatment Plant

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For success of PPP project **ECFA**

Engineering and Consulting Firms Association, Japan

PPP (Public Private Partnership) consists of;

- First P as Public
Central and municipal government and their agencies
- 2nd P as Private
Private enterprises including local (APPC represents)
- Last (but never in the least) P, “Partnership”

Former two “Ps” respect each other, cooperate, and share risks and responsibilities of the project.

Most of overseas investment into infrastructure project by private entities are under project finance scheme.

- Project with no ambiguities on risk sharing scheme

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Small scale sewage treatment plant by natural power

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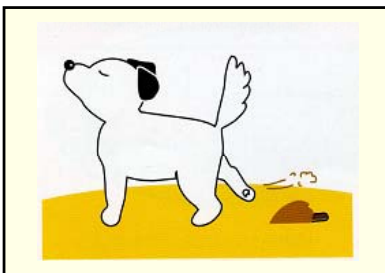


MOKAN JOKA SYSTEM CO., LTD.
President HIROKO KIMURA

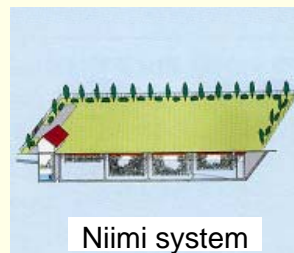
Birth of the Dojo-Joka System (Niimi system)

2

Natural phenomenon



Birth of the Dojo-Joka
System technology



Inspiration of Tadashi Niimi

- every sewage treatment plant has a bad odor.
- Soil can remove the bad odor.

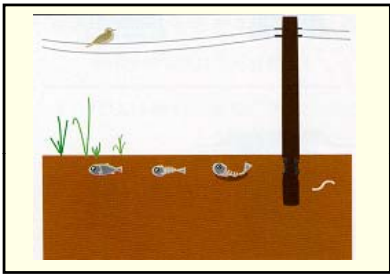
Application to a facility



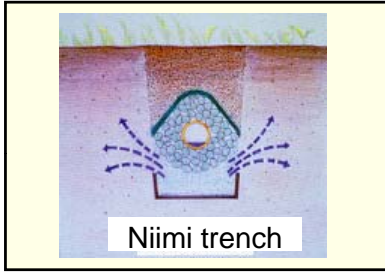
Chiran central Purification
Center in Minamikyushu City,
Kagoshima Prefecture

Birth of the Dojo-Joka System (Niimi Trench)

Natural phenomenon



Birth of the Dojo-Joka System technology



Inspiration of Tadashi Niimi

- I will try using living matters in soil.
- I will try using the capillary siphon action.
- Sewage and sludge are organic matters and must be able to be decomposed and purified by soil.

