Japanese experiences on development and implementation of water resources plan at a river basin level

~ The Basic Water Resources Development Plan & The Implementation Scheme

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1. Introduction

Japan achieved the postwar reconstruction in the middle of 1950's after World War II, and then, she had achieved remarkable economic growth. At the same time, Japan had faced urbanization, industrialization and increase of population, especially in urban areas such as Tokyo metro area. Due to that, demands for domestic and industrial water had increased significantly. Since, on the contrary, there had still been considerable water demands for agriculture or hydropower generation, Japan had suffered from chronic severe water shortages in 1960's. For example, we can list what is called "the Tokyo Olympics Drought", in which 1,259-day water rationing (from October 1961 to March 1965) was implemented. Namely, large gaps between water demand and supply was emerged especially in urban areas, and mitigation of such gaps became one of the critical problem in Japanese national strategies.

In order to deal with the aforementioned tight situations, Japan has had to develop the new water resources such as dam construction. However, at that time, Japan had hardly developed legal, administrative and organizational frameworks for water resources development and management. Therefore, Japanese Government has developed such frameworks (See the Appendix 1). Among these frameworks, the following two

(1) The Basic Plan for Water Resources Development (hereinafter referred to as "**the Full Plan**" [*1]), and
(2) Implementation scheme for the Full Plan

have greatly contributed to the overcoming of such water shortages as the comprehensive water resources development in the river basin text. Then, Japanese experiences related to the above two frameworks may be beneficial for the NARBO member countries, some of which are now suffering from the water shortages derived from urbanization, industrialization and increase of population.

This paper summarizes the Japanese experiences on (i) development of the Full Plan as the comprehensive water resources plans in the river basin text, and (ii) the organizational framework for implementation of water resources development and management along with the Full Plans.

Meanwhile, the legal, administrative and organizational frameworks introduced in this paper are basically those of 20th century, not current ones, though Japanese legal, administrative and organizational frameworks related to water resources was reformed several years ago [*2,3]. Recently, in Japan, growth in demand for new water resources development has been peaking out because of current tendency of low growth of population or other reasons. At present, gaps between water demand and supply have significantly decreased, which affected the aforementioned reforms related to water resources. However, such current Japanese water resources circumstances may be quite different from those of some NARBO member countries, which have suffered from the remarkable gaps between water demand and supply.

Therefore, explanation of current Japanese frameworks cannot be necessarily worthy for NARBO countries. Please note.

2. The Full Plan

2.1 Background

Around 1960, increase in water demand had been considerable due to the explosive urbanization and industrialization, and more and more population increase and industrialization had been predicted in broad and metro areas in Japan such as Tokyo metro area. On the other hand, water resources development projects were not implemented on the basis of the definite plans, but implemented by various bodies discretely. In addition, there are usually a lot of water-related stakeholders, and therefore a lot of interest oppositions related to water uses in such broad and metro areas. Under the condition, it had been required:

- First, preparing the water allocation plans based both on mid-and-long term prediction of water demand-supply and consensus building among the stakeholders within the broad areas across multiple Prefectures, and
- Second, establishing the organizational schemes for promoting water resources development on the basis of such broad-based plans.

Thus, two legal frameworks were enacted in 1962: one is **the Water Resources Development Promotion Law (WARDPL)**, which is related to the former; the other is **the Water Resources Development Public Corporation Law (WARDCL)**, which is related to the latter. They are called “the two legal frameworks related to water resources development”. **The Full Plans** are prepared according to WARDPL as comprehensive water resources plans in the river basin text, and **the Water Resources Development Public Corporation (WARDEC)**[*3] was established according to WARDECL as an implementation body for implementing the Full Plans. In this chapter, WARDPL and the Full Plan are explained; WARDEC and WARDECL will be explained in the next chapter.

2.2 The outline of the Full Plan

2.2.1 Introduction

As said before, the Full Plans have the character as a water allocation plan in the river basin text. According to the WARDEPL, there are 3 steps to prepare the Full Plans, (i) basic research, (ii) the designation of the Water Resources Development River Systems (WRDRSs), and (iii) the preparation for the Full Plan.

