Japan's Experiences in Water Resources Management - Some Implications to NARBO Members

Yoshida, Professor, University of Tokyo at the 3rd General Meeting of NARBO in Solo on 21 Feb 2008 in Solo

The Earth from the Moon: an Aqua Planet.

- High-vision photos by a Japan's moon probe satellite "Kaguya" on 7 November 2007. (c)AFP/JAXA/NHK
- The planet earth is sinking behind the moon's horizon.

① A Brief Review of Japan's Postwar Recovery and the World Bank

- 2 Lessons from the Aichi Canal Project (IWRM) assisted by WB
 Birthplace of Japan Water Agency (JWA)
- (3) How Japan has been managing "too little water", "too much water" and "environment"
- **④** Some implications for NARBO members

This is the end of an old Japan and the start of a new Japan Atomic Bomb in Hiroshima



Hiroshima city after the bomb attack



Source: Maichini Shinbun, Sengo 50 nen

Tokyo a day after the unconditional surrender in 1945



Source: Maichini Shinbun, Sengo 50 nen

Osaka : The postwar Japan starts from ruins like a moon face But, "destruction" means "creation" as well.



Source: Maichini Shinbun, Sengo 50 nen

Japan under SCAP occupation (1945-1952)



MacArthur arrival at Atsugi (near Tokyo) on 30 Aug. 1945

To rule over Japan without troubles, MacArthur quickly recognized "the significance of the Emperor" who was a spiritual/religious leader of the people in Japan.

MacArthur decided to do his duty "on behalf of (with the invisible consent from)" the Emperor.



The first meeting on 27 Sept. 1945
<u>A secret of good state security</u>
<u>and governance</u>

War Damages on Industrial Productive Capacity → the heavy damages gave opportunity to introduce the latest technology in Japanese industries.

Loss of Industrial Productive Capacity by War



Source: Taiheiyou Sensou niyoru Wagakuni no Higai Sougou Houkokusho, Ogawa T., 1971



Source: Taiheiyou Sensou niyoru Wagakuni no Higai Sougou Houkokusho, Ogawa T., 1971

Major Impact of GHQ/SCAP on Infrastructure Management

Institutional Reforms for Infrastructure Management

• Energy: Electricity

 $\rightarrow\,$ Privatization of a state-owned electricity corporation into 9 district private companies in 1946.

- Transport: Railway
- → Corporatization of a state-owned railway: an autonomous Japan National Railway (JNR). This led to full privatization in 1987.

Macarthur/GHQ's instruction in 1947

- Public works servants should not have the right of walk-out (strike).
- Tariffs of public utilities are examined by "public council" consisting of representatives of the stakeholders.

<u>Major reforms in line with the principles (democratic, marketoriented, self-financing) for infrastructure management were carried out during the occupation period from 1945 to 1952.</u>