Application to a facility

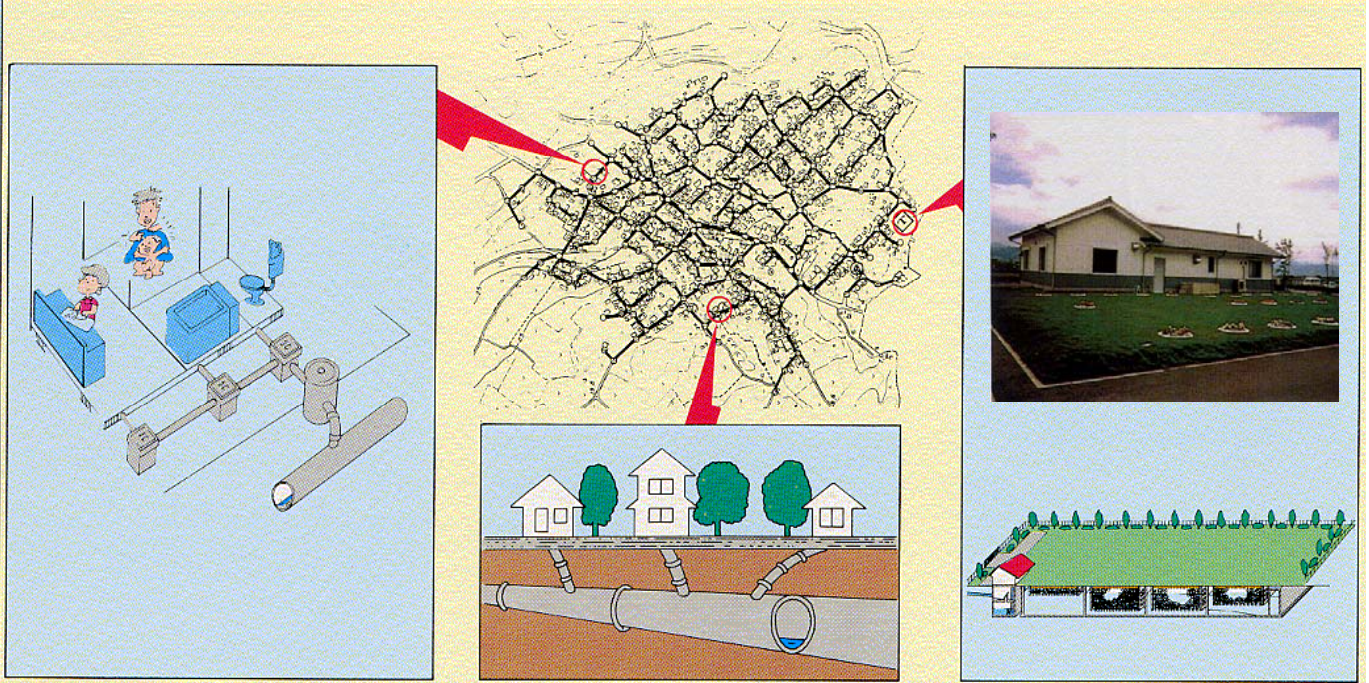


Mechanism of sewerage

Wastewater discharged from a household

Installed pipes

Purified in a purification center

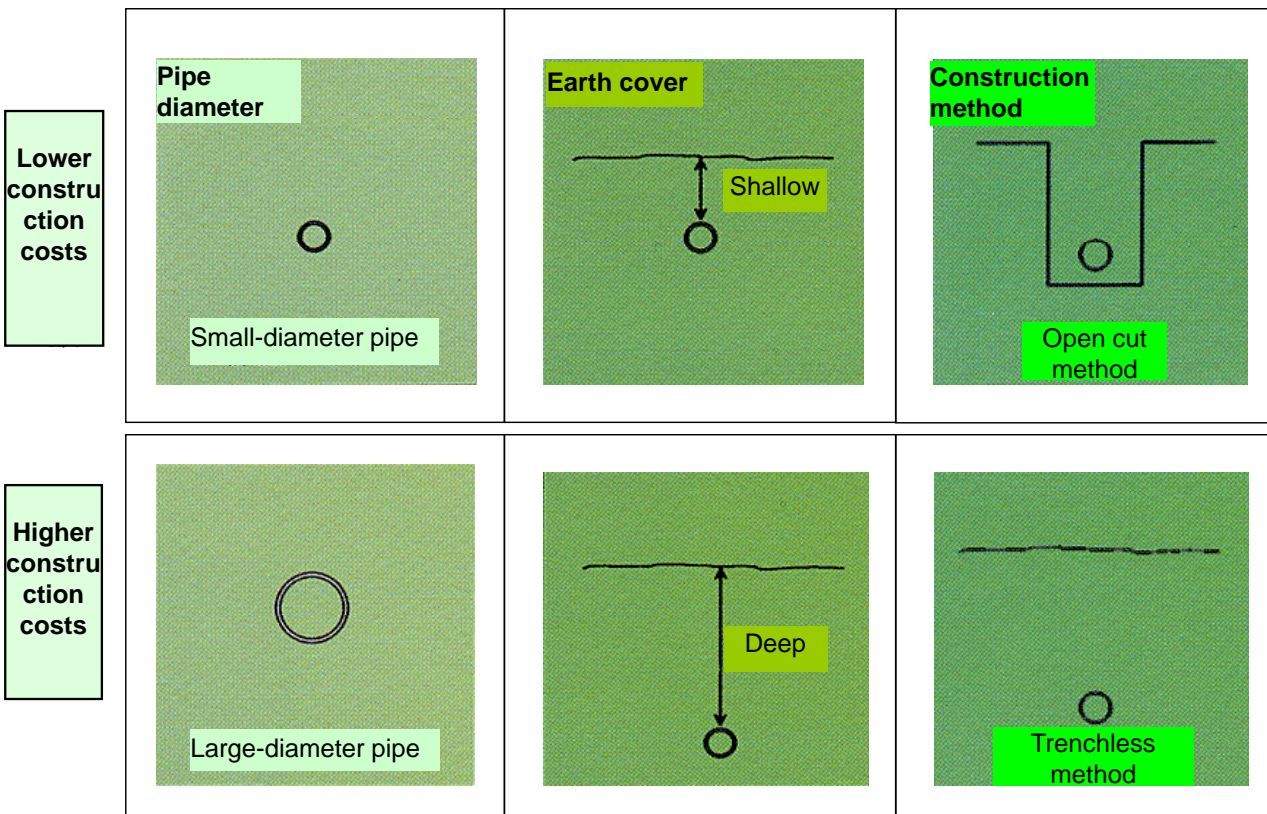


Requirements for small sewage treatment plants

Requirements for small sewage treatment plants

- Shall use wastewater treatment technologies that will not cause any secondary pollution.
- Shall use few machines and simple technologies.
- Shall be able to be operated fully unattended and shall not generate a large amount of sludge.
- Shall be able to be constructed and maintained at reduced costs.
- Shall assure cleanliness of treated water.

pipe construction costs



Soil-covered treatment plants can easily prevent secondary pollution

Secondary pollution prevention devices

Antifoaming spray



Covered treatment plant



Deodorization equipment



Pathogen flying prevention device



Solved by adopting a soil-covered structure
A sewage treatment plant in an urban area



Treatment plant constructed in the neighborhood of houses



**This is a feasible solution for our community.
This is what we've been waiting for.**

A sewage treatment plant based on the Dojo-Joka System can also be used as a park.



Annual Sewerage Festival in Aizubange Town. People enjoy light meals above the water treatment tank covered by soil.

