INTEGRATED WATER RESOURCES MANAGEMENT IN CITARUM RIVER BASIN - INDONESIA

Presented by

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1. Introduction

Water resources management for the Citarum River Basin can not be seen separately from land-use and the use of water associated to this land-use. It operates on the interaction between users (population) and resources, users and institutions and resources and institutions.

Integrated water resources management thus applied considers the use of resources in relation to social and economic activities and functions, and the water infrastructure needed. Activities and functions are also considered when laws and regulations for the sustainable use for water resources are set between institutions and users. The infrastructures made available, in relation to regulatory measures and mechanism, will allow for effective use of the resource, taking due account of the environment carrying capacity.

After the Proclamation of Independence (1945) the Government of the Republic of Indonesia extended the program of self-supporting national staple food of rice and poverty alleviation. Indonesian archipelago is located in tropic zone with two seasons every year that are rainy or wet season (October to March) and dry season (April to September).

In that moment the population of the Country is about 60 million and more then half of them are living in Java Island. Java is very fertile island with many active volcanoes. Average annual precipitation depth is 3,000 mm normally 70% falls during wet season and 30% falls during dry season. Relative humidity is about 80% and the daily temperature is 25^{o}C in the low land and 18^{o}C in the mountainous area.

Large-scale water resources development had been done in the North plain of West Java Province during the Dutch Colonial. One of them is Walahar Irrigation System (built in 1925) for 80,000 ha of paddy field by constructing gated weir across Citarum River in Karawang District about 60 km from its estuary. The other one is Salamdarma Irrigation System (1930) for 37,000 ha of paddy field by constructing weir across Cipunegara River in Subang District about 40 km from its estuary. The systems separate each other and rely on run-off water in the rivers that is why the cropping intensity is only achieved up to

130%. It is mean that not all area in the systems could be irrigated during dry season and often happen the farmers fighting each other for water.

In 1956 Ir. H. Djuanda, the Late Prime Minister of Indonesia declared the commencement of Jatiluhur Multipurpose Project. The main aim of the project is to enhance the rice production to achieved self-supporting national staple food. The project comprised with two major activities. The first one is to construct rock-fill type dam across Citarum River and reservoir behind the dam with impounding capacity of 3.0 billion m^3, besides hydroelectric power plant with the install capacity of 150 MW as well. The second is to develop technically irrigation system over the area of 240,000 ha of paddy field in the north plain of West Java Province connected to Walahar and Salamdarma irrigation systems for two crops per year as an integrated technically irrigation area. The project has been finished in 1967, since then the dam, the reservoir and the power plant were named Ir. H. Djuanda dedicated to the Prime Minister who declared the commencement of the project while the irrigation system were named Jatiluhur Irrigation System.

2. The Citarum River

Citarum River Basin located in tropic area of West Java Province, Java Island of Indonesia Archipelagos. There are two seasons every year, Wet Season or Rainy Season mostly from October to March and Dry Season from April to September. Annual precipitation depth of 3,000 mm in the mountainous area and 2,500 in the lowland, normally 70% falls during rainy season and 30% during dry season. Relative humidity of 80% and daily temperature of 25^0 C in the law land and of 18^0 C in the mountainous area.

There are 9 (nine) rivers traversing the area from mountainous range in the South to the North and terminated to Java Sea. Citarum River is the biggest one as the main source of water. The water flows from its spring in Wayang Mountain (El. 2,200 m) down to Java Sea about 300 km length. At the elevation of El. 26.50 m, about 80 km from its estuary Citarum is connected with 4 (four) rivers to the West and 4 (four) other rivers to the East by man-made canals named West Tarum Canal (WTC) and East Tarum Canal (ETC) respectively and formed a unit hydrological boundary of Citarum Integrated River Basin.

Average annual flow of water in the basin is 12.95 billion m^3 and by exploiting the existing water resources infrastructures the water that could be regulated is about 7.65 billion m^3 annually. Up to present potential of water is still enough to cope with the demands in the basin. However, according to study (BCEOM-1990) others measures should be taken into consideration to full fill the demand beyond 2025.

The basin covered 9 (nine) District administration and 3 (three) Municipalities of West Java and Jakarta Provinces. Most of the source of water initiated from West Java Province and utilized for irrigation, domestics, municipalities and industries in West Java Provincial area. Besides, its also supply water for Jakarta Special District of Capital City, means served across provincial administrative boundary. The basin is considered strategic at national level for which its managed by The Central Government.

