METI
Ministry of Economy, Trade and Industry

Towards
High-Quality Water Infrastructure

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Partnership for Quality Infrastructure ①

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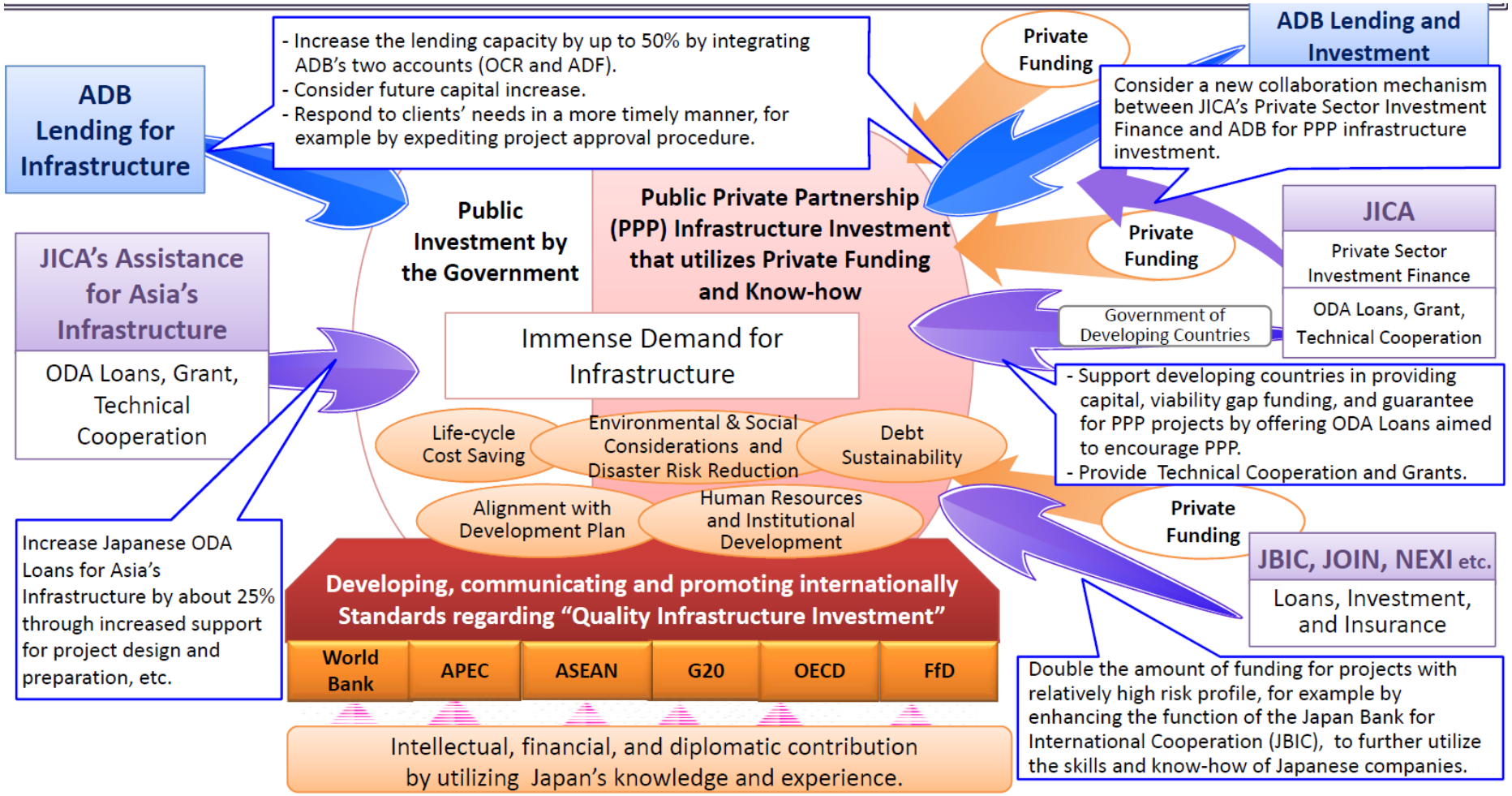
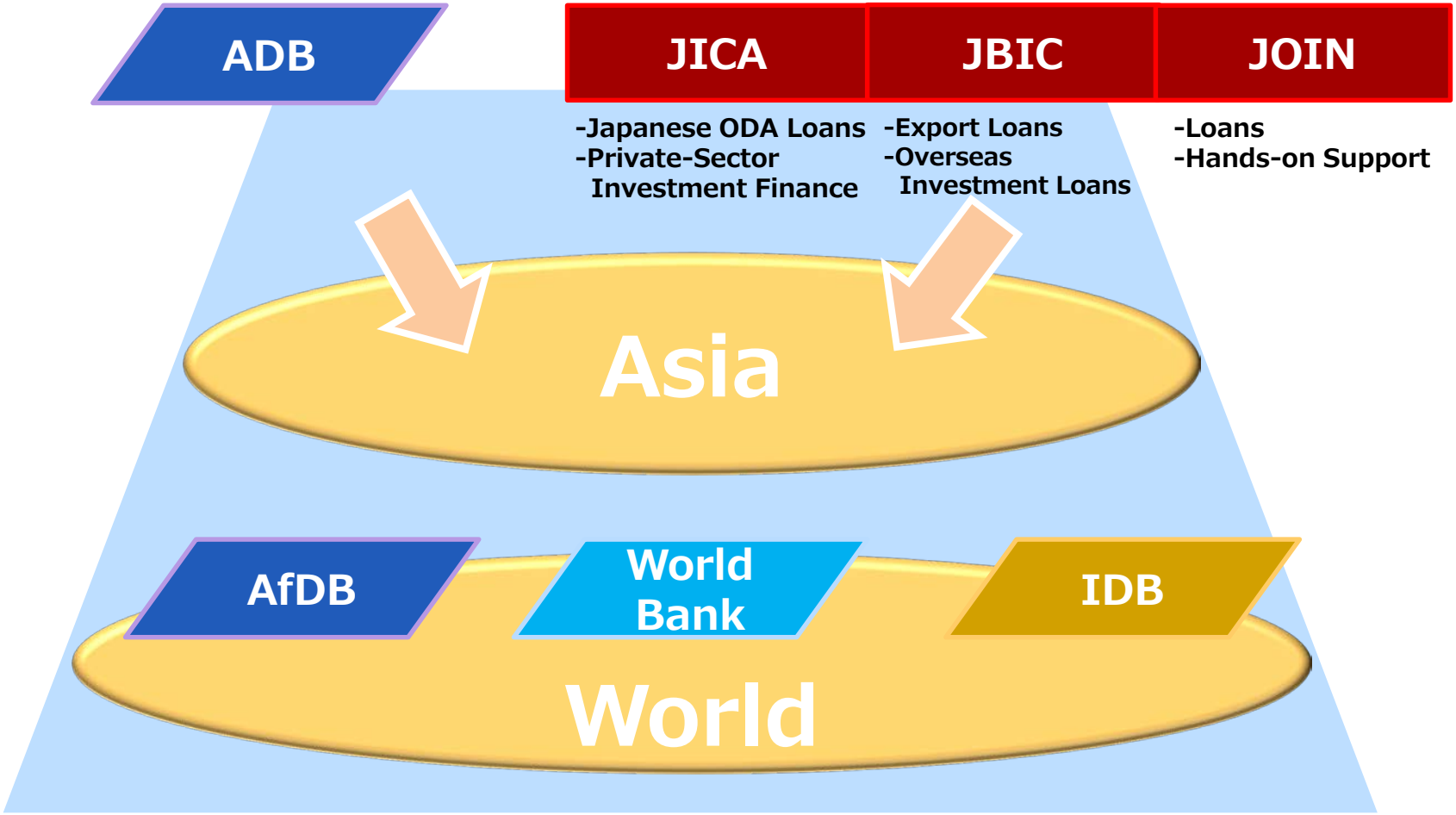
- Japanese government announced "Partnership for Quality Infrastructure" at May 2015.
- Promote "quality infrastructure investment" in Asia by making full use of Japanese economic cooperation tools, including Official Development Assistance (ODA), as well as by collaborating with strengthened Asia Development Bank (ADB).