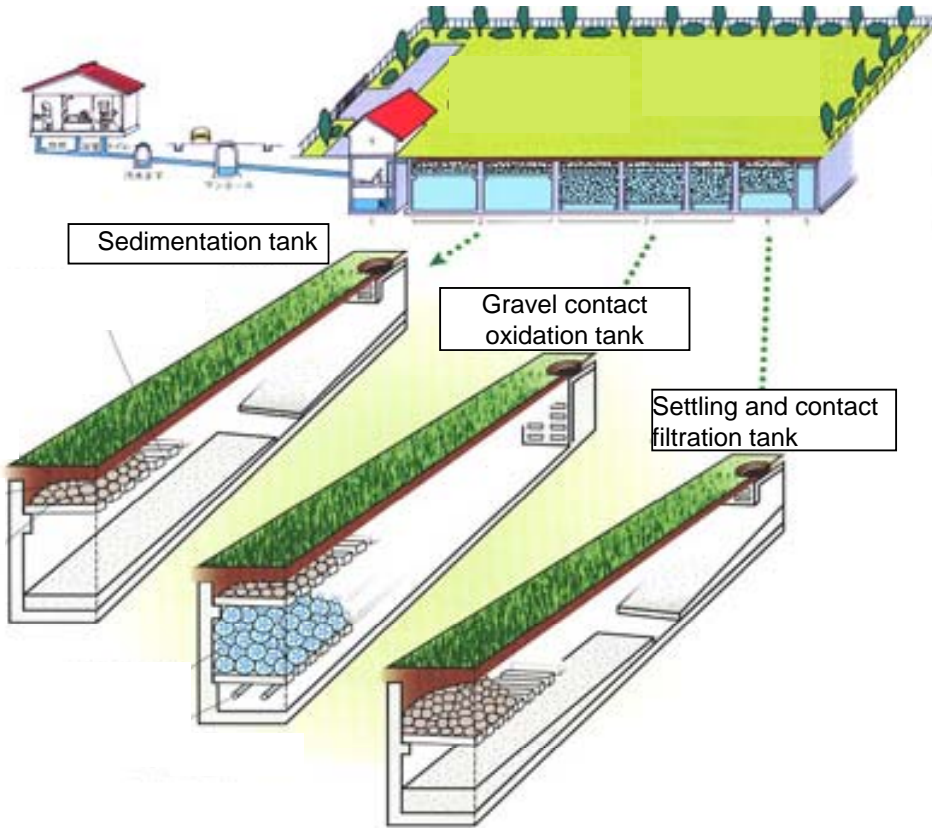


Ordinary scene. The water treatment system has been operating for 21 years under the grass.

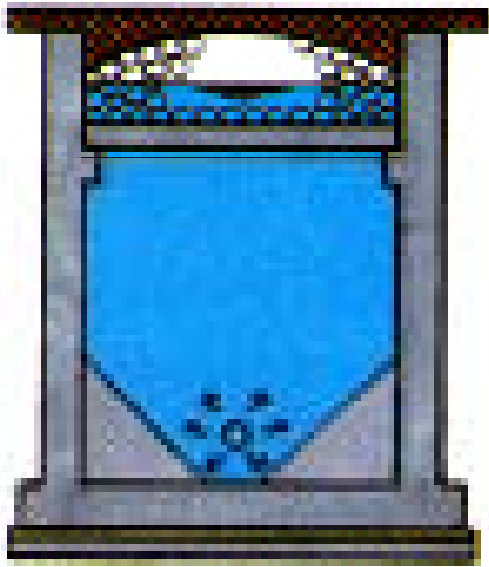
**There is a sewage treatment plant like a green park.
It has a wastewater treatment tank under the grass.**



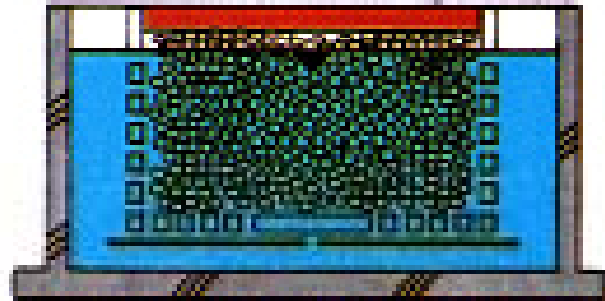
Paths to the ideal soil-covered sewage treatment system



