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1.Latest Information

1) NARBO secretariat attended prep meeting for 2nd Southeast Asia Water Forum

NARBO secretariat attended the prep meeting for 2nd Southeast Asia Water Forum in Jakarta, Indonesia on Jan. 24th 2005. The program of a conference for the 2nd Southeast Asia Water Forum that will be held in August 2005 was discussed in the meeting. NARBO expressed that Indonesian NARBO join the Session about ”Developing Capacity in River Basin Organizations”, included in the main theme ”Managing Resources in River Basins”, as Leading Convener in the Forum.

2.Serial Topics

1)WATER QUALITY LABORATORIES OF JASA TIRTA I PUBLIC CORPORATION OBTAINED ITS CERTIFICATION OF SNI-19-17025-2000 (ISO/IEC 17025)

Introduction

Industrial development and population growth in East Java – Indonesia have had positive impact on the economy of the region. However, this has inevitably placed increased pressures on the water resources of the Brantas Basin, both in terms of quantity and quality.

Jasa Tirta I Public Corporation has a mission to enable sufficient water in term of both quantity and quality to be available to support the livelihood of the people in the area. Jasa Tirta I Public Corporation is playing an active role in water pollution control within the framework of “Clean River Program” managed by East Java Provincial Government.

The main problems facing in water quality management at present can be summarized as follows:

- Increasing of pollution following by water quality degradation due to the growth of population and economic development. The main sources of pollution are industries, domestic and agriculture.
- Less of environmental awareness by industries, domestic and agricultural people, such as waste water treatment plant in industries which still do not function properly, disposing of waste water and garbage directly to river by people live near riverbanks, and excessive consumption of fertilizer and pesticide by farmers.
- Ineffective institutional arrangement for water quality management due to inapropriate coordination between concerned agencies and lack of funding.
- Incomplete regulations and ineffective of law enforcement.

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Since 1999, the Government of Indonesia in cooperation with Indonesian Institute of Science has developed Brantas River Water Quality and Pollution Management Project by installing 23 on-line water quality monitoring stations along the Brantas River. The criteria for selection of sites have been selected considering the reduction of pollution load,

improvement of water quality and using the on-line data for river basin management. Ideal locations for the stations will be close to point source (with the intention of controlling emissions), metropolitan areas (public health priority) and drinking water intake points (safe water for human consumption).

The continuous analysis of the quality of the river water is carried out through the on-line quality-monitoring stations. The parameters that continuously analyzed and recorded are as follows: temperature, pH, conductivity, turbidity, dissolved oxygen and the nutrient (ammonia and orthophosphate). The other facilities supporting the water quality monitoring are the new laboratory constructed in Malang and upgrading the existing laboratory in Lengkong - Mojokerto.

Water Quality Laboratories of Jasa Tirta I Public Corporation

Water Quality Laboratories of Jasa Tirta I Public Corporation are located in Malang City (Upper Part of Brantas Basin) and Mojokerto (Lower Part of Brantas Basin). The laboratory establishment is aimed at increasing the accuracy of analysis results by minimizing the sample delivery time, and the other hand is providing the industries with water quality analysis services.

The service area of the laboratories are summarized as follows:

- Sampling of river water, wastewater, and reservoir water at various depths
- Sampling of microbiology test
- Analyzing of more than 110 parameters that could be classified as follows:
  - a. Organic parameters : pesticide of organo chlorine, benzene, toluene, xylene, aliphatic hydrocarbon, polynuclear hydrocarbon, oil, fat, detergent, etc.
  - b. Inorganic parameters : kation (ion Ca, Mg, Na, K), anion (ion Cl, NO_3, F, SO_4) and NO_2
  - c. Metal parameters : Hg, Ag, Pb, Cu, Zn, Cd, Cr, Mn, Ca, Sb, Al, Ba, Bi, Co, Mg, Se, Si, Ni, Ti, V, As, Au, Fe, K, La, Li, Mo and Na.
  - d. Wet chemistry parameters : pH, COD, NO3, DO, PV, KMnO4, Boron, TDS, TSS, FSS, VSS, Alkalinity, Asidity, PO4, Phenol, Sulfide, etc.
  - e. Biological parameters : BOD, total coli, total feces coli, other bacterium

The laboratories are equipped with the supporting instruments like Gas Chromatography (GC-17A), High Pressure Liquid Chromatography (HPLC), Total Organic Carbon (TOC 5000 A), Fourier Transform Infrared Spectrophotometer (FTIR – 8300), Atomic Absorption Spectrophotometer (AAS/AA – 6800), Ion Chromatography (DX – 120 IC), UV – Visible Spectrophotometer (UV-Vis 1601) and water sampling equipment.

