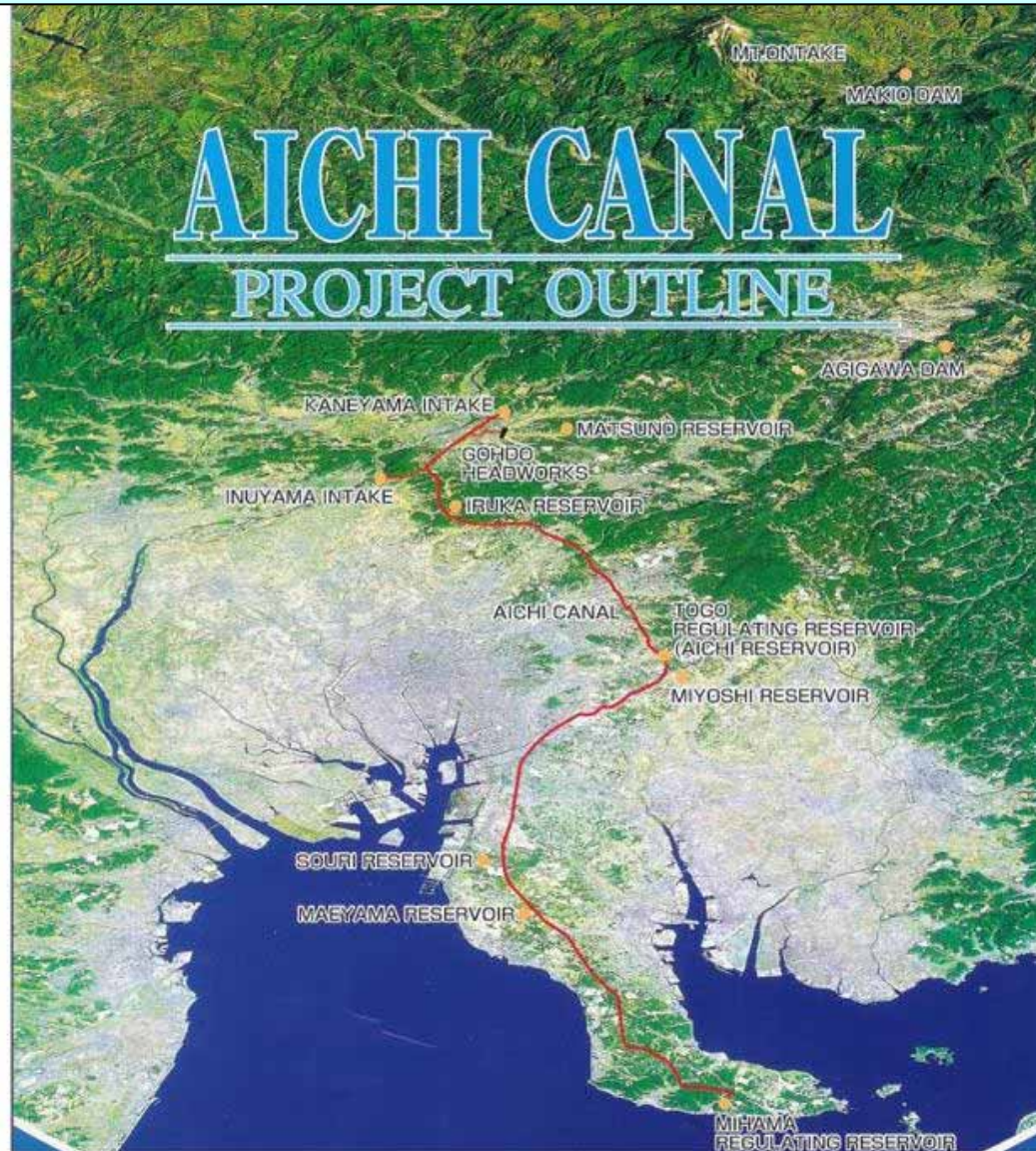


Japan's Experience in Water Resources Development

A Case Study on the Aichi Canal Project financed by the World Bank
by Yoshida, Professor, the University of Tokyo



Source: JWA, 水機構

An Atomic Bomb in Hiroshima

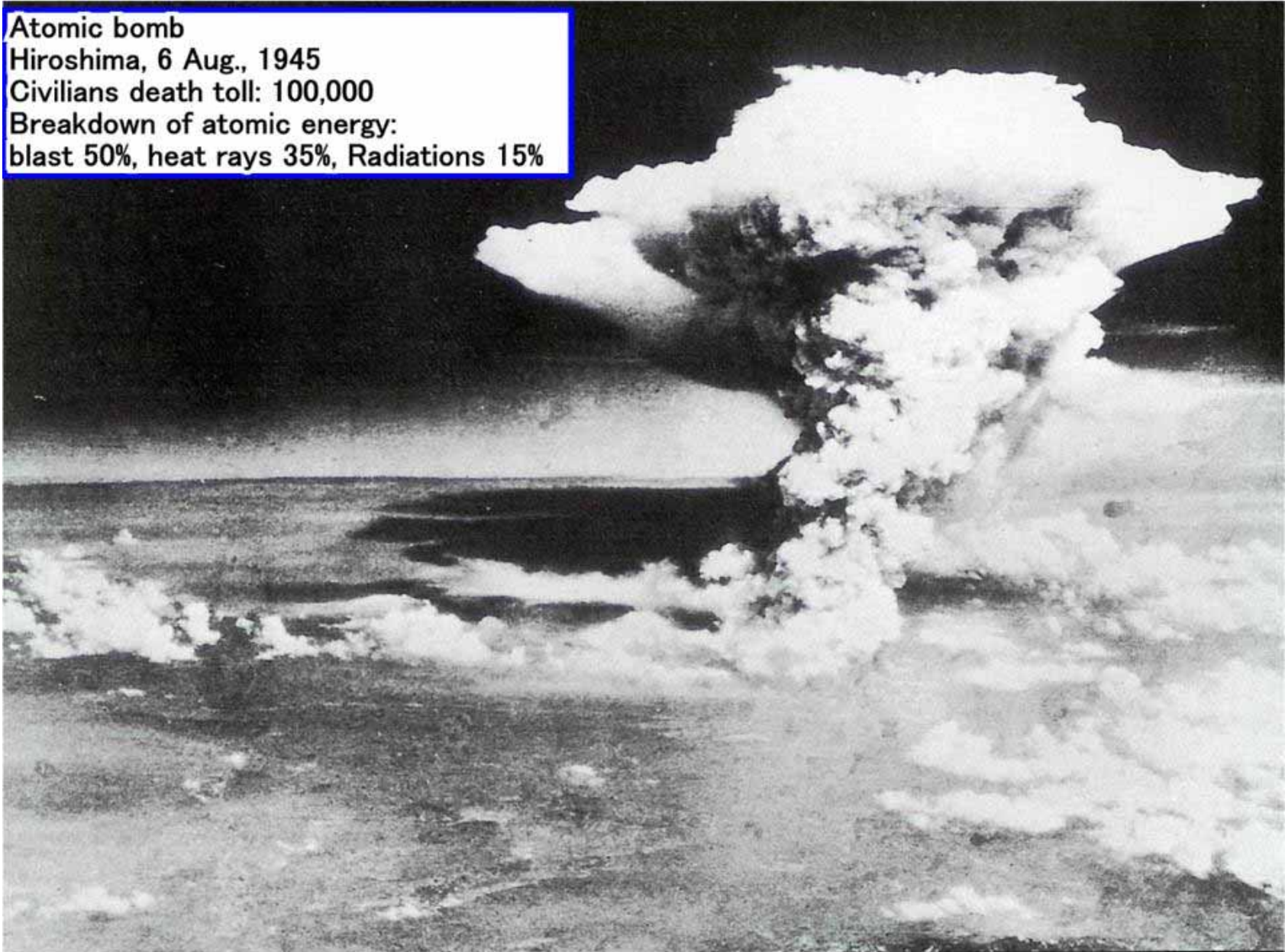
Atomic bomb

Hiroshima, 6 Aug., 1945

Civilians death toll: 100,000

Breakdown of atomic energy:

blast 50%, heat rays 35%, Radiations 15%



Hiroshima city after the bomb explosion

Hiroshima city after the bomb attack
Civilians death toll: 100,000



Tokyo after the war in 1945

Tokyo, 16 Aug., 1945



Osaka after the war in 1945

戦後は、月面のような廃墟から始まった

空襲後の大阪…1945

The postwar Japan starts from ruins like a moon face.