2.2.2 Basic Research

Prior to the designation of WRDRSs or the preparation for the Full Plans, the National Government is required carrying out the basic research for the said designation or preparation. Also, the National Land Agency (NLA) was required to make adjustments within the National Government with regard to the basic research (Art 2 of WARDPL).

Especially, since the Full Plans are prepared on the basis of the mid-and-long term prediction of water supply and demand, it is important how to predict the water demand. NLA was responsible for the research on the water demand prediction according to Art 2 of WARDPL [*2]. When preparing the Full plans, the NLA had conducted the researches on water demand prediction in collaboration with concerned Prefectures. Concretely speaking, (i) firstly, each concerned Prefecture itself predicts its future water demands, and (ii) secondly, the NLA examines the prediction carried out by concerned prefectures.

2.2.3 Designation of WRDRS

The Full Plans are prepared with regard to the specific river systems, which are called the "Designated Water Resources Development River Systems". The designations of WRDRSs are carried out when it is deemed urgently necessary to take broad measures concerning water with regard to the concerned regions (Art 3, WARDPL). Namely, the Full Plans are applied only to the specific river systems concerned with water deficit and broad areas across multiple Prefectures. At present, **7 river systems**, Tone, Ara, Toyogawa, Kiso, Yodo, Yoshino and Chikugo, have been designated for WRDRSs.

2.2.4 The Full Plan

According to the WARDPL, the following items must be included in the Full Plan (Art 5, WARDPL).

(i) Forecast for the demand for each water use and targets for supply;
(ii) Basic items regarding construction of facilities necessary to achieve the targets for supply in the previous items; and
(iii) Other important items regarding the overall development of, and rationalization of the use of water resources.

Please see the appendix 2 for your reference, which is the actual Full Plan in the Tone and Ara River systems.

2.3 Responsibilities related to the Full Plan

The responsibilities for designation of WRDRSs and preparation for the Full Plan had belonged to **the Prime Minister**, who occupies the apex of the National Government, although the both of them are related not to whole Japan but to the part of areas in which the specific river systems are located.

The reasons why the Prime Minister had taken the responsibilities for both of them are as follows.

- **Firstly, it should be clarified why the National Government has taken the role of the Full Plans** though they are only regional plans. In broad and metro areas, there are usually a lot of water-related stakeholders and therefore a lot of regional interest oppositions. Under such conditions, it is difficult for the Local Governments to deal with the plans. Thus, the National Government can be a more appropriate body to take such responsibilities rather than the regional organization such as the Local Governments.
- Secondly, **it should be clarified why the Prime Minister has taken the role** though there have been other water-related agencies in the National Government. The Full Plan, which is the water allocation plan in water deficit metro areas, is one of the most important issues from the viewpoint of national strategy. Also, the Full Plan must integrate the various interests related to water resources including flood control, irrigation water, water for water supply, industrial water and hydropower generation etc., However, there have been multiple government organizations which represent these water-related interests. That is [*2];
  (a) Ministry of Construction (MOC): River administration including flood control and Multi-purpose dam construction
  (b) Ministry of Agriculture, Fishery and Forest (MAFF): Irrigation water
  (c) Ministry of Health and Welfare (MHW): Water for water supply
  (d) Ministry of International Trade and Industry (MITI): Industrial water and hydropower generation

  Therefore, the Prime Minister, who occupies the superior position over other ministries, is the most appropriate to take the role from the viewpoint of coordination among the multiple water-related agencies.

2.4 Procedural Flow

2.4.1 Requirement

In this part, the detailed procedural flows for designating WRDRSs and preparing or revising the Full Plans are explained. When designing WRDRSs, or preparing (including revising) the Full Plans, the following 5 items are required, which are common to the said designation and preparation/revision.

(i) Consultation with relevant National Government Ministers

The Prime Minister had to consult with the Ministers of Concerned National Government organizations including MOC, MAFF, MHW and MITI (Art 3 and 4, WARDEPL). This consultation had a function to confirm the consensus building in the National Government.