Assurance of cleanliness of treated water with unattended operation

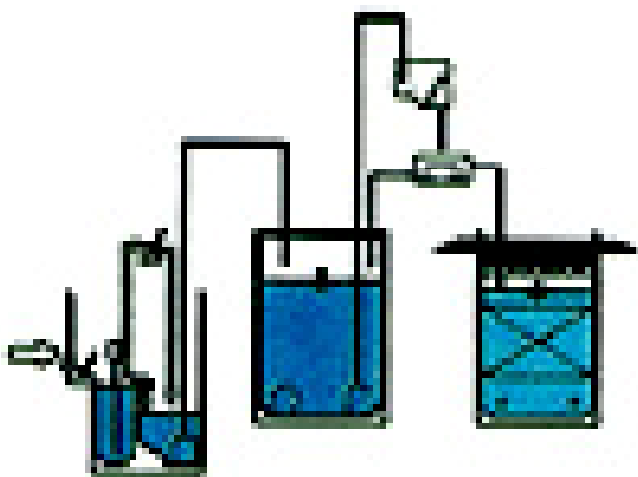


Floating organism method



Biofilm process

Easy-maintenance Sedimentation tank

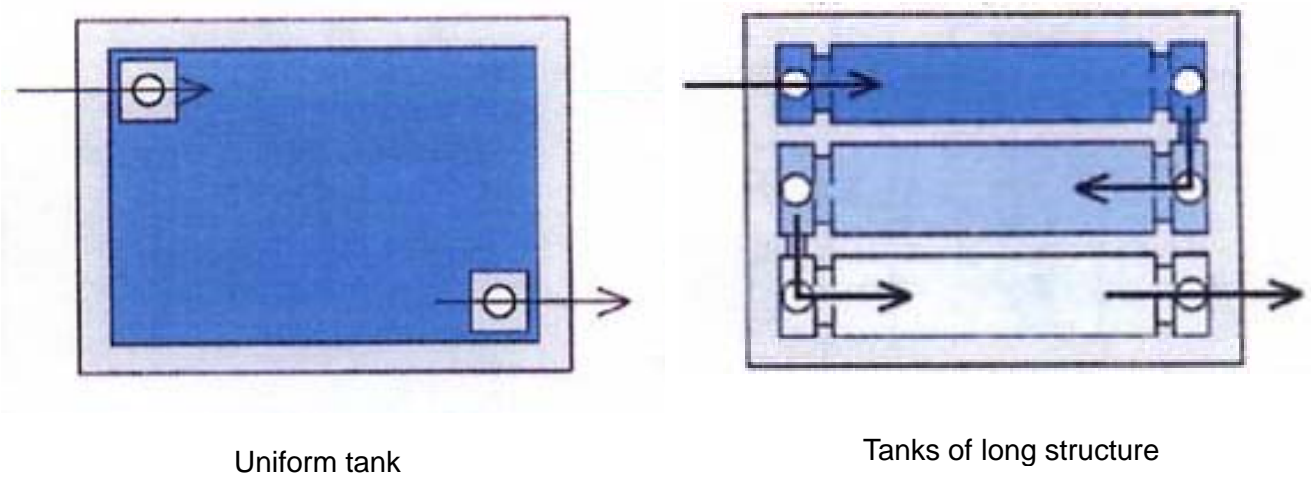