Losses by the Second World War

Japan lost one-fourth of total national wealth during the Pacific War
Death toll in Japan

	Soldiers killed	Civilians killed
Sino-Japan (1937-41)	511,000	
Pacific war(1941-45)	1,555,000	299,000

World Physical Loss of The Second World War

Military expenditure US\$1,117 billion

Total damages US\$4,000 billion

Soldiers death toll 15 million, Civilians 45 million

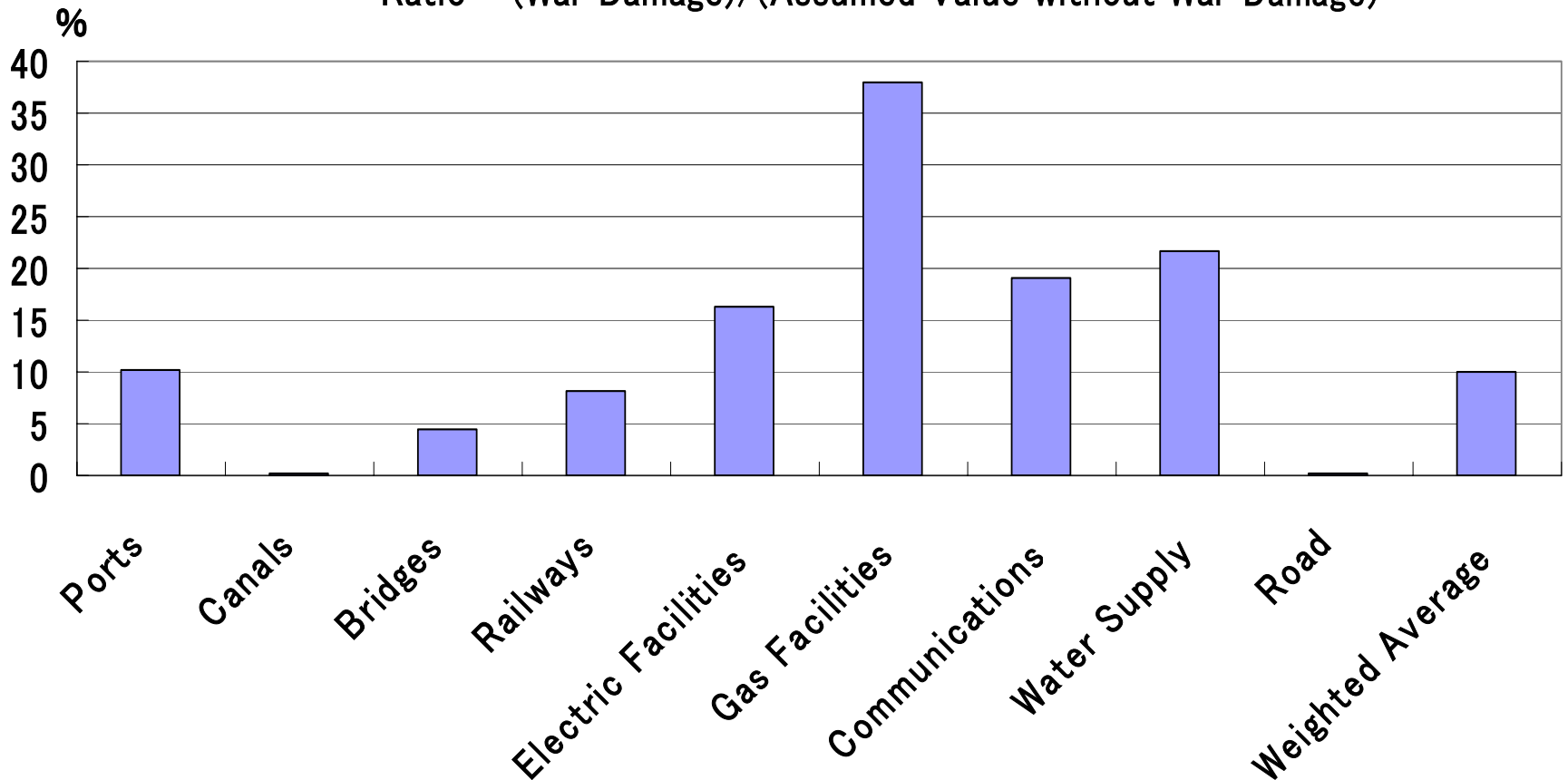
Civilians killed in Asia during the war were not well known.

Lesser Damages on Infrastructure

→ One of Secret Factors for the Rapid Recovery

War Damage Ratios of Infrastructure

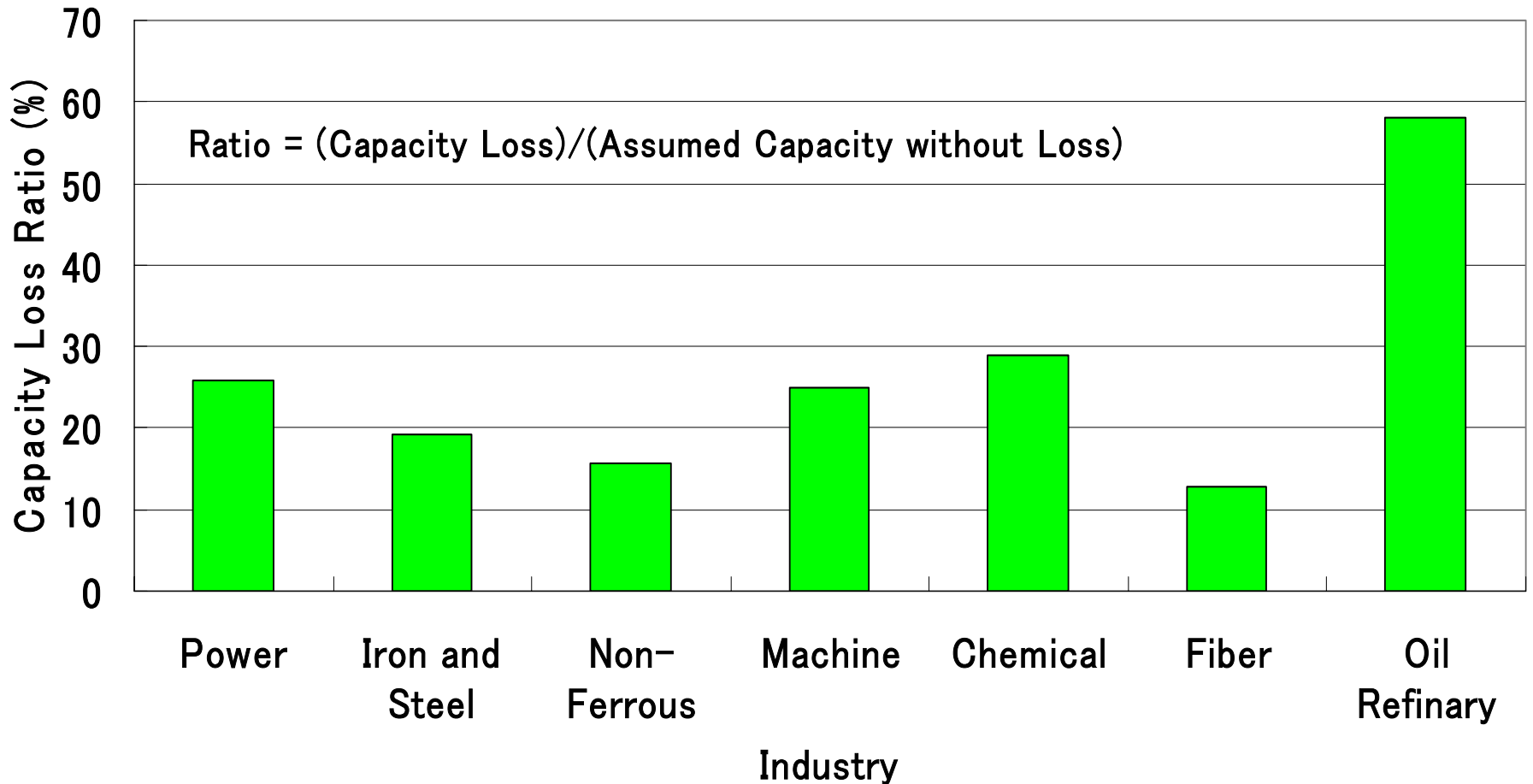
Ratio = (War Damage)/(Assumed Value without War Damage)