Certification of SNI-19-17025-2000 (ISO/IEC 17025)

The consideration of Jasa Tirta I Public Corporation to implement quality system of SNI 19-17025-2000 is to anticipate the stakeholders' requests and management necessity toward augmentation of the service and to create water quality analysis and monitoring system that fulfilled the International standards that finally would yield precise water quality data, efficient, effective and consistent monitoring system in order to improve the best performance of the Corporation.

Based on the assessment result that carried out by National Accreditation Committee (this committee has been acknowledged by Asia Pacific Laboratory Accreditation Cooperation (APLAC) and International Laboratory Accreditation Cooperation (ILAC) for test laboratory accreditation system) on May 17-19, 2004, the Water Quality Laboratories of Jasa Tirta I Public Corporation have fulfilled the conditions as test laboratory and have the rights to obtain its Certification of SNI 19-17025-2000.

After obtaining the certification, in the future, Jasa Tirta I Public Corporation would have many challenges, not only due to increased requests to the fulfillment of good water quality but also needs of prompt and accurate data and information on water quality management in the Brantas River basin.

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2)FLOOD OCCURRED IN THE TRIBUTARIES OF BRANTAS RIVER

Introduction

The Brantas River basin, one of the largest river systems in Indonesia, is located in the eastern part of the Java Island, Indonesia, between $110^0$30’ and $112^0$55’ East Longitude and $7^0$01’ and $8^0$15’ South Latitude. It covers catchment area of 11,800 km^2 in total and its main stream, the Brantas River, runs about 320 km long. This basin is located within the Inter-tropical Convergence Zone, in which the semiannual reversal of prevailing winds results in distinct wet (November-April) and dry (May-October) seasons. During the wet season there are around 25 rainy days per month, compared to seven or fewer during the dry season. Annual precipitation is around 2,000 mm on average, with roughly 80% occurring in the wet season.

The Brantas River itself originates in Mt. Anjasmoro, located northwest of Malang City and takes its way around the alluvial cone of extinct volcanoes such as Mt. Kawi, Mt. Butak etc. Gathering together many tributaries above the delta include the Lesti (Southeast), Ngrowo (Southwest), Konto (Central) and Widas (Northwest) Rivers along its traveling. At the confluence with the Ngrowo River in the Southwestern portion of the basin, the Brantas turns north through the agriculturally productive plains region and finally east through the delta, also an important paddy growing area. Then, it finally bifurcates at Mojokerto City to Porong River and Surabaya River, both of which pour into the Madura Strait.

Flood in the Tributary of Brantas River Basin in December 2004

Due to heavy rains in the Brantas River basin on December 3-4, 2004, the tributaries capacity could not retain the rain water, then flood occurred in some areas in the middle reach of the basin at that time. Those areas are located in Blitar, Kediri, Tulungagung Regencies. The discharge has caused the riverbanks collapsed in some points and inundation occurred and caused damages of housing, bridges and paddy fields. Map of flood locations and the damages could be seen in the Figure 1.

The recorded rainfall data within 24 hours at some stations in December 3, 2004 showed very high magnitudes such as recorded at Tunggorono (441 mm), Wlingi (366 mm), Sumberagung (244 mm), Semen (217 mm), Doko (277 mm), Wates Wlingi (267 mm) and Birowo (371 mm). The recorded discharges at some points also showed very high magnitudes as recorded at Lengkong Barrage (950 m^3/sec) and Porong River (1,194 m^3/sec). These magnitudes are considered high compared to the 50 year-flood discharge that is only 900 m^3/sec.

Today, flood hazard is occurring even the first Brantas River Basin Master Plan (1961) has mitigate this threat from the dense-populated basin. This hazard occurs back due to watershed degradation, slack urban drainage facilities, as well as heavy sedimentation in the major multi-purpose dams that has the responsibility to control flood during wet seasons.

Jasa Tirta I Public Corporation as the Brantas River Basin Management Agency is facing a great challenge to cope with the flood hazard in the basin.

Figure 1. Map of Flood Locations and the Damages

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3)CASCADE- BASED WATER MANAGEMENT IN SRI LANKA.

M.U.A Tennakoon, PhD, DSc.

In a river basin hierarchy, cascade or micro-basin remains an integral as well as a vital component. Several cascades together form a **sub-water basin** and several of them form a **river basin**. Cascades are very distinct natural landform features in a rolling landscape. **(Fig.1)**

On a rolling land, keels occupy the cascades and the crests are the boundaries of the cascades **(Fig.1)**.