Infrastructure Service Indexes in Post-war Period: A Quick Recovery



Source: Nihon Chouki Toukei Souran, Nihon Toukei Kyoukai



World Bank Loans to Japan

Loa	ns to J	lapan from	World Bank (1953	-1966)					
							Loan		
	Date of	Date of				Interest	Amount	Repay	Grace
No.	Contract	Effectiveness	Borrower	Executing Agency	Used for	(%)	(\$'000)	Period	Period
1	531015	531229	Development Bank of Japan	Kansai Electric Power Co.	Tanagawa Thermal Power(2 x 75MW)	5	21,500	20	3.5
2	531015	531229	Development Bank of Japan	Kyushu Electric Power Co.	Karita Thermal Power (1 x 75MW)	5	11,200	20	3.5
3	531015	531229	Development Bank of Japan	Chubu Electric Power Co.	Yokkaichi Thermal Power (1 x 66 MW)	5	7,500	20	3.5
4	551025	560216	Development Bank of Japan	Yawata (Nippon) Iron-Manufacturing Co.	Thick steel plate rolling mill	4.625	5,300	15	2.5
				Nippon Steel Co.	Seamless pipe manufacturing equipment	4.75	2,600	15	2
5	560221	560325	Development Bank of Japan	Toyota Motor Corporation	Machine-tools for trucks and buses to Koromo (Toyota) factory	4.75	2,350	15	2
5				Ishikawajima Heavy Industry Co.	Ship-turbine manufacturing equipent to Tokyo factory	4.75	1,650	15	2
				Mitsubishi Shipbuilding Co.	Diesel engine manufacturing equipent for Nagasaki dockyard	4.75	1,500	15	2
6	561219	570325	Development Bank of Japan	Kawasaki Steel Co.	Hot and cold strip mills for Chiba factory	5	20,000	15	3.5
			Agriculture Land		Land reclamation for Kamikitane-river Area *4	5	1,330	15	3
7	561219	570319	Development Machinery Corporation	Agriculture Land Development Machinery Corporation	Land reclamation for Shinotsu peat area (Ishikari-river)	5	1,133	15	3
					Import of dairy cattle	5	984	15	3
					Contingency	5	853	15	3
8	570809	571119	Aichi Canal Corporation	Aichi Canal Corporation	Aichi Canal Project (multi-purpose)	5.75	7,000	20	4.5
9	580129	580328	Development Bank of Japan	Kawasaki Steel Co.(2nd)	1,000 mt blast furnace and coke oven for Chiba factory	5.625	8,000	14	2.5
10	580613	580822	Development Bank of Japan	Kansai Electric Power Co.(2nd)	Kurobe No.4 Hydropower (3 x 86MW)	5.625	37,000	25	4.5
11	580627	580822	Development Bank of Japan	Hokuriku Electric Power Co.	Arimine Hydropower (265 MW)*3	5.625	25,000	25	3.5
12	580711	580924	Development Bank of Japan	Sumitomo Metal Co.	1,000 mt blast furnace and blooming mill for Wakayama factory	5.625	33,000	15	3
13	580818	581010	Development Bank of Japan	Kobe Steel Co.	Nadahama factory for 800 mt blast furnace, Wakihama factory for steelworks	5.625	10,000	15	3
14	580920	581222	Development Bank of Japan	Chubu Electric Power Co. (2nd)	Hatanagi No1+No2 Hydropwer (85MW each)	5.5	29,000	25	4
15	580920	581114	Development Bank of Japan	Njppon Steel Pipe (2nd)	60mt revolving furnace for Mizue factory	5.5	22,000	15	2
16	590217	590224	Development Bank of Japan	Power Development Corporation	Miboro Hydropower (2 x 125MW)	5.25	10,000	25	4
17	591112	600115	Development Bank of Japan	Fuji Steel Co.	1,500 mt blast furnace and a revolving furnace for Hirohata factory	6	24,000	15	2
18	591112	600115	Development Bank of Japan	Yawata (Nippon) Steel Co.(2nd)	1,500 mt blast furnace (2 units) and a revolving furnace for Hirohata factory	6	20,000	15	2
19	600317	600525	Japan Highway Corporation	Japan Highway Corporation	Amagasaki-Kuritou Highway	6.25	40,000	23	3
20	601220	610129	Development Bank of Japan	Kawasaki Steel Co. (3rd)	Chiba factory for thick plate equipment	5.75	6,000	15	3
21	601220	610120	Development Bank of Japan	Sumitomo Metal Co. (2nd)	Wakayaa factory for combined mill	5.75	7,000	15	3
22	610316	610503	Development Bank of Japan	Kyushu Electric Power Co (2nd).	Sin-Kokura Thermal Power (156MW)	5.75	12,000	20	1.5
23	610502	610630	Japan National Railway	Japan National Railway	Toukaido Sin-kansen	5.75	80,000	20	3.5
24	611129	620130	Japan Highway Corporation	Japan Highway Corporation (2nd)	Meishinn (Ichimiya-Kuritou, Amagasaki-Nishinomiya) Highways	5.75	40,000	23	3
25	630927	631121	Japan Highway Corporation	Japan Highway Corporation (3rd)	Toumei (Tokyo-Shizuoka) Highway	5.5	75,000	26	5.5
26	640422	640624	Japan Highway Corporation	Japan Highway Corporation (4th)	Tomei (Toyokawa–Komaki) Highway	5.5	50,000	25	5
27	641223	650225	Metropolitan Expressway	Metropolitan Expressway Corporation	Shuto-Kosoku (Haneda-Yokohama) Expressway	5.5	25,000	24	4
28	650113	650326	Power Developent Co.	Power Developent Co.	Kuzuryu river (Mizushi-Nagano and Yuage) hydropower	5.5	25,000	25	4
29	650526	650720	Japan Highway Corporation	Japan Highway Corporation (5th)	Toumei (Sizuoka-Toyokawa) Highway	6.5	75,000	25	4.5
30	650910	651104	Hanshin Exoressway	Hanshin Exoressway Corporation	Koubw-city Expressway Route-1	6.5	25,000	24	4
31	660729	660920	Japan Highway Corporation	Japan Highway Corporation (6th)	Tomei (Tokyo-Shizuoka) Highway	6.625	100,000	15	3
					Total		862,900		