War Damages on Industrial Productive Capacities

→ The heavy damages lead to quick modernization of industrial capacities

Loss of Industrial Productive Capacity by War



Reconstruction from the Ruins

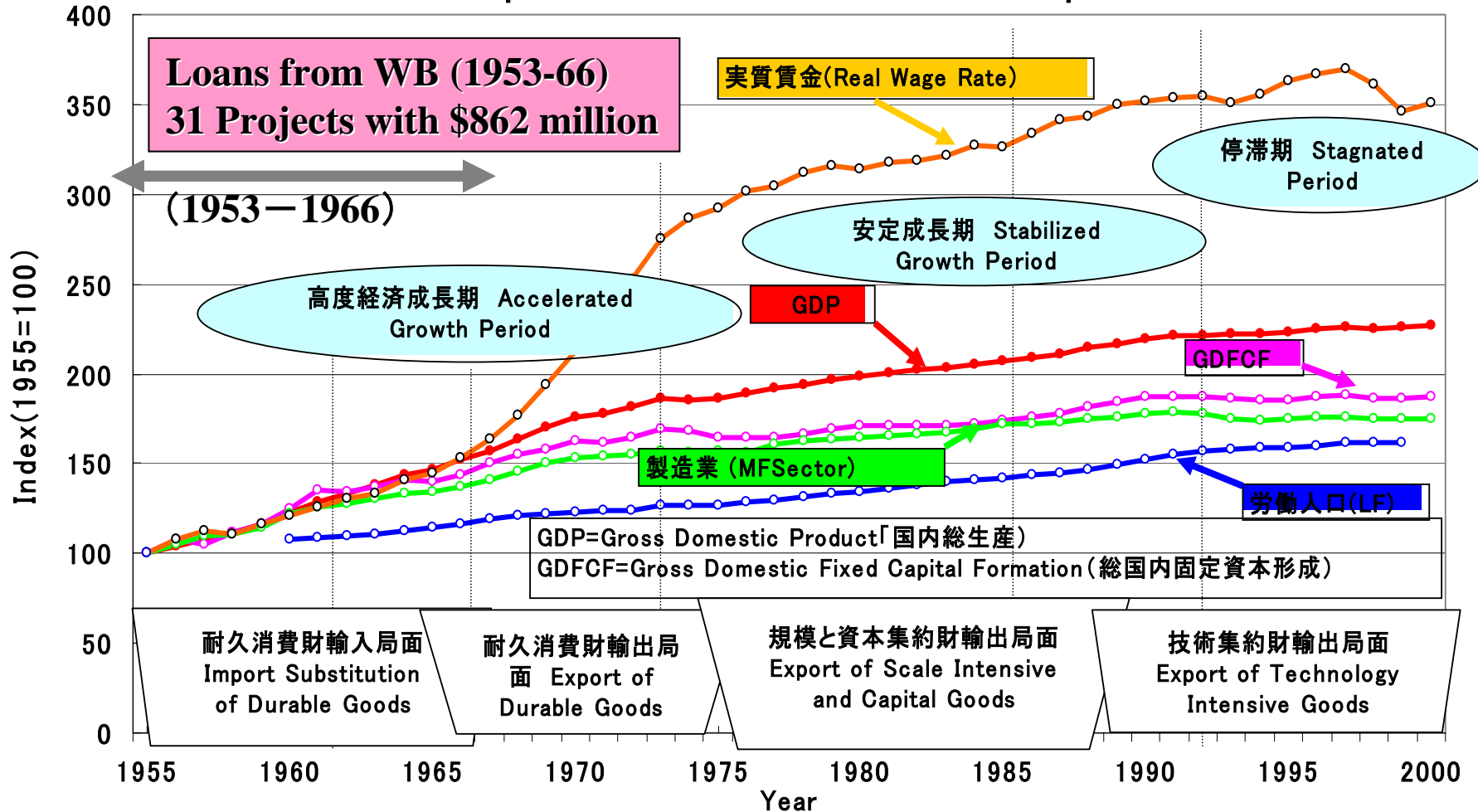
Foods hunting from Tokyo to villages, 1945-46



Post-War Development and WB's Assistance

What learnt from the Assistance

Development Phase in Postwar Japan



World Bank Loans to Japan (1953-1966)

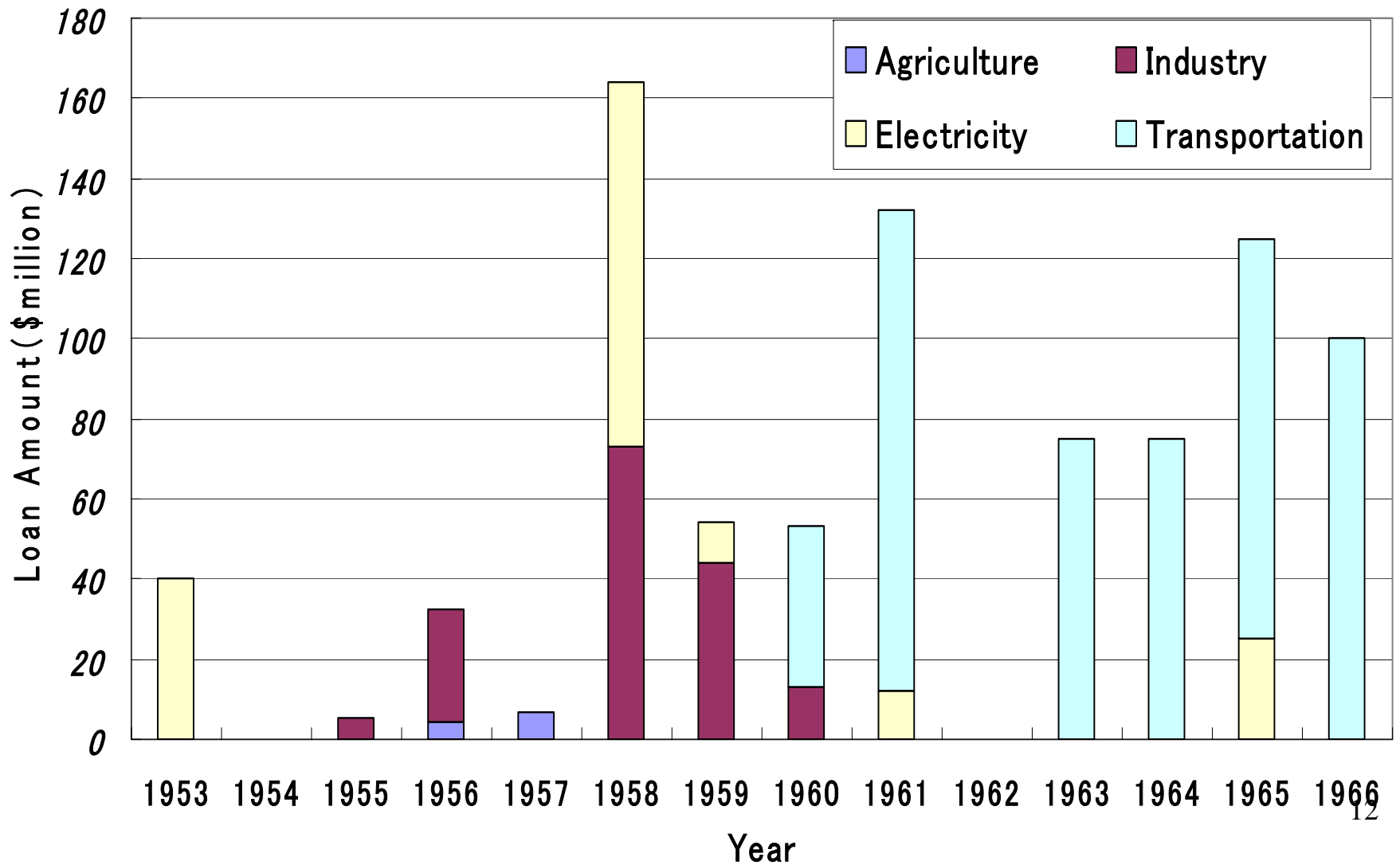
日本の世界銀行からの借款実績(1953-1966)									
件数	契約 調印日	借入人	受益企業	対象プロジェクト計画	利率 (%)	借款額 (千米\$)	償還 期限 (年)	据置 期限 (年)	
	(年月日)								
1	531015	日本開発銀行	関西電力	多奈川火力2基(75千KW)	5.000	21,500	20	3.5	
2	531015	日本開発銀行	九州電力	刈田火力1基(75千KW)	5.000	11,200	20	3.5	
3	531015	日本開発銀行	中部電力	四日市火力1基(66千KW)	5.000	7,500	20	3.5	
4	551025	日本開発銀行	八幡製鉄→日本製鉄	圧延設備	4.625	5,300	15	2.5	
5	560221	日本開発銀行	基幹産業4社(注1)	鋼管・輸送車輛・船タービン・ディーゼル製造設備	4.750	8,100	15	2.5	
6	561219	日本開発銀行	川崎製鉄	千葉工場?ット及びゴールド"ストリップ"・ミル	5.000	20,000	15	3.5	
7	561219	農地開発機械公団	農地開発機械公団	開墾事業/泥炭/乳牛輸入分/保留分(注2)	5.000	4,300	15	3	
8	570809	愛知用水公団	愛知用水公団	愛知用水事業	5.750	7,000	20	4.5	
9	580129	日本開発銀行	川崎製鉄2次	千葉工場千トン高炉およびピークス炉	5.625	8,000	14	2.5	
10	580613	日本開発銀行	関西電力2次	黒部第4水力発電(185千KW)	5.625	37,000	25	4.5	
11	580627	日本開発銀行	北陸電力	有峰水力発電(264千KW)	5.625	25,000	25	3.5	
12	580711	日本開発銀行	住友金属	和歌山工場千トン高炉精銅??設備	5.625	33,000	15	3	
13	580818	日本開発銀行	神戸製鋼	瀬浜工場800トン高炉	5.625	10,000	15	3	
14	580920	日本開発銀行	中部電力2次	畑薙第一、第二水力発電	5.500	29,000	25	4	
15	580920	日本開発銀行	日本鋼管2次	水江工場60トン転炉	5.500	22,000	15	2	
16	590217	日本開発銀行	電源開発	御母衣水力発電(215千KW)	5.250	10,000	25	5	
17	591112	日本開発銀行	富士製鉄	広畑工場1500トン高炉1基	6.000	24,000	15	2	
18	591112	日本開発銀行	八幡製鉄2次	戸畑工場1500トン高炉第二基	6.000	20,000	15	2	
19	600317	日本道路公団	日本道路公団	尼崎-呉東間高速道路	6.250	40,000	23	3	
20	601220	日本開発銀行	川崎製鉄3次	千葉工場厚板工場新設	5.250	6,000	15	3	
21	601220	日本開発銀行	住友金属2次	和歌山工場コンバインドミル	5.250	7,000	15	3	
22	610316	日本開発銀行	九州電力2次	新小倉火力(156千KW)	5.250	12,000	20	1.5	
23	610502	日本国有鉄道	日本国有鉄道	東海道新幹線	5.250	80,000	20	3.5	
24	611129	日本道路公団	日本道路公団2次	一宮-栗東 尼ヶ崎-西宮間高速道路	5.250	40,000	23	3	
25	630927	日本道路公団	日本道路公団3次	東京-静岡間高速道路	5.500	75,000	26	5.5	
26	640422	日本道路公団	日本道路公団4次	豊川-小牧間高速道路	5.500	50,000	25	5	
27	641223	首都高速道路公団	首都高速道路公団	羽田-横浜間高速道路	5.500	25,000	24	4	
28	650113	電源開発(株)	電源開発(株)	九頭竜川水系長野および湯上発電所建設	5.500	25,000	25	4	
29	650526	日本道路公団	日本道路公団5次	静岡-豊田間高速道路	6.500	75,000	25	4.5	
30	650910	阪神高速道路公団	阪神高速道路公団	神戸市高速道路1号	6.500	25,000	24	4	
31	660729	日本道路公団	日本道路公団6次	東京-静岡間高速道路	6.750	100,000	15	3	
						合計	862,900		