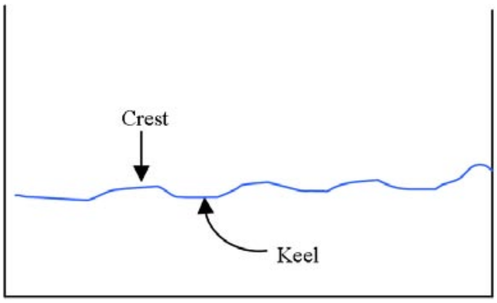


Fig. 1 - Rolling Land with Moderate Keels and Crests

Thus a cascade has two water divides or the crests of the two ridges on either side of that cascading valley. In addition, to these either side boundaries, the other boundaries consists of : **a)** the upper most point of area from where the main steam of the cascade (micro-valley) begins and **b)** downstream of such a cascade which ends at a large reservoir or a large stream into which the main stream of the cascade falls **(Fig. 2)**.

Water in a Cascade

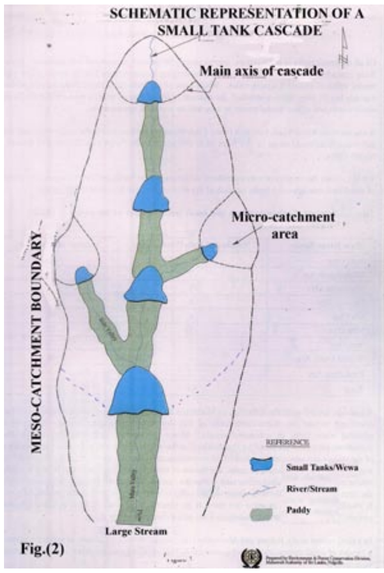
Notably in a cascade of highly seasonal and low rainfall, rain water has to be collected and preserved for successful crop irrigation. The devise adopted is, construction of small reservoirs (tanks) by throwing earth bunds across the main stream of a cascade as well as across the tributaries of that main (axis) stream **(Fig. 2)**. The shapes of these (reservoirs) tanks vary in accordance with the relief of land around them but generally the size increases from the top end reservoir to that of the downstream end reservoir.

Catchments of Reservoirs

Catchment extents vary from top end tank constructed on the "**main**" axis of a cascade **(Fig.2)** to the most downstream tank of a cascade.

A reservoir (tank) immediately downstream of a most top-end tank will have: **a)** the micro catchments of the top-end reservoir; **b)** area occupied by the reservoir itself; and **c)** the second reservoir's direct and independent catchment itself.

As one goes down the "**main axis of a cascade**" to the last reservoir at the bottom, he would see, that, reservoir's catchment includes: **a)** the catchments of all tanks upstream of it ; **b)** all the upstream tank surfaces; and **c)** the last reservoir's own catchment in addition to **a) and b) above**. It is a very systematic net-work of reservoirs designed, constructed and maintained to make maximum possible use of rainfall received in the entire cascade over the past 2,500 years in Sri Lanka.



After Panabokke 2000

Net work's Benefits

Several benefits are derived from a reservoir (tank). These include:
i) retention of possible quantities of rain water spread throughout a cascade facilitating irrigation of command areas under each reservoir, facilitating an effective land-use system; **ii)** Upstream reservoir regulating water flows not allowing very lean or excessive flows towards those reservoirs in the lower part of a cascade; **iii)** ability to provide any irrigation short-falls in downstream reservoirs, if there are surplus water storages in upstream reservoirs after irrigating crops in their command areas ; **iv)** the reservoir networks ability to hold water in different reservoirs preventing excessive volumes of water straining a single reservoir and causing bund-breaching and damaging floods; **v)** a spread of reservoirs in a cascade improves the micro-climate and ground water levels in their vicinities, which, at least in limited ways can be tapped by digging wells for human uses and for some crop and plant irrigation; and **vi)** the reservoirs remaining as water holes through out the year to quench the thirst of all living beings !

Tennakoon (2002) among others, has identified as many as 26 such benefits of the small tank cascade system in the Dry Zone of Sri Lanka from which the most important ones are reproduced above.

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Regaining Cascade-based Development Concept

Cascade-based agricultural and social development which prevailed over 2,500 years remained forgotten over the past 200 years under the foreign rule in Sri Lanka. During this period, development focus was on plantation crops mainly tea, rubber and coconut in the wet zone parts of the country. However, from about the early twentieth century and notably towards the latter part of the first 50 years of the last century, dry zone irrigation development has drawn increasing attention of the British Administration. The focus was on renovation and rehabilitation of once abandoned large irrigation schemes.

Cascade-based development was never in sight at that time through some efforts were made to develop dry zone small scale reservoirs in isolation. During the last three decades of the twentieth century many scholars have shown an increasing interest in cascade-based development. The interest is ever increasing.