(ii) Hearing the opinion of the concerned Prefectural Governors

The Prime Minister had to hear the opinions of the Concerned Prefectural Governors (Art 3 and 4, WARDEPL). This hearing had a function to confirm the consensus building among the concerned local governments.

(iii) Hearing the opinion of the Water Resources Development Council

The Prime Minister had to hear the opinions of the Water Resources Development Council (Art 3 and 4, WARDEPL). The Water Resources Development Council was the advisory body for deliberating on the important matters related to water resources development affairs [*4].

(iv) Cabinet Approval

The Cabinet approval is needed for the designation of WADRSs and the preparation for the Full Plans (Art 3 and 4, WARDEPL).

(v) Announcement

After finalizing the procedures (i)-(iv), the Prime Minister had to announce the designation and preparation/revision through the government gazette (Art 3 and 4, WARDEPL). This announcement has contributed to the transparency of project implementation.

Also, please see the Appendix 3 for your reference.

2.4.2 Advanced informal negotiation

Prior to the procedures mentioned in the Paragraph 2.4.1, a lot of advanced informal negotiations among stakeholders have usually been carried out. They were working-level talks in other words, which have been held not only among the National Government but also between the National Government and the Local Government. Moreover, they have often taken a lot of years. These informal negotiations have led the consensus building among stakeholders, which have made great contributions to the preparation for the Full Plans.

2.5 Lessons learned

According to WARDPL, preparation and disclosure of the plans for water demand and supply, which are supposed to be a fundamental of comprehensive water resources development and water use rationalization, are obligated in the designated river systems. That has led the well-planned development of water resources development facilities in the concerned areas. That is, the relation between the water users and water resources facilities including water source facilities and water transmission facilities can be quite complex because the designated river system are located across the multiple Prefectures (See the Appendix 5), which may make it quite difficult to develop and manage the concerned water resources facilities in an planned manner: However, the aforementioned preparation and disclosure of the plans have not only promoted the consensus building among various stakeholders including water users and river

administrators but also contributed to the more transparent implementation of the water resources development projects.

3. Organization for implementing water resources development along with the plans ~ Water Resources Development Public Corporation

3.1 Background

WARDEC was established in 1962 in order to implement the water resources development projects on the basis of the Full Plans. At that time, WARDEC was regarded as the special corporation for implementing projects under the supervision of the National Government. The objective of WARDEC was to develop water resources in the 7 designated river systems in an integrated manner with constructing and managing water facilities including multi-purpose dams, barrages, development of lakes and multi-purpose canals. Also, WARDEC activities range widely from securing water for domestic, industrial and agricultural use to controlling floods, and maintaining and improving normal functions of river water (e.g. securing vested water and conserving the river environment).

WARDEC was transformed into Japan Water Agency (JWA), Incorporated Administrative Agency in October 2003. Incorporated Administrative Agencies are established and given objectives and missions by the National Government to carry out “administrative tasks and projects, where implementation should ensure public benefits such as stable public life and social and economic activities”. After this reform was carried out, JWA has not been in charge of the water facility constructions which aim the newly water resources development.

3.2 Frameworks for Project Implementation

3.2.1 Introduction

In order to implement the projects of water facility construction and management, the following 4 factors can be needed.

- Clarified responsibility for projects
- Consensus building among stakeholders
- Adequate funding
- Technical capacity for water facility construction and management

In Japan, responsibilities for project must be decided prior to the project implementation from the viewpoint of the accountability. Also, in order for consensus building among stakeholders, WARDECL provided detailed procedures. Furthermore, some financial frameworks were prepared in order for adequate funding. The first-third items are explained in the below in detail.

The forth item, technical capacity, is of course vital, but not related to frameworks for project implementation directly; thus it is not taken up in this paper.

3.2.2 Responsibilities

WARDEC had implemented projects for water facility construction and management under the supervision of the National Government Ministries, which had had the final responsibilities for project implementation (hereinafter referred to as “Ministry in Charge (MIC)). MIC(s) had been usually decided along with the objective of projects as follows.