Source: Segin Shakkan Kaisou, WB Tokyo Office,

WB Loans by Sector

Loans from World Bank by Sector



Pictures of WB Financed Projects



Sinkansen

Hydropower

Shipbuilding

Steel Plant Highways Truck Industry



2 Lessons from the Aichi Canal Project financed by the World Bank



Presentation by "Project Realization League" in 1949

Source: 愛知用水史 愛知用水公団(現水資源開発公団・水機構)1968

Kiso River System and the Aichi Canal



How was the Project formulated ?

1948 The Project was conceptualized by the local leaders. Messrs. Kuno (farmer) and Hamajima (agri-highschool tea





- Local needs
 - \rightarrow Drought prone area \rightarrow shortage of water causing acute poverty.
 - \rightarrow But, the climate, soil and location are good for farming.

The local priority needs met with:

- National and agriculture sector needs
 - \rightarrow Food security: Rice production increase was the first national priority. 18
 - Social Stability: Employment creation.

However, Involuntary Re-settlers Opposed (1952~1958) For and Against the Project – Is Democracy Working ?



Signboard saying "Oppositions to Dam Construction"

(二子持地点) 19

Re-settlers' Houses Better-off ?



Makio Reservoir's Re-settlers and Compensation (Livelihood Reconstruction)

240 families (1003 persons) with 6 years negotiations

Total compensation of 1.4 billion yen (US\$3.85 million): 3% of the total construction cost of which 11% for public works for the affected reservoir area.

The re-settlers were given opportunities to investigate several areas for resettlements, they decided their places where they will rebuild their livelihoods. Most of them were re-settled by group in places where they could oversee their homeland.

World Bank Agricultural Survey Mission in 1954



世銀農業調査団の現地調査

(東浦町日高農場にて)

Introduction of Mechanical Construction Method 1958-62



牧尾ダム工事で活躍すパワーショベル(上)とダンプホーラー(下)

Field training by farmers and technicians (1957)



Makio Dam and Reservoir



MAKIO DAM: ROCKFILL 68MCM ACTIVE STORAGE

How was the Project financed WB Project Financing (US\$ '000) - Saving !

('000 US\$)

Item	Planned	Actual	(+) or (-)
Consultant Service for Design and Supervision	1,500	1,540	-40
Construction Equipment	4,400	2,560	+1,840
Consultant Service for Farm Irrigation	40	40	0
Interest during Construction Period and Other Expenses	1,060	760	+300
Total Loan form World Bank	7,000	4,900	2,100
	(8.8%)	(4.1%)	
Total Project Cost	80,000	117,500	

Note: Interest rate of 5% with 25 years repayment period including 5 years grace.

Actual Financing Arrangement Farmers' contribution shows "ownership" Ioans from agro-bank with 20 years repayment period

Category	Amount (mil yen)		
Central Subsidy	8,000	18%	
WB Loans	1,754	4%	
Fund of US Surplus Foods Sales	12,250	27%	
Loans and Investment Fund	22,719	50%	
Others	768	2%	
Total	45,491	100%	

Financing for Agriculture Component				
National Budget	18,600	55%		
Prefecture	8,722	26%		
Farmers	6,639	20%		
Total	33,961	100%		

Impact of the Project - Water Demand Changes of Water Demand from Agriculture to Industry



Impact of the Project



Ultimate Impact of the Aichi Project: Capacity Development

- Establishment of a RBO and its spillover effect all over the country: (laws, organization, rules and regulations, financing mechanism, etc).
- Implementation of IWRM with participation \rightarrow Democracy can work.
- Introduction of new technologies (design, construction, management).
- Flexible capacity with changing conditions of economy and society.
- Increased social capital in the communities. \rightarrow Success of the Agri-Coop.
- Increased capacity of the farmers. \rightarrow Many functional business networks

As a result, the Project area is enjoying higher income because they can properly respond to the ever changing conditions.