Partnership for Quality Infrastructure ②

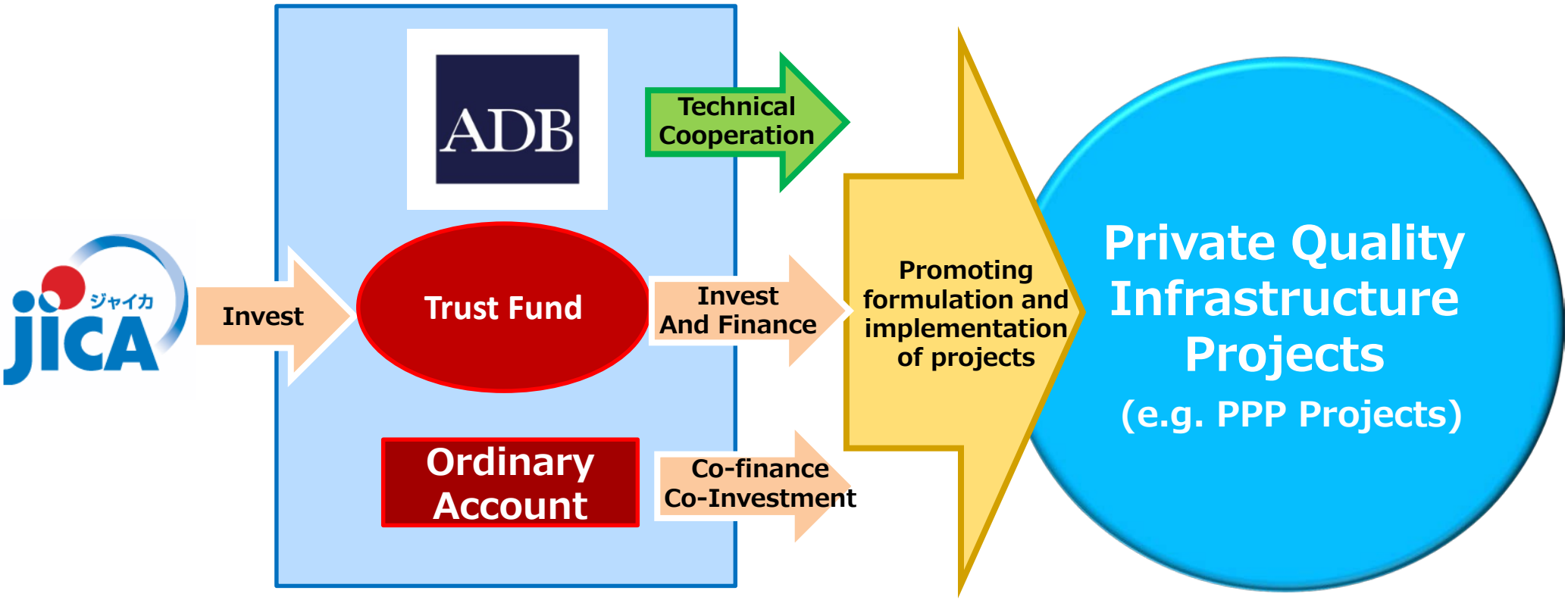
- Japan will fully mobilize public and private resources, in collaboration with other countries and international organizations, to address the immense demand for infrastructure development in Asia, and globally.
- This initiative will play a catalytic role in further mobilizing private funding and know-how to realize sufficient infrastructure investment in terms of both quality and quantity.