(注1) 日本鋼管→継目なし中継管製造設備、トヨタ自動車→拳母工場トラック・バス用工作機械、石川島重工→東京工場船舶用ター
三菱造船→長崎造船所ディーゼルエンジン製造設備

(注2) 上北?川地区開墾事業/薩津泥炭/乳牛輸入分/保留分

WB Loans by Sector

Loans from World Bank by Sector



Major WB Financed Projects



Sinkansen



Hydropower



Shipbuilding Industry

Steel Plant



Highways



Truck Industry



General Lessons Learned from the WB's Assistance

Lessons at Project Level

- **Introduction of new methods in planning, designing and construction, but, procurement practices were not well transferred.**
- **Justification from macro, sector, regional policies.**
- **Introduction of sound project investment analysis.**
- **Emphasis on financial viability of service providers and pricing.**
- **Promotion of technology transfer and innovations.**
- **Human resources development.**
- **Institutional building.**

Lessons at Policy Level

- **Consistency between macro-economic management and project investments.**
- **Institutional reforms including new laws, organizations, and regulations.**

A Case Study: A Review of the Aichi Canal Project

The Kiso River System and the Aichi Canal Project

KISO RIVER SYSTEM



Total canal length 112 km

Open canal 63 km

Tunnel 28 km

Siphon 12 km

Others (bridges, etc) 6 km

Maximum capacity 30 m³/s

Branch canals 1,012 km

Project Components

Irrigated Area 33,000 ha

Farms 45,000(1957)→ 20,000(2000)

Water supply 195,000

Industrial water supply 37 million m³

Electricity 35,000 kw

Project Area and People

Rain-fed Agriculture by Irrigation ponds (before the project)



図 1 — 30

半田市西北部のため池かんがい状況

(承認番号昭44第7.396号)

Problems: drought prone areas

Data and statistics were accumulated.
(Statistics paranoid?)

Japanese are paranoid in statistics.

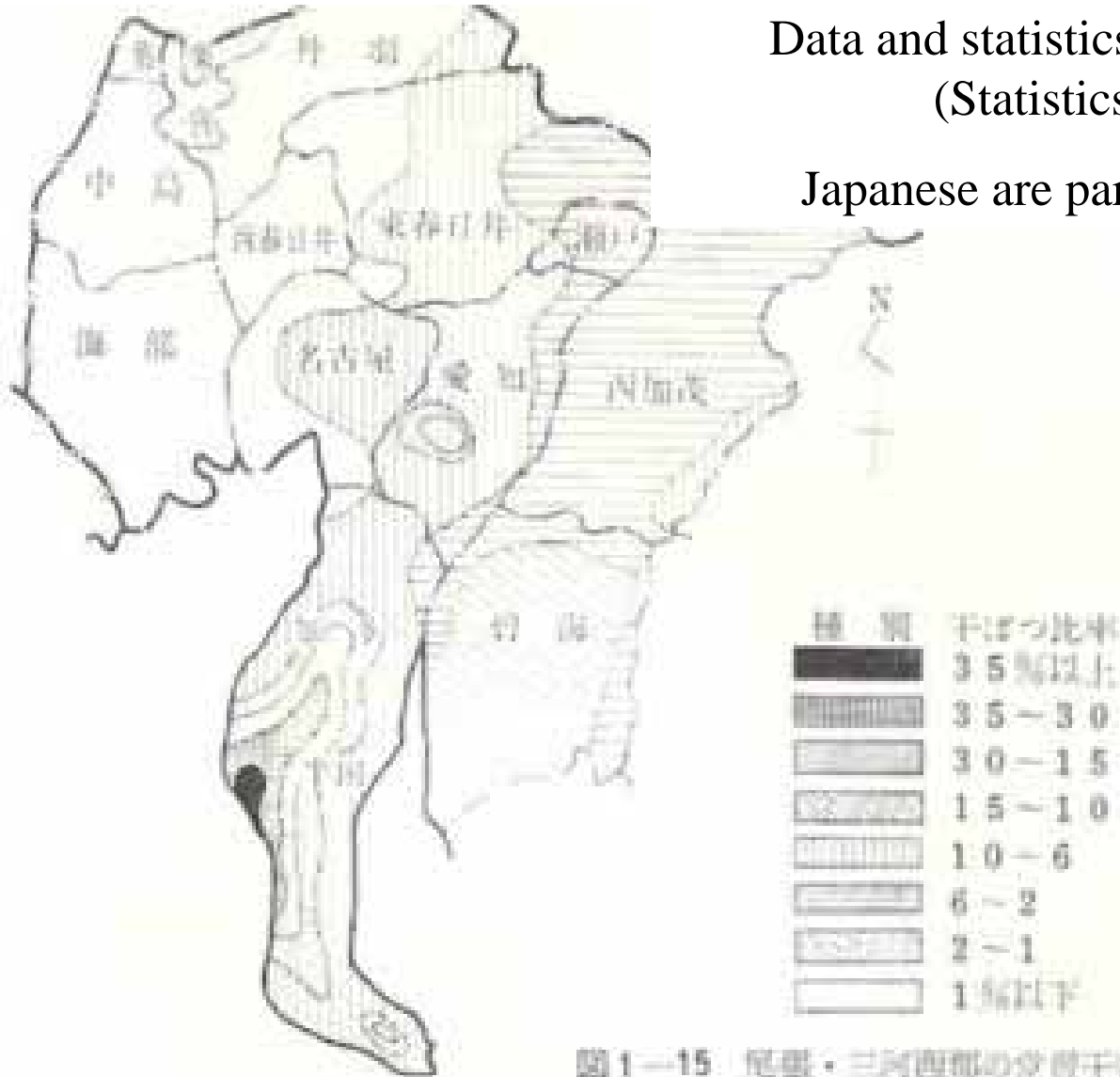


図1-15 尾張・三河両郡の常年干害発生地帯

Priority Needs of Local People and Their Initiatives

Hand swing bucket irrigation (before project)



Shortage in Domestic Water Supply



The people in this town located in the southern tip of the peninsula had prepared by themselves a town water supply fund and system before the water reached the town.