Pretreatment in an ordinary sewage treatment plant

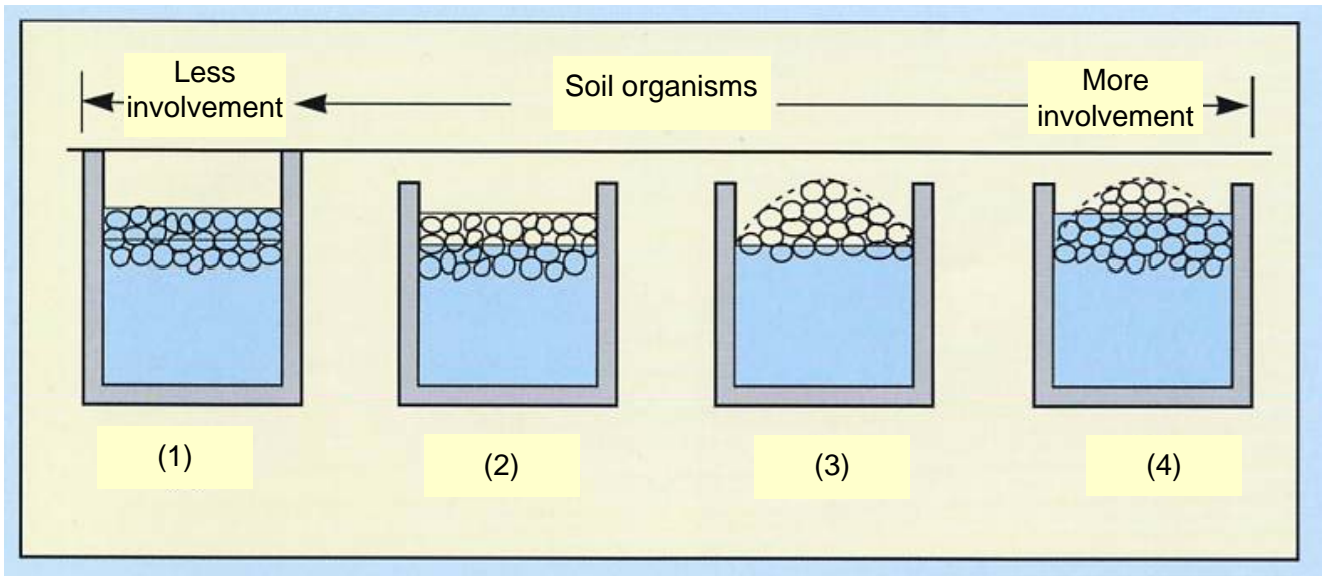


Sedimentation tank of the Dojo-joka System

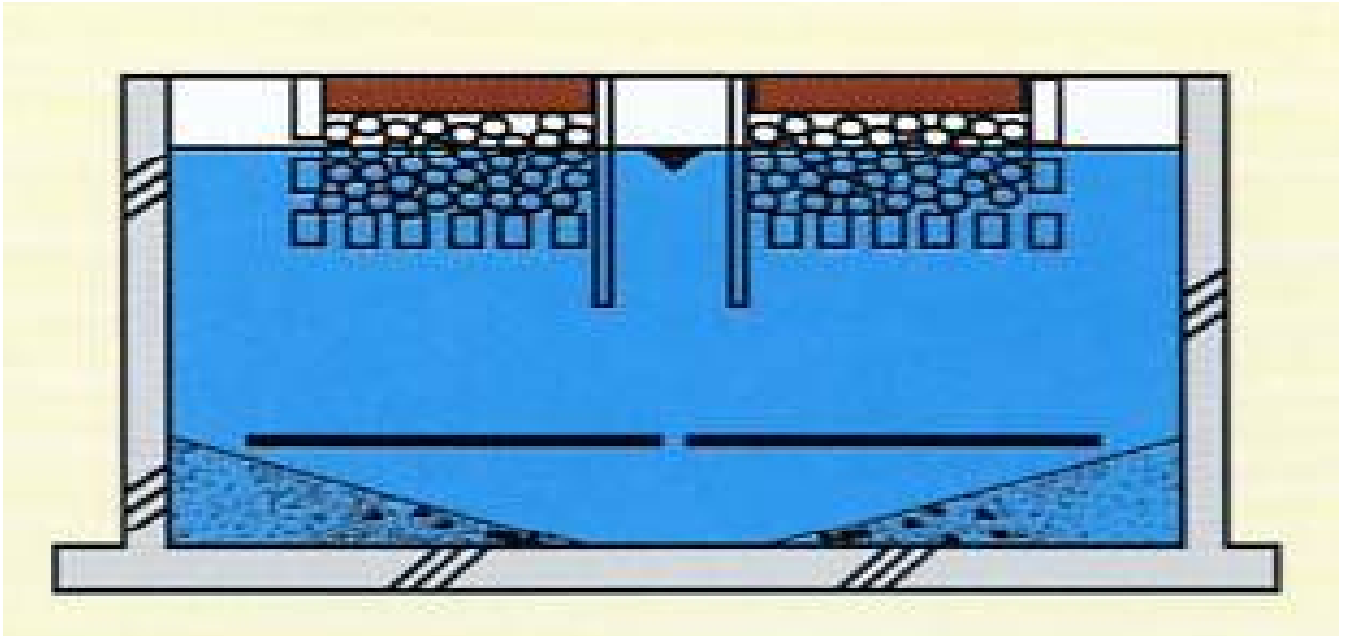
Features of the biofilm process used in the Niimi system