- Multi-purpose dam, estuary barrage and Lake Development: MOC
- Water facilities for irrigation water: MAFF
- Water facilities for water for water supply: MHW
- Water facilities for industrial water: MITI

Under the schemes, multiple MICs may be responsible for one project implementation, especially multi-purpose canal systems. For example, 3 organizations, MAFF, MHW and MITI were the MICs in case of multi-purpose canal systems whose objectives were irrigation, water supply and industry.

3.2.3 Project implementation procedure

3.2.3.1 Introduction

In this chapter, implementation procedure for WARDEC project is explained. Firstly, each project must be provided in the Full Plans. In other words, provisions in the Full Plans are the prerequisite for the WARDEC project implementation.

Implementation procedures for WARDEC projects are explained in the below paragraphs, through which the consensus building among stakeholders such as administrative organizations and water users would be confirmed. The procedures for project implementation consist of two steps; (i) **the “project execution principle” was prescribed to WARDEC by MIC(s),** and (ii) **the “project implementation plan” was prepared by WARDEC**.

3.2.3.2 Project execution principle

When starting water resources projects, MIC(s) had to prescribe the “project execution principle” to WARDEC. In this principle, the 3 items had to be mentioned; (i) the outline of the water facility project, (ii) the basic principle of implementation of the project, and (iii) the matters which should be the basic of the implementation. When prescribing the “project execution principle”, MIC(s) had to consult with the minister of other relevant National

Government ministries, and also had to seek the opinion of the prefectural governors concerned with the project (See the Appendix 4).

Meanwhile, the framework of the project execution principle was abandoned when the mentioned transformation from WARDEC to JWA was carried out, 2003.

3.2.3.3 Project implementation plan

After the prescription of the “project execution principle”, WARDEC had to prepare the “project implementation plan”. In this plan, the nine items had to be mentioned; (i) denomination of the project, (ii) objective(s) of the project, (iii) plans related to water storage, discharge, water intake or water conveyance, (iv) venue, (v) benefited areas with regard to the irrigation and drainage projects, (vi) plans for work, (vii) period of project, (viii) cost and the way for cost sharing, and (ix) other important matters.

When preparing the “project implementation plan”, WARDEC had to (i) consult with the prefectural governors concerned with the project, (ii) obtain the approvals of water users concerned with the project, and after that, (iii) obtain the approval of MIC(s) (See the Appendix 4).

3.2.3.4 Advanced informal negotiation

Advanced informal negotiations have been very important with regard to the preparation for the “project execution principle” or the “ project implementation plan”, which is same as the Full Plans. MIC(s) and WARDEC have made efforts to negotiate with stakeholders (local governments or water users) when preparing the “project execution principle” or the “ project implementation plan”.

3.2.4 Funding

3.2.4.1 Composition of the fund

Funding is critical for the project implementation. The followings are the main items compose of the fund for the WARDEC project implementation.

- Government grants
  The government provides grants for controlling floods, preventing high tides or maintaining normal function of the river water from the special account for flood control under the supervision of MOC/MLIT.
- Subsidies

Government Ministries (MAFF, MHW/MHLW, and MITI/METI) grant subsidies to reduce the financial burden of beneficiaries such as land improvement districts, and domestic and industrial water suppliers.

- Charges (Beneficiary shares)
  Beneficiaries make payments during water project construction or make installments after the completion of the facility and also make payments for facilities management.
- Loans (Beneficiary shares)
  WARDEC/JWA receives long-term government loans based on the government financing programs to enable beneficiaries to make installments to pay for construction after the completion of the facilities, and also issues water resources bonds. WARDEC/JWA also lends funds from the private sector to promote project implementation, to pay for the costs of advance land acquisition (from fiscal 1984) and of dam construction (from fiscal 1985).
- Trust Funds and Trust Revenues
  WARDEC/JWA obtains trust funding from respective implementers for construction, surveys, and other projects related to hydropower plants and roads etc.

3.2.4.2 The importance of the loans

Among the items mentioned in the paragraph 3.3.4.1, the long-term government loans based on the government financing programs is the most important from the viewpoint of promotion of the projects.