Collaboration with ADB ①

-Support for Private Infrastructure Projects through Measures such as PPP-

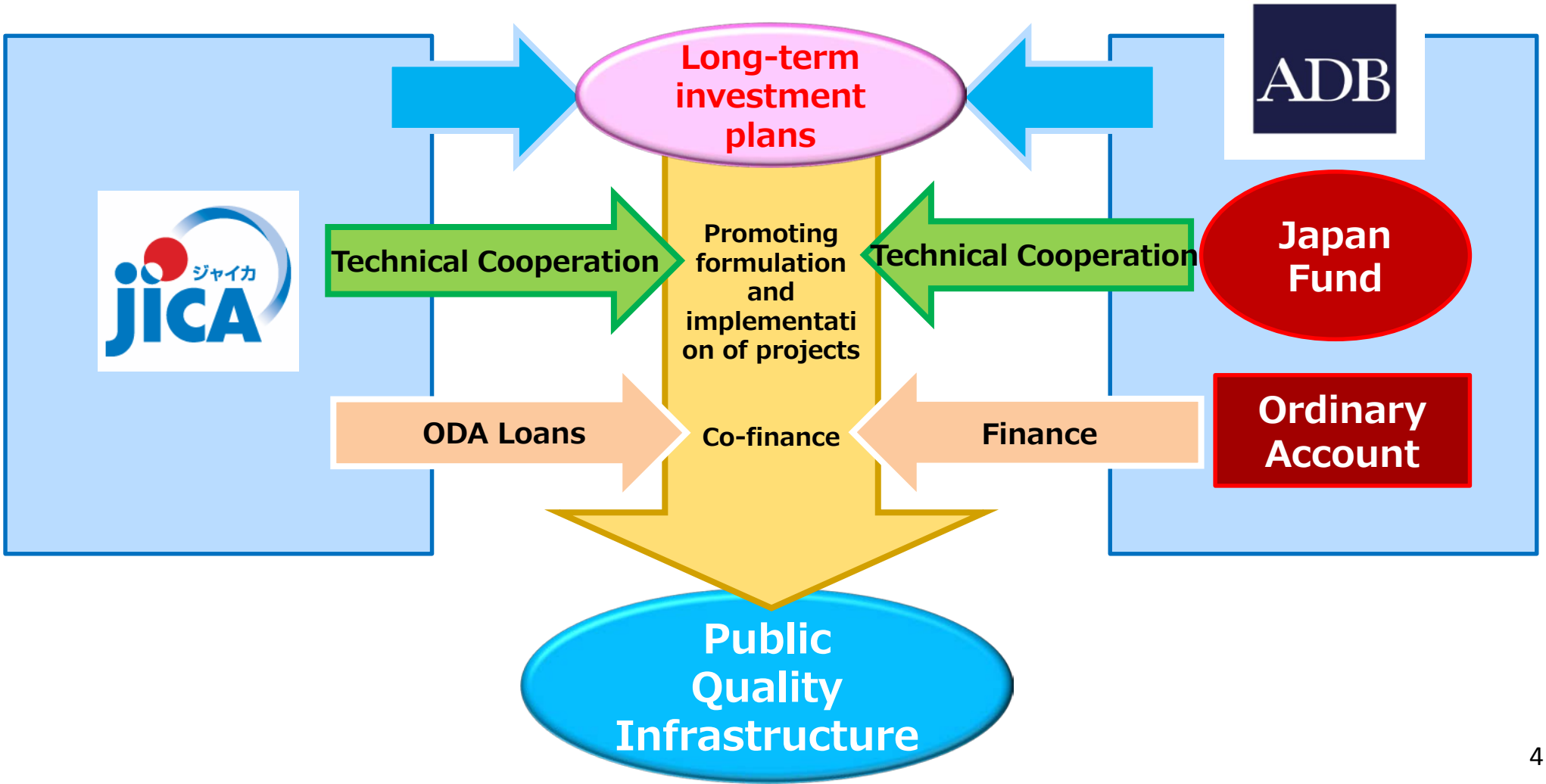
- A new trust fund was established in ADB through JICA's investment in March 2016.
- It invest in and finance private quality infrastructure projects through measures such as PPP, targeting up to USD 1.5 billion in the next five years.