How was the priority needs being identified by the farmers?

Demonstration Effect (1891~)

- Local farmers' knowledge about the impact of irrigated agriculture demonstrated by the neighboring Meiji canal project (since 1891).
 - We want the same because we know how large benefit we can get.

Who are the project promoters? (1948~1957)

- *Farmers' leader Mr. Kuno* who was so talented in local communications and active in local business.
- *The local agriculture high school teacher, Mr. Hamajima who was capable of planning an irrigation project.*
- A local city mayor who once worked as a correspondent in USA before the war played an important role of *“communicator” to external resources*. He knew “democracy” practiced in USA, and various public projects including TVA project in USA.
- The local leaders had *good connections with the local and central authority*.

**Project Promoters: Local Farmer and Teacher
Mr. KUNO and Mr. Tatsuo Hamajima (1970)**



How were the local people participated in the project ?

In 1948, the promoters visited and persuaded the villagers.

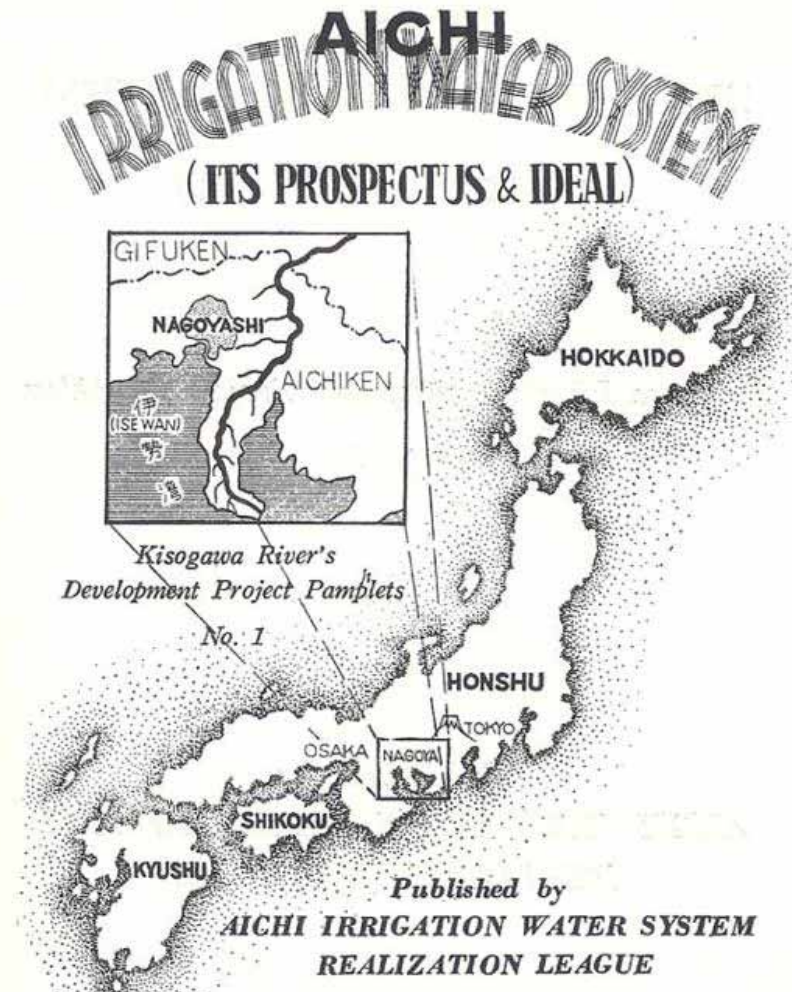
- Consultation meetings in all villages.**
- Project presentation through local entertainers (local folk tellers).**
- Later, the project concept brief was circulated to all the elementary school pupils in which TVA and Dutch farming system were cited as the models for the proposed Aichi Canal project.**

In 1948, Kuno and Hamajima petitioned to the central government and met with the then prime minister Yoshida.

In 1949, The Aichi Irrigation Water System Realization League was organized.

In 1949, The project proposal was prepared in English by Mr. Mori (city mayor) to be presented to GHQ. Japan was ruled by the Allied Occupation Army until 1952 when the San Francisco peace treaty was enacted.

Project Proposal prepared by the Project Realization League in 1949 – Cover Page



Prepared by the farmers group of “Project Realization League” in 1949

Farmers Proposal and Government's Objectives

How was the Project kept consistent?

1948 The Project was conceptualized by the local leaders. (Kuno and Hamajima)

- The promoter visited and discussed with then prime minister Yoshida who was in support of the project concept.
- The Ministry of Agriculture staff visited the project area.

1950 TVA concept was introduced among the stakeholders. Then the scope was scaled up including electricity, industrial water and urban water.

1951 The Kiso river comprehensive water use survey office was established by the Ministry of Agriculture.

Local needs

- Drought prone area → prevailing poverty and shortage of water.
- But, the climate, soil and location are good for farming.

The local priority needs met with:

National and agriculture sector needs

- Food security: Rice production increase was the first priority.
- Social Stability: Employment creation.

Coordination among Government Agencies → A New Concept

Multipurpose development:

Irrigation → Ministry of Agriculture

Domestic water supply → Ministry of Welfare

Industrial water supply → Ministry of T/I

Hydropower (Electricity) → Ministry of T/I

Flood control → Ministry of Construction

TVA Approach

→ USA's Tennessee Valley Authority's experience in 1930 (New Deal Policies)

→ Comprehensive development of the Kiso river basin

Institutional Evolution → Concept of **IWRM (WWF3 2004)**

- 1955 → Aichi Canal Public Corporation (1955) for the project implementation
- 1968 → Later merged with the Water Resources Development Corporation which was responsible for developing 7 major river basins in Japan.
- 2004 by the administrative reform act, transformed into Japan Water Agency.

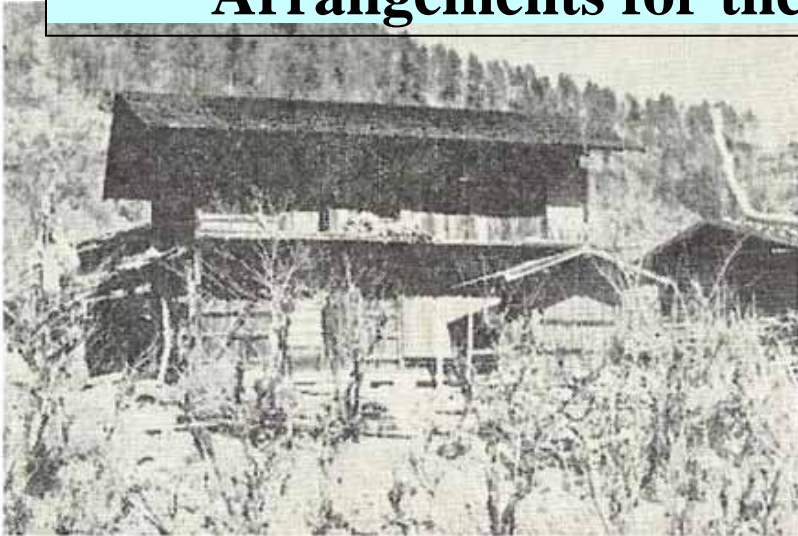
**However, Affected People's Oppositions Movement (1952~1958)
Pro vs. Con Against the Project – Democracy was Working?**



Signboard saying “Oppositions to Dam Construction” (二子持地点)

Compensations

Arrangements for the Re-settlers, are they better-off ?



水没前の家屋



水没移住者の住宅 (三好町緑ヶ丘開拓地)

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 re-settlements, they decided the place where they will rebuild their livelihoods. Most of them were re-settled by group in places where they can oversee their homeland.

How was the WB get involved in?

1950 Mr. Mori, Mayor visited WB and handed over the Project proposal.

1952 WB mission to survey the Japanese economy.

1953 Japan became a member of WB.

**The first loan from WB for Tanagawa Thermal Power Project (\$21.5m).
MOA contracted with PCI for technical assistance.**

The WB Vice President visited Japan to discuss possible loans.

1954 The feasibility study report prepared by PCI (consultant).

The WB Agricultural Mission visited Japan and the Project area.