Under the loan scheme, (i) WARDEC/JWA borrow money from the National Government instead of water users, which is applied to the water facility constructions, and (ii) water users pay the money for WARDEC/JWA by annual installments after the construction project is finished. Thanks to the loan scheme, water users can pay off the loan after the practical benefit is generated; that is, shared cost can be disbursed from the collected water fees paid by the end users such as farmers, inhabitants (the end user of the domestic water) and factories. As a result, water users could participate in the projects easily, which have promoted the water resources development in Japan.

3.3 Lessons learned

WARDEC/JWA is the organizational framework for implementation with well-developed schemes for accountability, consensus building and funding. Thanks to those, WARDEC/JWA have completed 48 water facilities projects in 53 planned ones in the 7 designated river systems since 1962, establishment of WARDEC. The volume of water resources developed in WARDEC/JWA projects based on the Full Plan for each of 7 designated river systems amounted to approximately 335m3/sec, which represents approximately 88% of a total volume of 379m3/sec in all water resources developments, including those implemented by other

organizations than WARDEC/JWA. Of the water resources developed by WARDEC/JWA, municipal water is approximately 321m3/sec (292m3/sec completed) and irrigation water is approximately 70m3/sec., while conveyance of municipal water is approximately 133m3/sec (118m3/sec completed).

4. Summary ~ Conclusions

The significances of the Full Plans can be summarized as follows.

- Water resources development projects became to be implemented on the basis of definite plans, while these projects had been implemented in a discrete manner before the establishment of the framework for the Full Plan.
- The Full Plans are prepared on the basis of river basin text, which cover broad areas across multiple local governments.
- The Prime Minister had taken the responsibilities of the affairs of the Full Plans, which had facilitated the preparation for the Full Plans.
- The framework for the Full Plans has promoted the consensus building among stakeholders, **which has contributed to solving the water allocation issues in the basin text**.
- Due to the framework, projects have been implemented in a more transparent manner.

The significances of WARDEC, the implementation body of the Full Plans, can be summarized as follows.

- Responsible organizations for the project implementation have been explicit, which have contributed to the accountability and transparency.
- The WARDEC's project implementation frameworks have promoted to the consensus building among stakeholders.
- WARDEC has been able to enjoy the funding systems including well-developed government loan or subsidies, which has facilitated the water resources development projects remarkably.

Both of the two frameworks, the Full Plans and WARDEC, had contributed to the water resources development and management in the 7 designated river systems. As a result, the gaps between the water demand and supply has decreased, and at present Japan is escaping from the tight water situations such as those of 1960s-1970s. Moreover, frequency of severe droughts has also decreased. The status of water allocation in Japan has improved remarkably.

5. Current Status

A lot of water infrastructures including multi-purpose dams have been constructed and this development has contributed to the improvement of water allocation in Japan. However, now

we are facing the issue of unstable water supply owing to the recent trend that rainfall has been on the decline by low precipitation in some years.

As long-term trend, temperature has been fluctuating in Japan; the annual average temperature has been raised by approximately 1 degree over the last 100 years. Concerning precipitation, numerous low rainfall years have been recorded since 1970 and precipitation was below average in those years 1973,1978,1984,1994 and 1996, when water shortage has been serious and brought damages. Recently a trend of fluctuation between extremely low rainfall and extremely high rainfall has been observed, and especially the trend of small precipitation in low rainfall year has been remarkable.

In Japan, dams are designed on the storage level of relatively low rainfall year (base year for water use) to meet the water requirement in most cases. When river flow falls below level of the base year for water use and dam capacity remains unchanged, the amount of water that can be obtained throughout the year, even with dam replenishment included, will fall below the level of base year for water use. Due to decline in rainfall in recent years, securing stable water supply throughout the country has been focused. On the other hand, it has been difficult to develop additional water resources with constructing new water infrastructures in Japan. As reasons of that, decrease of suitable dam sites, rise of oppositions to dam constructions from the viewpoint of environmental conservation and tight financial conditions in public sectors can be listed. Therefore, we have to consider how to manage water resources efficiently under such a condition in the future.

6. Remarks

The views expressed in this paper don’t reflect the official views of any government organization including the Ministry of Land, Infrastructure and Transport (MLIT), or Japan Water Agency (JWA).