Chita Agriculture Cooperative (as of Mar, 2003) Members: Ordinary: 17,610 Quasi-ordinary: 31,070 Staff: 1,326 Subscription: ¥6,704 million (\$58 mil) Savings : ¥780,821 million (\$6,790 mil) Loan Outstanding: ¥195,378 million (\$1,700 mil) Pension fund: ¥2,346,018 million (\$20,400 mil)

Lessons Learned from the Aichi Project (1)

- 1 Institutional evolution from "a project" to RBOs with IWRM concept.
 - **1948 Project concept by the locals leaders and participation.**
 - 1949 The Aichi Irrigation Water System Realization League (NGO).
 - 1955 Aichi Canal Public Corporation was established
 - **1961** The canal operation was started.
 - **1968 Water Resources Development Public Corporation established.**

2004 Japan Water Agency + NARBO established

- ② Flexibility or <u>capability to respond to the changing external</u> <u>conditions</u> are essential for self-help and sustainable development.
- ③ In the Project area, "social capital" has been enhanced through participation, negotiations, self-investment, operation and maintenance at field level.

→ Community based infrastructure project (irrigation, flood 30 management, domestic water supply or drainage) can be

3 Coping with Too Little Water





Data source:国交省水害統計、ダム年鑑(1999); Graphed by Imamura & Yoshida

Dams in Japan

Around 3,200 \rightarrow One of the highest density in the world. with one dam for each 100 km2 (10 km by 10 km)



Dams by Purpose in Japan



Coping with Environment: An Good Example of Policy Mix



for 4 categories with about 200 sites. Data Source: 環境庁「公共用水域水質測定結果報告書」[環境白書」、通産省「公害設備投資調査」.

Implications to NARBO Members (1)

- From the institutional evolution and experiences of JWA, <u>"IWRM</u> <u>could be best implemented by RBO".</u>
- From the Aichi Canal Project, the long-term impact should be "sustainability" of the Project communities. A community-based infrastructure project such as irrigation, flood management, domestic water supply or drainage project can be recognized as "instrument" to enhance community's capability (creation of trust-based functional networks) or "social capital". <u>"Civil Engineers should recognize they</u> <u>are "social capital builders".</u>
- RBO in charge of IWRM has to handle many stakeholders and complicated decision-makings. This gives an opportunity to demonstrate "<u>democracy in practice</u>", <u>which becomes a foundation for "good water governance</u>"</u>

Implications for NARBO Members (2) IWRM and Policy Mix Approach

- Along with the changing priority and values of the stakeholders and society, a policy mix approach needs to be well designed and implemented so that the three issues (too little, too much and environment) can be properly addressed.
- Policy Mix consists mainly of:
- 1. <u>Introduction of laws and regulations</u> with proper allocation of responsibilities among central, local, service delivery agencies, private sector, and civil societies.
- 2. <u>Adequate water pricing and subsidies</u> need to be introduced reflecting appropriate regional and personal income distribution effect.
- 3. <u>Choice of financing modality</u>: budget allocation, subsidies, selffunding, public-private-partnership, etc. depending on value judgment and managerial capability.
- 4. <u>Technology innovation</u> through public-private partnership
- 5. <u>Human Resources Development</u> by in-house training.

Thank You for Your Attention

Many Thanks for Hosting Agencies

- Ministry of Public Works, Indonesia
- Asian Development Bank
- Japan Water Agency
- ADBI
- Jasa Tirta I Public Corporation

Congratulations for 3rd NARBO General Meeting !

Ref 1: Principles for Infrastructure Management by SCAP

- Revenue = reasonable cost = cost for efficient operations + fair profit reward
- Beneficiary pays principle: beneficiaries should pay in accordance with the benefits they receive.
- Self-financing principle: sustainable service delivery without external subs Tairiff Decision for Public Utilities in General