The WB Industrial and Electricity Missions visited the Project site.

1955 Policy and technical dialogues between Japan and WB.

1957 The Aichi Canal Project loan was approved by the WB.

The construction started.

1962 Project was completed and operation started.

World Bank Agricultural Survey Mission in 1954



世銀農業調査団の現地調査

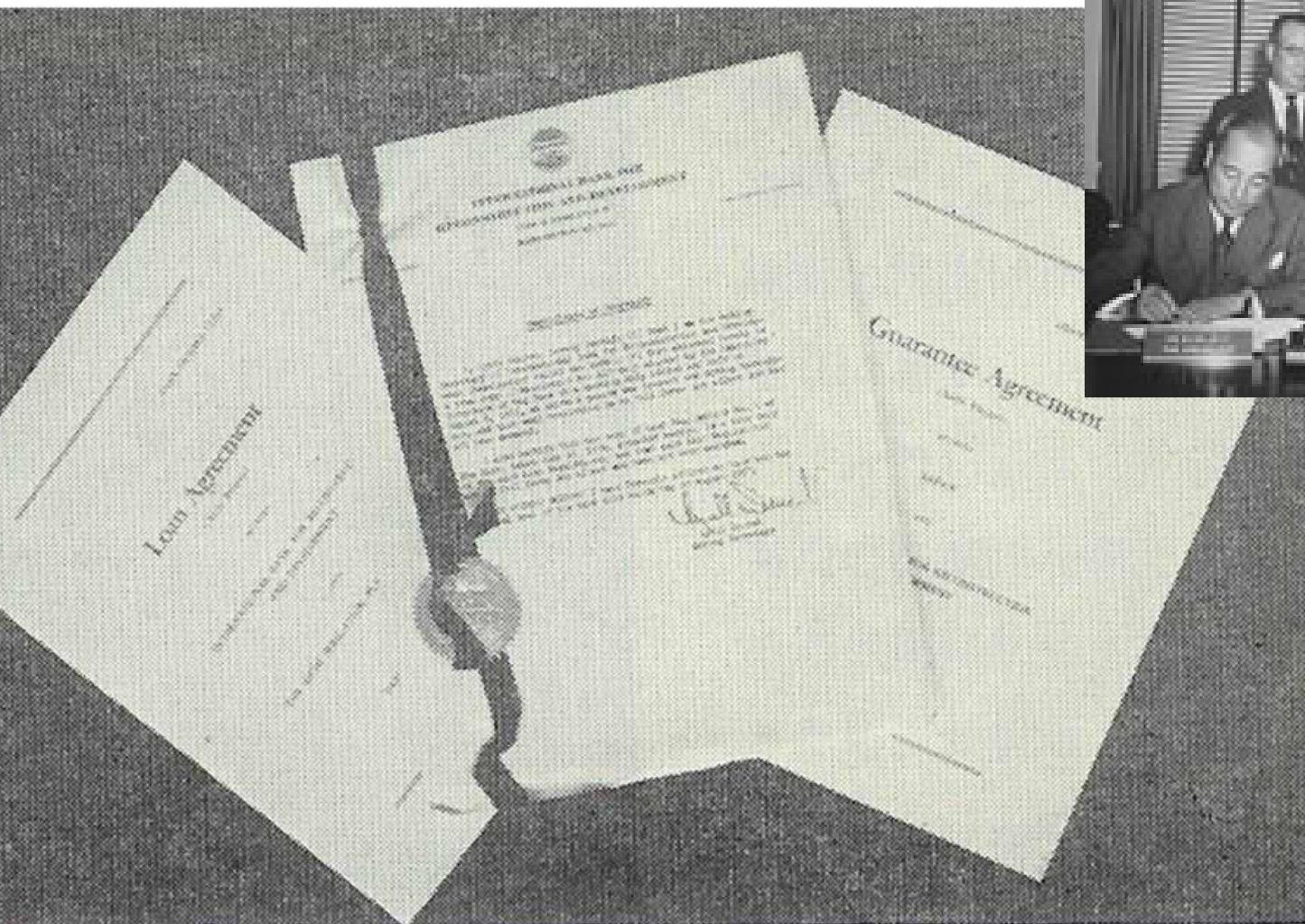
(東浦町日高農場にて)

A Meeting with WB Appraisal Mission in 1956



調査団と関係者との会合

Loan Agreement and Government Guarantee Certificate 1957



世銀契約書と日本政府の保証書

How were new technologies transferred?

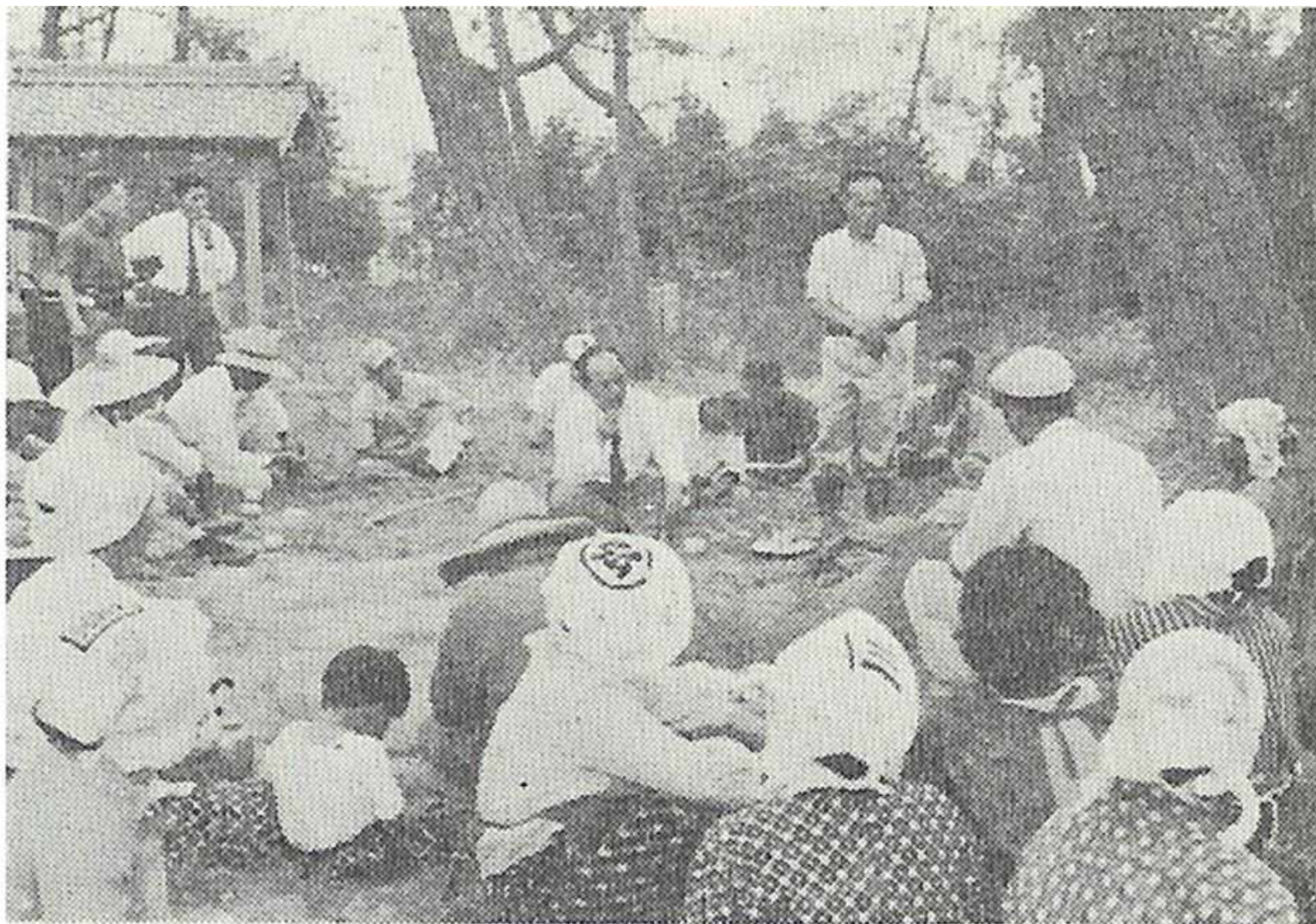
- 1953** MOA contracted with a US consultant (PCI) under TA for planning.
- 1954** PCI prepared a preliminary feasibility report.
- 1955** PCI submitted a final report.
- 1955** PCI and EFA (Elick Flore Associates) discussed with Japan's engineers.
- 1956** A pilot farm was established for new irrigation methods.
- 1956** EFA contract under TA agreement for design and construction supervision.
- 1957** WB approved the project.
- 1958** 5 pilot farms were established in the project area for farm irrigation techniques (sprinkler irrigation).
- 1959** Local peoples objection meeting against the proposed rock-filled dam in place of a concrete dam.
- 1961** EFA contract (5 .5 years) under TA Agreement was expired.