3. Development of The Citarum River

Based on the study paper written by Prof. Dr. Ir. W.J. van Blommestein, presented in Paris Seminar (1948) with the title "Integrated Water Resources Development in the Western Part of Java Island (514.000 ha of paddy field). Reviewed by Ir. Van Schravendijk in 1956 in the form of "Integrated water Resources Development in Citarum River Basin " (240,000 ha of paddy field).

Citarum integrated river basin located in the north plain of West Java Province, Java Island of Indonesian archipelagoes, covering area of about 12,000 km^2. Its consist of 12 rivers traversing the area from south to north terminating to Java Sea, namely : Bekasi, Cikarang, Cilemahabang, Cibeet, Citarum, Ciherang, Cilamaya, Cijengkol, Ciasem, Cigadung, Cipunegara and Cipancuh rivers successively. The mean of total annual flow of water in the basin about 12.95 billion m^3 out of which about 7.65 billion m^3 have been regulated, employing dams, barrages, canals and the appurtenance structures while the rest of 5.30 million m3 is still wasted to the sea.

Current water use both for irrigation and for domestic, municipal and industrial uses (DMI), and the main water storage and water transfer routes are indicated. The water demand in the downstream area of the SWS is already influenced by the inter-basin transfer to the neighboring Jakarta – Bogor – Tangerang – Bekasi region.

Water supply in the Citarum basin will be increasing determinate by the strongly growing water demand in the neighboring Jabotabek regional. The water supply for Jabotabek will be provide by a number of basin located to the East and West, with the Citarum system ad the main supply source.

4. Task of Jasa Tirta II Public Corporation

To manage output of the development, the government established a Public Corporation in 1970 named "Jatiluhur Authority" Public Corporation. Since 1999, it was changed to "Jasa Tirta II" Public Corporation to recognize the entity with the core of business in water. The dam has been achieving valuable benefits that became commitment to prevent the existence. Further development in Citarum River, upstream Ir. H. Djuanda Dam were the

construction of Saguling (1984) and Cirata dams (1988). The purpose of the dams is mainly for generating hydropower electricity with the installed capacity in Saguling and Cirata are 700 MW and 1008 MW respectively. The dams and the power stations were constructed and being operated by the National State Electric Company.

In line with the Government Regulation of the Republic Indonesia No. 94 year 1999 dated October 1999 and the Decree of Minister of Resettlement & Regional Infrastructures No. 18/KPTS/M/2000 dated 15 December 2000, about the guidelines of operational activities of Jasa Tirta II Public Corporation, the tasks are as follow :

a. To exploit and maintain the water resources infrastructures and hydro-electric power generation.
b. To manage water, water resources and hydro-electric power
c. To manage the watershed, such as: control, develop, and utilize water resources in Citarum River Basin
d. To rehabilitate the water resources infrastructures and hydro-electric power plant as well.

Jasa Tirta II Public Corporation Vision is to realize a well known and high quality company in water management and water resources for wide service in water supply to the various requirement and contributions to national food sufficiency. Mission to realize the Corporation Vision, the company has Missions as follows (1) Raw water supply for drinking water, electric generation, agriculture, industry, harbor, flushing and other need (2) Electric power generation and supply the electric power (3) To develop Tourism and land use, (4) To maintain the food sufficiency by mean supplying of agriculture water and flood control with effort of preservation environment protection by mean information, recommendation and guidance (5) To maximize the profit and to foster the benefit based on business principle in assuring government asset continuance and service continuity to public.

In general, water is a natural resource needed by all creatures in the globe and no other substance substitute. Comprehensive water resources management in Citarum river basin includes:

1. Catchments area (watershed) management,
2. Water quantity management,
3. Water quality management,
4. River environment management,
5. Flood and drought management,
6. Water resources infrastructures management and supported by research and development.

The characteristic of water among other, there are relations between up-stream and down-stream area, quality and quantity, in-stream and off-stream, at-present and in-future, part of hydrological cycle. Therefore the water resources management should be performed comprehensively in a holistic approach considering to ***one river, one integrated plan and one coordinated management.***

5. Water Management System

Citarum river is biggest one connected with four rivers to the West namely Cibeet, Cikarang, Bekasi and Ciliwung and four rivers to the East namely Ciherang, Cilamaya,Ciasem and Cipunegara by man made canals namely West Tarum Canal and East Tarum Canal respectively formed a unit by hydrological boundary of Citarum integrated basin of 12.000 km2.

Three big reservoirs, in the upstream, Saguling, Cirata and Djuanda Reservoir regulates river run off and releases stable water flows to the curug barrage and diverted to the west Tarum Canal and east tarum canal by gravitation to the north.