Foot Note

1. In general, the Basic Water Resources Development Plan is called the “Full Plan” in Japan.
2. In 2001, Japanese National Government carried out the National sector reform. Due to that, the names of water-related organizations have been changed. The details are as follows.

Mandate	Before the sector reform	After the sector reform
The Full Plans	Prime minister	Ministry of Land, Infrastructure and Transport
Coordination related to water resources policy	National Land Agency	Ministry of Land, Infrastructure and Transport
River administration (including flood control)	Ministry of Construction	Ministry of Land, Infrastructure and Transport
Irrigation Water	Ministry of Agriculture, Fishery and Forest	Ministry of Agriculture, Fishery and Forest
Domestic Water	Ministry of Health and Welfare	Ministry of Health, Labor and Welfare
Industrial Water	Ministry of International Trade and Industry	Ministry of Economy, Trade and Industry
Hydropower Generation	Ministry of International Trade and Industry	Ministry of Economy, Trade and Industry

3. In 2003, large-scale public corporation reform was carried out. Due to that, Water Resources Development Public Corporation (WARDEC) was transformed into Japan Water Agency (JWA), Incorporated Administrative Agency. In this transformation, it was decided that JWA would not be in charge of new water resources development. In other words, JWA is supposed to be mainly in charge of water resources management.
4. The Water Resources Development Council was transformed into the Water Resources Sectional Committee of the National Land Development Council in 2001.

References

1. Sabro Yamamoto (1993). Historical Study on Modern River Works until Overall Revision of the River Law

Appendix 1

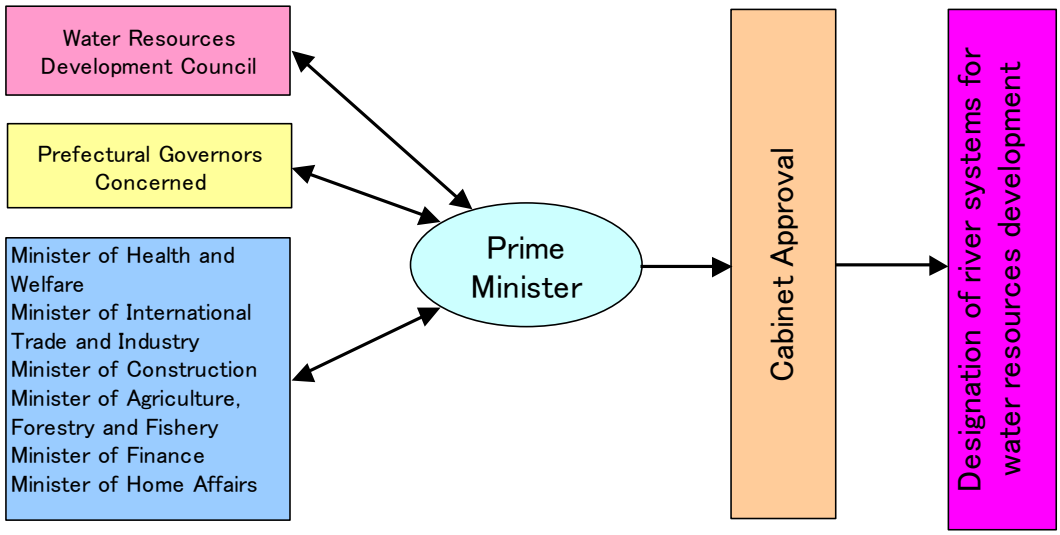
Water-related frameworks

- Land Improvement Law (1947)
  Food security related to considerable increase of population
- Electric Power Development Promotion Law (1952)
  Promotion of electric power development including hydropower generation
- Waterworks Law (1957)
  Countermeasure for the increase of domestic water use
- Industrial Water Supply Business Law (1958)
  Countermeasure for the increase of industrial water use
- Multiple-purpose Land-development Law (1950)
  Promotion of nationwide land development
- Aichi Irrigation Public Corporation Law (1955)
  Regional comprehensive development mainly in the Chita Peninsula area
- Specified Multipurpose Dam Law (1957)
  Countermeasure for the new water demand including municipal water use and flood control
- Water Resources Development Promotion Law (1962)
- Water Resources Development Public Corporation Law (1962)