Consultant Specialists Meeting in 1956



名古屋駐在E.F.A.首脳部

Field training by extension workers (technicians) (1957)



指導班による現地研究会

(武豊町)

Introduction of Mechanical Construction Method 1958-



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）

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
<u>Construction Equipment</u>	<u>4,400</u>	<u>2,560</u>	<u>+1,840</u>
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 (8.8%)	4,900 (4.1%)	2,100
Total Project Cost	80,000	117,500	

Note: Interest rate of 5% with 25 years repayment period including 5 years grace.³⁵

Actual Financing Arrangement

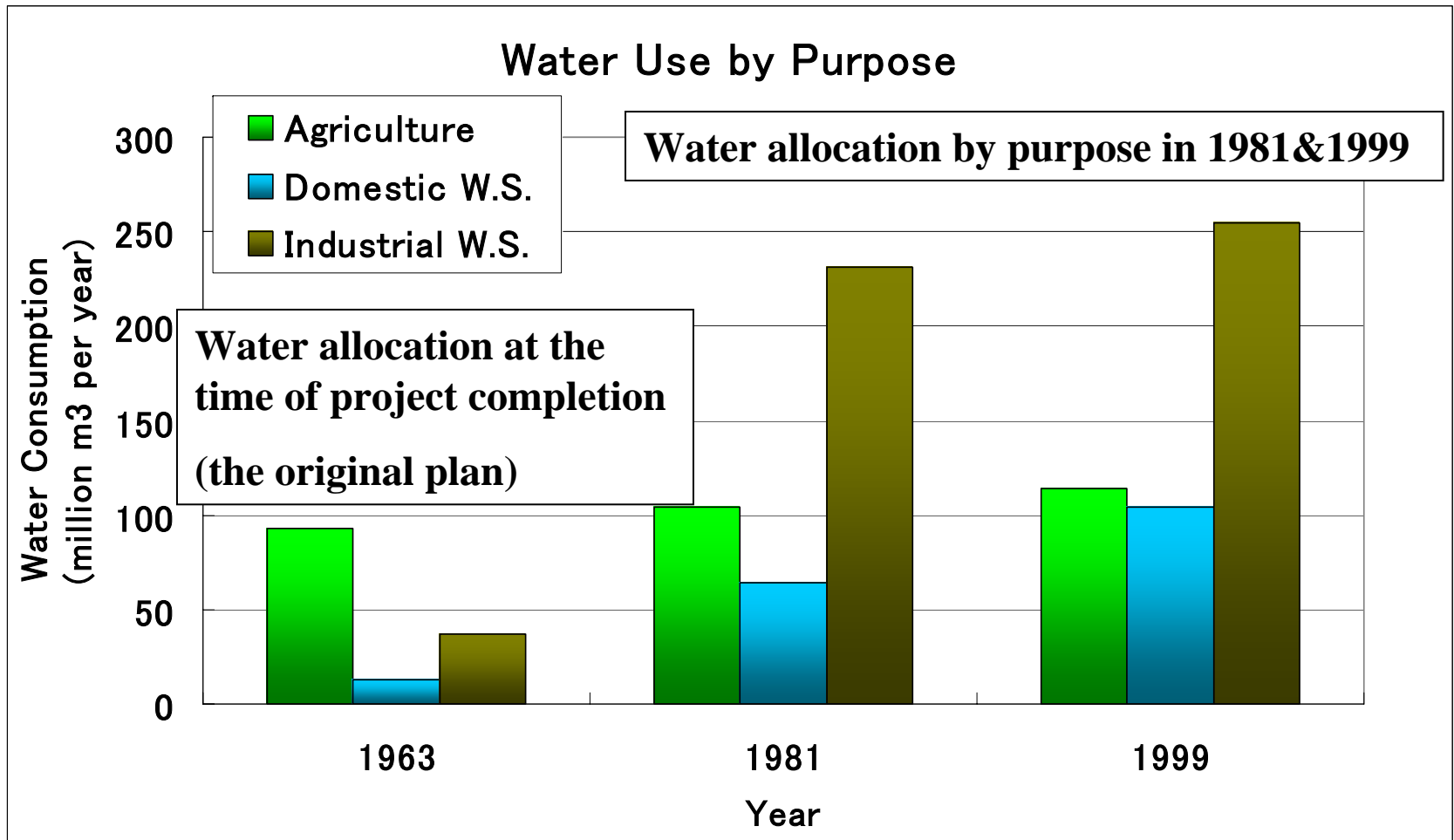
Category	Amount (mil yen)	
Central Subsidy	8,000	18%
WB Loans	1,754	4%
Fund of US Surplus Foods Sales	12,250	27%
Loans and Investment Fund	22,719	50%
Others	768	2%
Total	45,491	100%

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



Outputs of the Project - Water Supply to meet the demand

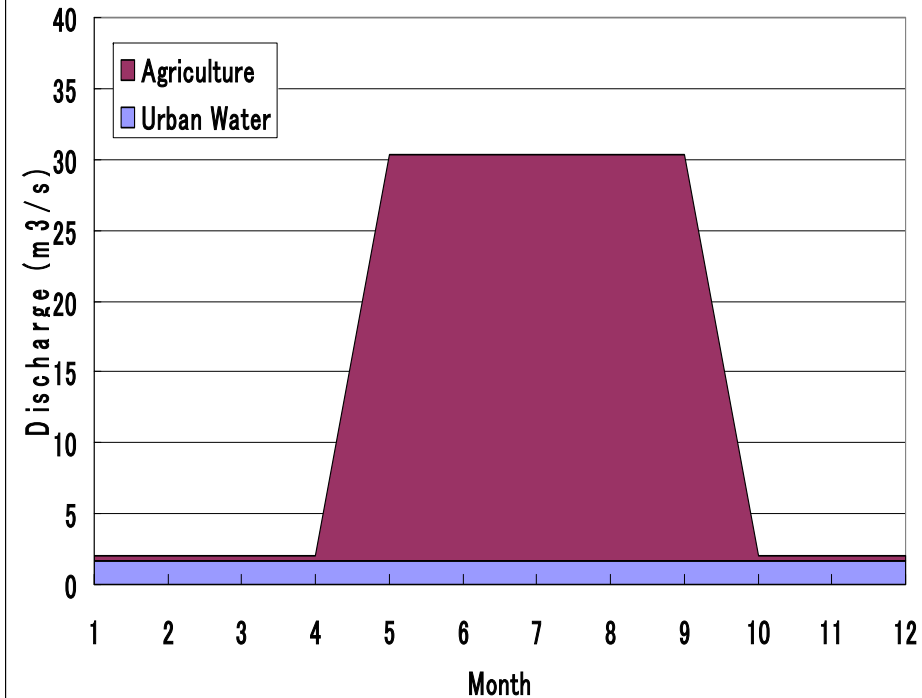
Changes of Water Use from Agriculture to Industry