As mention before, the main aim of the Jatiluhur Multipurpose Project is to enhance the national staple food of rice through river water utilization in optimal way for certain irrigation area, especially during dry season. Before the project there were run off irrigation systems, in small, medium and large scale, supplied from local rivers traversing the area. During dry season normally the cropping intensity very low, due to low flow in the rivers and only a part of the systems could be irrigated.

After the construction of Djuanda Dam and reservoir the systems were integrated and become Jatiluhur Irrigation System. The water released from Djuanda Reservoir through turbines to generate electric power, besides through other means named hollow-jet valves and then flows to Citarum down-stream. About 8 (eight) km from the tail race, the water were diverted to the West and to the East and discharged into West Tarum Main Canal and East Tarum Main Canal respectively. Citarum through operation of Djuanda Reservoir became the water main source especially during dry season. In principle during wet season, 70% water requirement could be supplied by local resources and 30% from Djuanda Reservoir, while during the dry season, it only 30% of the requirement could be provided by local resources and the rest of 70% are supplied from the reservoir.

Citarum Water System of 240,000 Ha were divided into 3 (three) service area namely West Irrigation System (57.000 ha), North Irrigation System (81.000 ha) and East Irrigation System (102.000 ha).

Based on the law No. 7 on year 2004 concerning Water Resources and utilization are as follows : first is for domestics and municipalities, second is for agricultures including fisheries and animal, third is for industries, and the latter is for power generation. In order to be distributed equally to beneficiaries the Government established Water Resources Management Committee in the provincial level and Water Resources Management Implementation Committee in the basin level. The members of the committee are the representatives of the government institutions, private sectors, Non Government Organizations, universities, professionals, and representatives of farmer associations. In fact the members of the committee are representing of water regulators, basin operators and water users all together are the stakeholder.

Irrigation is the biggest demand of water it is about 90% of the total demand for two crops per year. The first crop is commenced in the first of October or in the beginning of rainy season and the second crop is commenced in the first of April. For which the Committee extend the meeting at least twice a year, once every August for preparing annual water supply program considering the availability of water in the reservoirs and prospective weather in coming year, secondly every April for evaluation of the implementation program and/or analysis of the continuation of the program or preparing the program modification if necessary.

According to the Note for Jatiluhur (Ir. H. Djuanda) Reservoir Operation (Angoedi, 1960) total water demand in the downstream of the reservoir will be supplied during wet season 70% from local resources and 30% from the reservoir, and conversely, during dry season 30% from local resources and 70% from the reservoir. The committee is also prepares integrated reservoirs operation rule curve based on the equal sharing of the three reservoirs in term of water level and hydro electric power production.

6. Coordination

PJT II as a state-owned company is mandated to manage the Citarum river basin. Its jurisdiction covers the whole project area from the watershed of the Citarum river down to the estuary including the main canals.

The Public Work Department of Republic Indonesia and West Java Governor and has the authority to approve public to use water in the project area. PJT II is responsible for examining new applications to use water, especially concerning the effects on water availability trough demand and supply balance simulation, and to submits recommendations to Governor.

The annual allocation of water in the main river and canals is subject to the results of coordination by River Basin Water management executive committee (PPTPA). The

Governor decides the annual allocations to various users in his decree, based on PPTPA recommendations. The first priority is for drinking water, the second to cultivation, the third to industry and the last to hydropower.

Coordination among stakeholders in Citarum river basin is to coordinate water administrator, users and other stakeholders. PJT II in managing the citarum shall be coordinate with :

a. Water resources council for national (Dewan Sumber Daya Air)
b. Provincial basin water management committee for provincial and district levels (PTPA)
c. River basin water management executive committee for river basin level (PPTPA)

The evaluation of water allocation in Jasa Tirta II Public Corporation working area, executed:

1. Every month : Coordination of water management secretariat of Citarum (SPKTPAC).
2. The meeting will arrange the Citarum cascade water system of Saguling, Cirata and Jatiluhur reservoirs to evaluate last and next month of climate. The members of team : PJT II, Meteorological and Geophysical Agency (BMG), State Electric Company (PT. PLN, PJB), Water Resources Management Service (Dinas PSDA), Public Works Department, Other stakeholders
3. Every 2 weeks : Team for Evaluation of Water and Water resources Management (TEPASA) will arrange the water sup ply and demand planning in PJT II working area, and the meeting will present by related bureau, divisions and units. The members of the secretariat are the representatives of all agencies concern with citarum river. The secretariat prepares integrated reservoir rule curve for operation of the three reservoir in citarum based on downstream water demand and considering the prospective inflow of water in Citarum.
4. The rule curve mentioned above is also prepared based on equal-sharing principle from those three reservoir.

7. Conclusion

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