Collaboration with ADB ②

-Promotion of Public Infrastructure Development and High-level Policy Dialogues-

◆ To promote public quality infrastructure development, JICA, in collaboration with ADB, will support long-term investment plans and provide technical cooperation and loans for sovereign projects. JICA and ADB will target to co-finance USD 10 billion in the next 5 years.



G7 Ise-Shima Principles for Promoting Quality Infrastructure Investment

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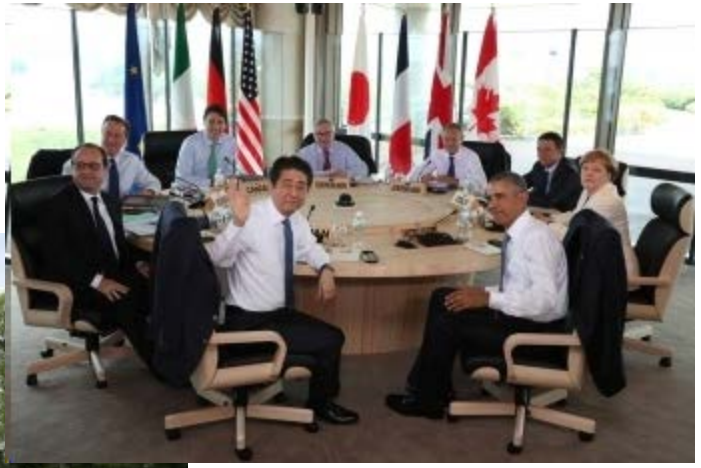
- Strive to align our own infrastructure investment with following principles.
- Encourage the relevant stakeholders to align with these principles, including the introduction and promotion of a transparent, competitive procurement process that takes full account of value for money and quality of infrastructure.

Principle 1: Ensuring effective governance, reliable operation and economic efficiency in view of life-cycle cost as well as safety and resilience against natural disaster, terrorism and cyber-attack risks

Principle 2: Ensuring job creation, capacity building and transfer of expertise and know-how for local communities

Principle 3: Addressing social and environmental impacts

Principle 4: Ensuring alignment with economic and development strategies including aspect of climate change and environment at the national and regional levels



G7 Ise-Shima Summit (May 26-27,2016)

Elements of “Quality Infrastructure”

◆ In order to realize Value for Money (VFM) to all stakeholders, such quality elements of infrastructure should be incorporated in planning, transparent & competitive procurement process, and implementation of projects.

- Economic Efficiency (From Life Cycle Cost (LCC) perspective)
- Safety
- Disaster resilience
- Environmental and social friendliness
- Contribution to the local society and economy (capacity building and technology transfer)

※ Also projects should be aligned with economic and development strategies.

“Values” in water service ①

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Water works

- Water quality to avoid risks to human health
  > Appropriate purification of raw water
  > Systemic operation to maintain such quality
- Stable (24hour) water supply for human needs
  > 24 hours supply control facility
  > Appropriate O&M
- Durability & disaster resilience to avoid unintended shutdown
  > Physical strength and durability of facilities & equipment
  > Well designed network
  > Appropriate O&M, emergency response
- “Financial robustness” for sustainable services
  > Tariff system based on “benefit principle” proper
  > Non-Revenue Water control through efficient water leakage detection (utilizing new technology)

“Values” in water service ②

Sewerage -1

- Appropriate & continuous waste water treatment to avoid bad influence a living environment
  > Quality control of treated waste water
  > 24 hour operation (facility, O&M)
- Water reclamation & sludge disposition to improve urban environment & functions
  > Service expansion from mere water treatment to water reclamation & sludge reduction & recycling
- Stormwater control to maintain urban environment & functions
  > Well-designed combination of (separated) sewerage network and stormwater storage & conduit
- Network development without disrupting urban function
  > Introduction of new technology such as trenchless pipeline installation method