Changes in Water Allocation in Response to Changes in Demand

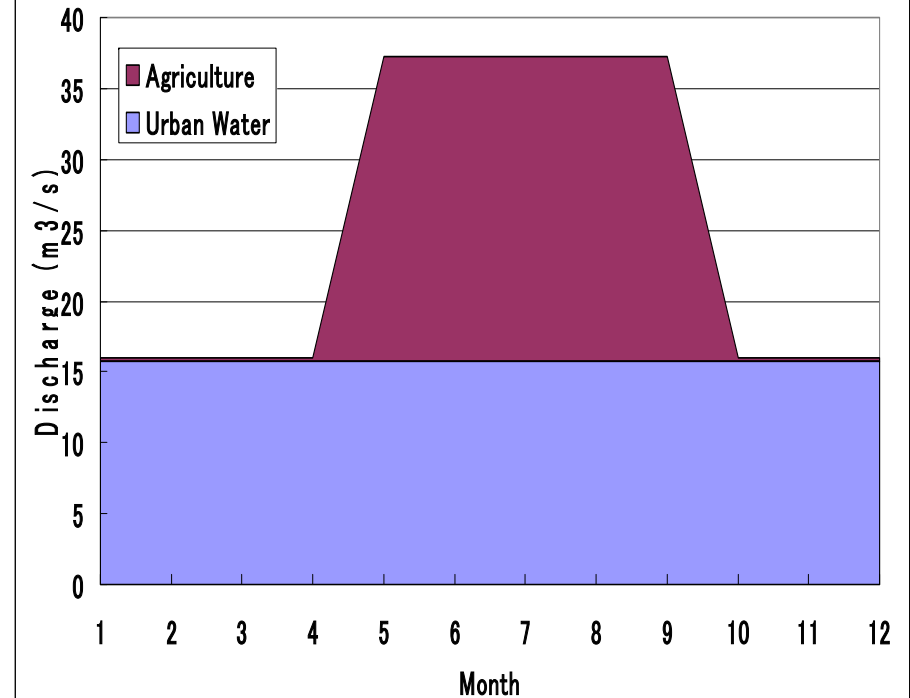
1963

Water Discharge by Purpose in 1963



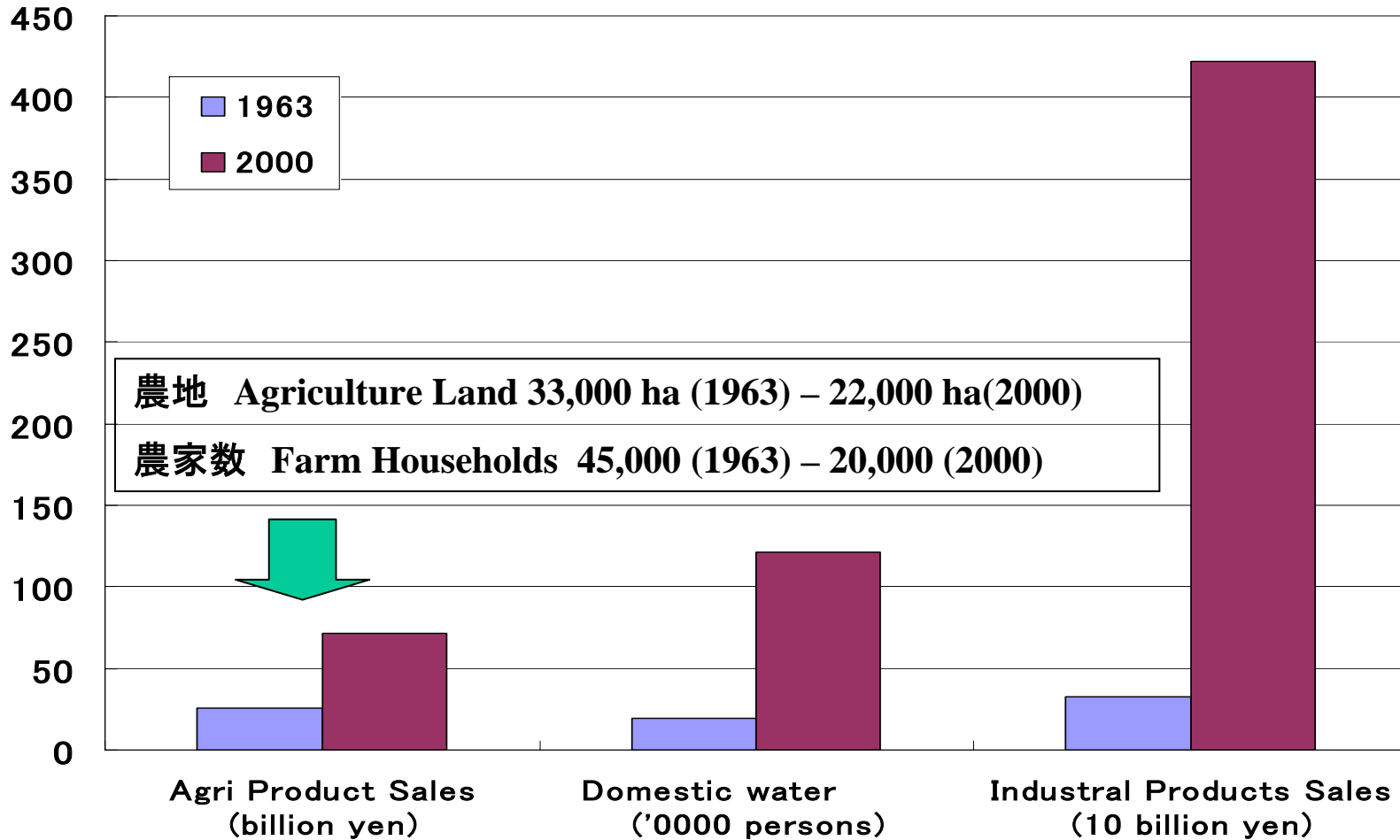
1997

Water Discharge by Purpose in 1997



Impact of the Project

Indirect Impact of Project



The Chita Agriculture Cooperative

(As of April 2006)

Members: 17,378

Quasi-Members: 38,295

Staff: 806



The Head-Quarter Building

Subscription: ¥7,400 m (\$64 mil)

Savings : ¥839,600 m (\$7,300 mil)

Loan Outstanding: ¥191,500 million (\$1,7 bill)

Pension fund: ¥2,285,000 million (\$20 bill)

Collective input supply: ¥12 ,000 mil

Collective products sales:¥9,700 mil

Individual products sales:¥2,100 mil



Continued Innovations: Reservoir renovation and Double Canal (middle walled canal)



Project Area Now

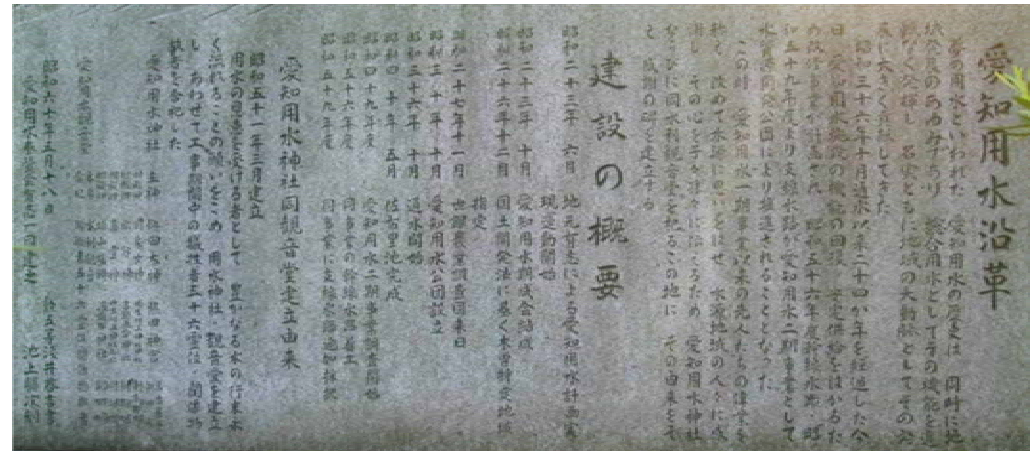
The Monument and Watershed Management by Peoples of Upstream and Downstream Reaches together



The Shrine and Monuments



UNVEILING CEREMONY OF A MONUMENT
"GREEN BATON TO THE FUTURE CENTURIES"



Ultimate Impact of the Aichi Project

→ Capacity Development of the Project Community

Planning Process Learning by Doing with Democracy (good governance) in Practice

- Participation and decision making with consultation → Democracy can work.
- Re-settlement = Livelihood reconstruction, social considerations.

Ownership, self-help and consistency

- The Project was designed by the beneficiaries to meet their priority needs.
- The Project was fully supported by all other stakeholders.
- Political and industrial leadership played important roles.
- The administrations at central and local levels worked together.
- The beneficiaries committed their financial contribution (20% of investment).

Institutional Evolution: Establishment of a river basin organization

- (laws, organization, rules and regulations, financing mechanism, etc).

Transfer and Diffusion of Technologies

- Design and construction, and nation-wide spillover impact.

Local Institutional Capacity (Various Associations strengthened)

- Local capacity to meet the changing conditions of the social environment (sustainability).

Increased Capacity of Social Capital

- Overall capacity development of the beneficiaries in the Project area.
- Witness: Success of the Chita Agriculture Cooperative.

The Project provided various opportunities to enrich peoples' capacity or community's social capital in the Project area.

Summary: Ultimate Impact of the the Aichi Canal Project - Community's Capacity Building -

- **Definition: Good governance concerns the efficient management of a country's public resources. This includes challenges of a constitutional nature that establish rules of political conduct, creative interventions to change rules and structures, and the nature of interactions and types of relationships between states, citizens, and other actors. The codes of conduct for good governance include participation, transparency, accountability, efficiency and predictability**
- **The Aichi Canal Project provided a precious opportunity to enhance “community's good governance” and strengthen “community's capacity” to effectively respond to the changing social and economic conditions. Therefore, the Project became “sustainable”.**