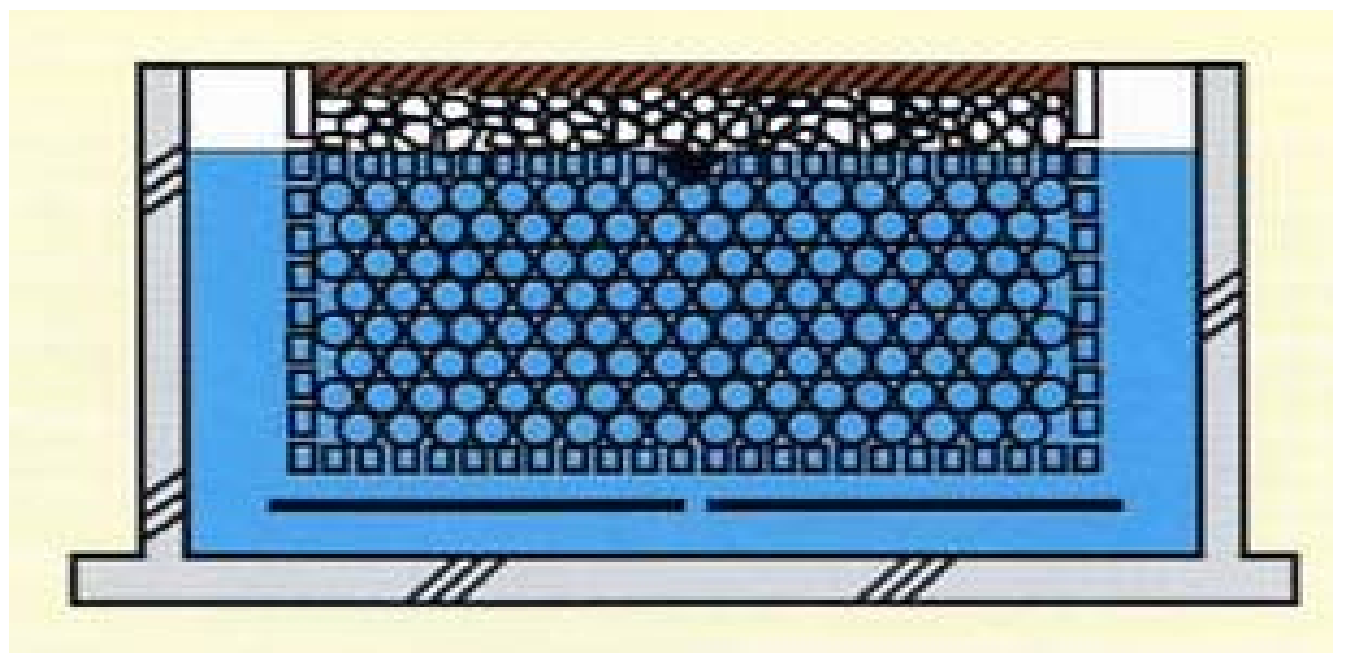
Involvement of organisms in the Dojo-Joka System



Technology used in the Dojo-Joka System – Sedimentation tank



Technology used in the Dojo-Joka System – Contact oxidation tank



Screens used in the Dojo-Joka System



Coarse mesh screen with openings of 30 mm used in the Dojo-Joka System



Every fine mesh screen with openings of 3 mm

Technology used in the Dojo-Joka System – Setting of the amount of air to be fed into a contact oxidation tank



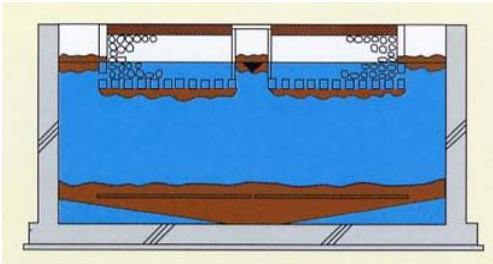
Blower used for blowing air into a contact oxidation tank



Simplified control panel

Sludge treatment method for the Dojo-Joka System

Aeration in a contact oxidation tank



Sludge accumulation in a sedimentation tank

Normal aeration state



Forced aeration state



Soil organisms involved in the Niimi system



Earthworms and other soil organisms living in the cover soil



Springtails living in capillary gravel (white dots in the photo)

Model plant of Dojo-Joka System in China



中国泰州市董北村
40m³/日



中国泰州市赵家新村
150m³/日

Model plant of Dojo-Joka System in Mexico



dojo-joka system of Amojileca
1,971 person



dojo-joka system of Tepechicotlan
1,480 person

Model plant of Dojo-Joka System in Bhutan

A seminar is held dojo-joka system in thimphu of capital Bhutan



Model plant of dojo-joka system in high school of Bhutan



Please come to see the Dojo-Joka System in Japan



**thank you
for your
attention**



President KIMURA HIROKO
Pioneer Engineer & Consultant in Dojo-Joka System
Mokan-Joka System Co., Ltd.
11-2 Nakamaru-cho, Itabashi Ward, 〒173-0026 Tokyo- JAPAN
Telephone : (03)5995-2849 Fax : (03)5995-2879