“Values” in water service ②

Sewerage -2

- Durability & disaster resilience to avoid unintended shutdown
  - > Physical strength & durability of facilities & equipment
  - > Well-designed network
  - > Appropriate O&M, emergency response
- “Financial robustness” for sustainable services
  - > Proper tariff system based a “benefit principle”
  - > Awareness raising of people on benefit to society and proper burden sharing

Water infrastructure/service in Japan

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Shift to modern waterworks

○To control infectious diseases (e.g. cholera)
・install water treatment plants
・convert from waterways to pipelines

Ensure water quantity

○To serve increasing population and developing economy
・develop water resources (together with irrigation water resources)
・start 24 hour service

Efficient tariff collection

○For sustainable water service
・require installation of water meters
・reduce non-revenue water

Advanced water treatment

○To secure high water quality with varied & worse raw water quality
・remove odor
・remove detergent…

130years

(Waterworks) Knowhow to achieve “safe & secured water from faucets”

Operation, maintenance, renewal

○Secure stability in operation
・information management of pipelines (geological and aging information)
・database of asset inspection and maintenance

Disaster management

○Strengthen disaster management after Kobe earthquake
・renewal to earthquake-resistant pipes
・installation of emergency power system

89years

(Sewerage) Knowhow to achieve environment & treated water improvement

Shift to modern sewerage works

○ To control infectious diseases
・install sewage treatment plants & pipeline networks

Advanced treatment

○To improve marine environment and control pathogens
・remove nutrient
・treat Sludge …

Water reclamation, resource recovery

○To reduce volume of sludge and reclaim sewage and sludge
・reclaim water
・recycle incineration ash

Rainwater collection

○To reduce oad on WWTP and control flood
・separated sewer(for rainwater)
・stormwater reservoir…

Technologies to achieve VFM in water service

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★Information Communication Technologies (ICT) to achieve efficient water service

- Non-Revenue Water reduction
  - > Leak detectors using SCADA (not relying on labor intensive works) enable efficient pipeline rehabilitation
- Distribution control
  - > Appropriate pressure control with ICT and efficient operation of pumps with inverter control contribute to energy saving and cost reduction

★Technologies for effective use of sludge for making profit while reduce environmental burden

- Technologies for sludge incineration and recycling
  - > Sludge volume reduction by high performance sludge dehydrator & incinerator, energy recovery by digested gas power generator, and recycling by technology which converts sludge to fertilizer or bricks

★Technologies for maintaining urban environment & functions

- Trenchless pipeline installation
  - > Method to install pipelines without trenches from surface (works through only under ground tunnel)
  - > Enables cost-effective and eco-friendly new construction & repair of defective pipes in less time, without major traffic disruptions
- Space saving waste water treatment facility
  - > Multilayer plant or deep aeration tank technologies which ensures high treatment ability of the WTP or STP even with limited ground space, contributes to maintenance of environment and functions of developed dense urban areas

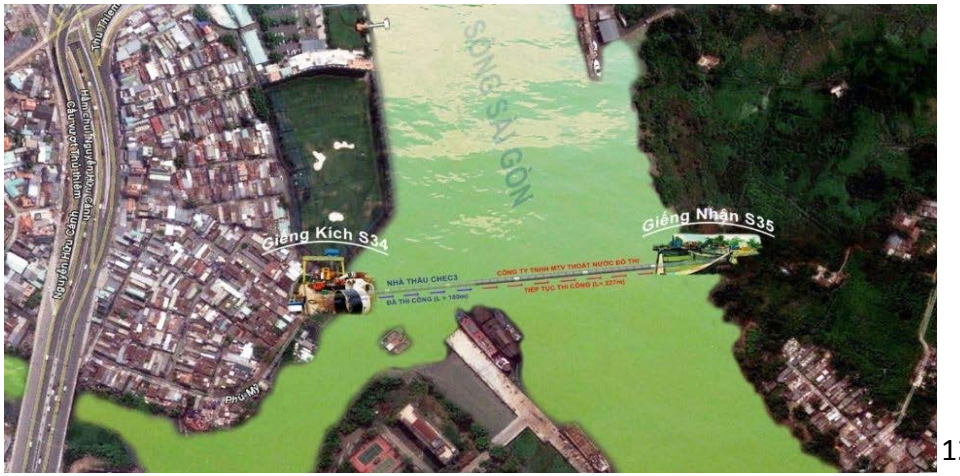
Implying cases why VFM in water service is required