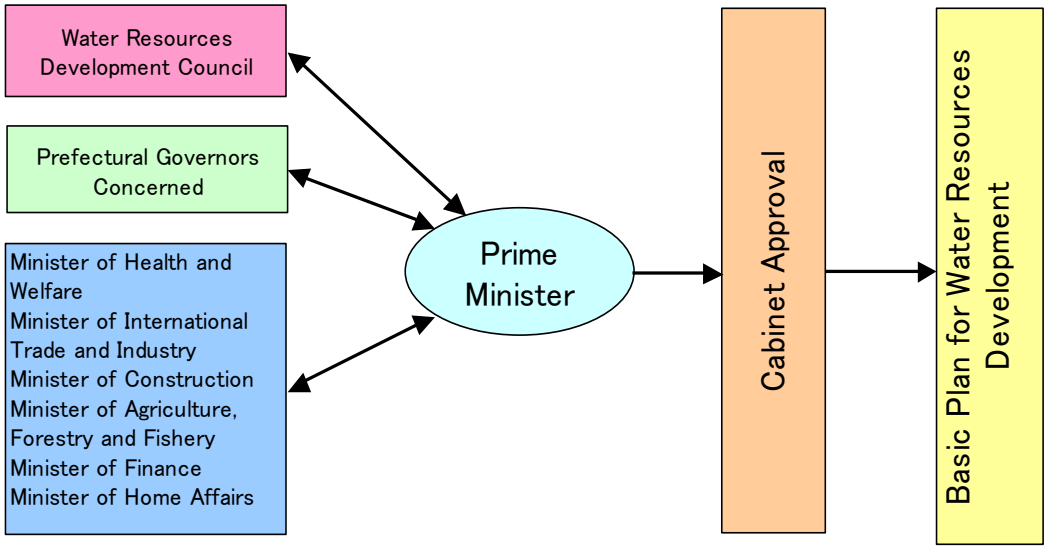
Appendix 3

Procedural Flows (I)

Procedural Flow of Designation of River Systems for Water Resouces Development



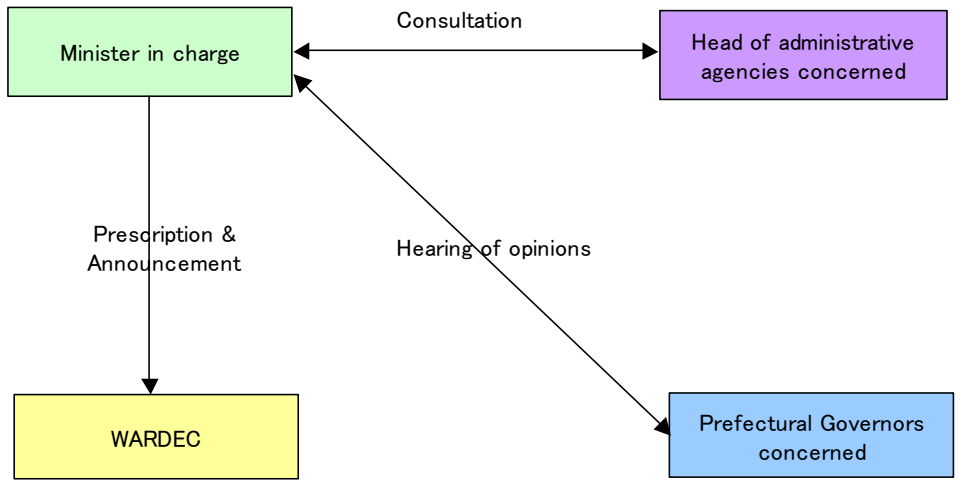
Procedural Flow of Preparation for The Basic Plan for Water Resources Development



Appendix 4

Procedural Flows (II)

Procedural Flow of Prescription of The Project Execution Principle



Procedural Flow of Prescription of The Project Implementation Plan