Troubles in durability & security

- Water pipeline construction project which installs 1.6m diameter water pipes
- Construction was completed, but pipeline broke for 20 times
- More than 70,000 families (approx. 1million people) were troubled in water interruption
- It is reported that while soil at construction site was soft and falls easily, FRP pipes installed were fragile

Construction delayed with additional cost

- Depressed sewer installation project by pipe jacking method
- Bidding were closed by initial cost evaluation
- Flooding accident in the pit occurred when 183m-long pipeline of total 410m were installed
- The contractor gave up the construction, leaving the machines at the site
- It took 8 years, when it completed constriction



Cases which deliver high VFM in water service

- In developing urbanization & economy, urban solution like water & sanitation is required to improve urban environment
- Especially in overcrowded areas, Sewage treatment plant installation requires space efficiency & efficient operation

- In this case, Space efficient construction was required because of the overcrowded residential area.
- Added LCC evaluation method and Design-Build proposal along World Bank's procurement policy
- Japanese engineering company proposed an space-efficient plant arrangement and LCC-effective water treatment process
- After 1 year process proving period, treatment operation is properly running, and VFM seems to be realized in Talayan

Important Elements for Procuring Quality Infrastructure

● Prequalification (P/Q)	To evaluate bidders' ability to provide high quality service > track records, certificate by third parties
● Bidding ● Methods	To encourage bidders' originality/creativity of their proposal for high quality service > output specification, Design & Build (& Operation)
● Contract Management	To secure implementation of high quality service > warranties and penalties (incentive for high quality service), appropriate monitoring
● Evaluation methods	To evaluate from "VFM" perspective, not just CAPEX > Life Cycle Cost- focused evaluation > Non-cost factors (e.g. technology) to be also included

Prequalification (P/Q)

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- Prequalification (P/Q) is very important to ensure quality of bidders.
- P/Q for quality includes Credentials, Capabilities, Financial robustness, and so on.
- P/Q is usually executed by self-reporting manner. To increase credibility, certification issued by clients or third parties are effective.

Items	Examples of P/Q requirements	Examples of certification
(a)Experiences & Credentials	Credentials which include construction (and operation) with similar scale and performance	Copies of contracts, Certification from clients and/or official letters from clients which prove their performance
(b)Capabilities for product and construction	Evidence of capabilities which includes factories to produce the products and construction facilities with similar scale and performance	Certification issued by governments of official agencies, ISO certification
(c)Financial robustness	Financial statements with positive earnings in past 5 years	Audited financial statements
(d) Performance credentials	Evidence of the performance of the products (e.g. actual credentials of durability after the earthquake (Magnitude XX))	Certification and/or official certified letters from clients

Bidding Methods

- In “Input Specification” method, evaluation is usually implemented based on cost. Since clients sorely check whether the bidders’ offer match to the specifications or not, securement of performance cannot be guaranteed.
- “Output Specification” method allows the details of operation, design and construction (DB or DBO) methods to private sector. The maximization of Value for Money can be expected through bidders’ creativity and ingenuity.

	Input Specification	Output Specification
Scope of Works	Limited scope (e.g. fuel or chemicals may be supplied by public sector)	Comprehensive scope (collective order including operation and maintenance etc.)
Creativity and ingenuity of private sector	Limited (e.g. the number of staffs is fixed in the specification and reduction of man power may not allowed.)	Flexible (e.g. number of staff for operation is based on the proposal by the private sector, thus Enhancement of efficiency can be expected.)
Risk Share	Responsibility for satisfying the specification, not for performance	Responsible for performance
Bid Method	Least cost method is commonly applied	Comprehensive evaluation or proposal are commonly applied

Contract Management

- For good governance of the project, security and penalty are of importance whereas too high standard of security and penalty discourage private sector to be participated in the project.
- Thus, establishment of balanced level of security and penalty for both private and public sectors is important.
- Additionally, establishment of appropriate monitoring system on delivery of the project is simultaneously of important.

Contract Management	Proposed Measures
Establishment and management of appropriate security and penalty	• Establishment of standards on penalty • Appropriate raise of penalty standard
Delivering appropriate monitoring	• Support of monitoring capacity through utilization of consultants • Establishment of appropriate monitoring system and improvement of monitoring kills through implementation of capacity building

Evaluation Method

- Cost oriented evaluation method is simple but may not secure the quality of the services.
- Comprehensive evaluation method (combination of technical and financial evaluation) is an effective mean in securing high quality of the services, but requires high standard of transparency and fairness in technical evaluation.
- Capacity building for evaluation of technical aspect by the private sector should be emphasized.

	Cost oriented evaluation	Comprehensive evaluation
Subject	Cost Only (Bidder who propose the least cost wins)	Financial and Technical (Bidder whose score of the sum of financial and technical aspects is the highest wins)
Project Cost	Unusually low project cost, which is lower than the client assumption, may be proposed under the highly competitive environment	Project cost is based on the bidder's proposal. Creativity and ingenuity of private sector may reduce the project cost
Quality	Significantly lower bid may lead to difficulty in securing quality	The project cost is based on the proposed technology by the bidder. Thus, quality of the works shall be secured
Difficulty in Evaluation	Easy since evaluation focuses on cost only	Expertise in evaluation of proposed technology required
Transparency	High due to quantitate evaluation only	Transparency may not be secured since arbitrariness may work in evaluation of technical proposal

LCC Evaluation:
A methodology to secure the quality of the service

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◆ Life Cycle Cost (LCC) evaluation, which take account of not only initial cost but also operation and maintenance cost, is one of the effective mean to maximize the Value for Money.

Life Cycle Cost (LCC)

Initial Cost (CAPEX) + **O&M Cost (OPEX)**

Item	Applicable Technology	Applicable Cost Reduction
a) Quality / Maintenance	Introduction of high quality and long life mechanical and electrical equipment	Rehabilitation
b) Energy save	Introduction of energy saving type pump or high efficient blower	Utility (Electricity)
c) Load on environment	Introduction of high performance sludge dewatering machine	Sludge disposal
d) Remote monitoring	Introduction of remote monitoring (IT) System	Labor Cost

Basic Components for LCC Evaluation

- Referring the case study by METI, below table shows proposing items for LCC evaluation.
- Additional evaluation items, including certainty and conditions of financing, may be considered to add in case if the project requires private financing.

Proposed Item for LCC Evaluation

Item	Items to be included in the cost
Design	–
Procurement Construction	Preparatory Cost (Topographic Survey, Land Reclamation, Insurance, Office and Storage, HSE, etc.)
	Construction (Civil Works, Architecture, Mechanical and Electrical Works)
	Commissioning
Operation and Maintenance	Maintenance and Repair
	Labor（Maintenance)
	Electricity
	Chemical
	Sludge Disposal
	Rehabilitation

Reference: Example of template for LCC evaluation

◆Basic Components for LCC Evaluation in water infrastructure procurement.

	Components	Year 0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10	Year N	Total
CAPEX	Design													
	Procurement Construction													
	Preparatory cost													
	Civil works, Architecture													
	Mechanical works													
	Electrical works													
	Commissioning													
	Others													
OPEX	Fixed costs													
	Electricity													
	Rehabilitation													
	Maintenance & repair													
	Labour													
	Variable costs													
	Electricity													
	Chemicals													
	Sludge disposal													
	Other requirements													
	Others													
LCC (before discount)														
LCC (Net Present Value)														