The Mahaweli Authority of Sri Lanka (MASL) having recognized the importance of these studies, in collaboration with **IWMI**, has supported the conduct of many studies on the importance of cascade-based development. The MASL which is increasingly moving towards an integrated river basin development approach being an active member of **NARBO** is in the process of incorporating all cascades in the Mahaweli River Basin in its development efforts. It has the ability to be a fore runner in cascade-based water management in development.

4)Flood Control by Dam and the Effect

1. About Flood Control by Dam

Basic concept of flood control is illustrated on Fig. 1. In the figure, a dam is expressed as a drum, inflow into the dam is expressed as water from a bucket and sprinkling can, flood control capacity of the dam is expressed as the size of a pipe on the drum, and an outflow discharge is expressed as an amount of water from the pipe on the drum.

If the amount of water poring into the drum is 100 and the amount of water running out of the drum is 20, the difference, 80, is compounded in the dam. It is what we call “flood control by dam”.

However, when the drum is filled up completely, it cannot be impounded any more. Then, the same amount of water as that of water poured into the dam has to be discharged from the pipe. In fact, there is a limit of flood control by dam.

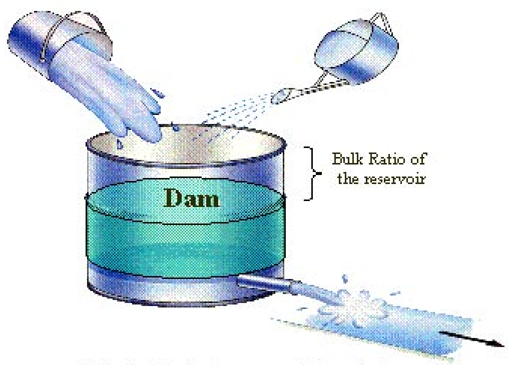

Fig.1 Basic Concept of Flood Control

2.The flood control by Hiyoshi dam

Next, let us explain about the flood control by Hiyoshi dam (Hiyoshi-cho, Kyoto), managed by Japan Water Agency, as a specific case of flood control. At the time indicated in figure 2, a flood control was conducted as the amount of river water and inflow into the dam had been increasing with heavy rainfall caused by typhoon No.11.

Please perceive the inflow in fig. 2 as the amount of water pouring into the drum, and the outflow discharge as the amount of water running out of the drum. The maximum inflow became around 189m^3/s as the rainfall has been increasing in addition the time has been going by. By contrast, the outflow from the dam, the amount of water out of the drum, increased to 91m^3/s by degree. After the rain stopped, the inflow and outflow became smaller by degree. The value found by subtracting the outflow from the inflow indicates the amount of water stored by the dam. Thus, it can be con-

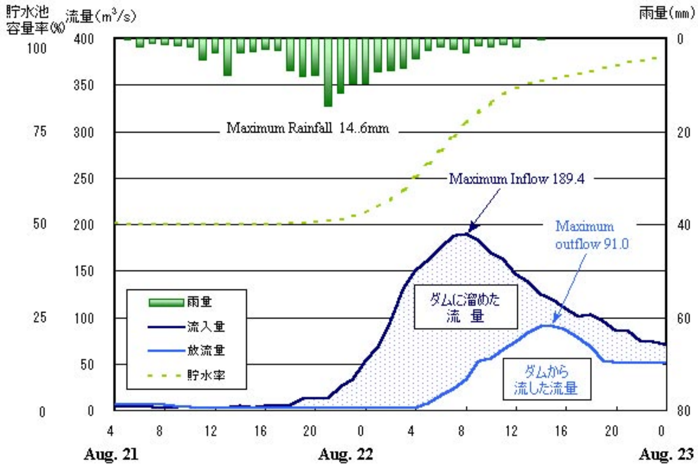

Fig.2 Flood Control at Hiyoshi Dam (Oct. 21-23, 2003)

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sidered that the dam conducted flood control. In terms of the bulk ratio of the reservoir (See Fig. 1), in other words the amount of water in the drum/ the cubic capacity of the drum, it became around 50%.

As the result of the flood control at Hiyoshi dam, the river stage was 66 cm lowered in Kameoka-city Kyoto, located in the downstream far away from the dam, than the assumed river stage without the flood control. Thus, the flood control contributes to a security in the basin. (See Fig.3)

3.Flood Control at Dam and Effect of Flood Damage Reduction

In Fig.4, the sum of the maximum inflow and outflow of the all dams in Japan from 1987 to 1999 are represented respectively by bar charts. Although it is ideal to count the amount of each dam individually, the chart indicates the difference of total inflow and outflow of all dams for the meantime. For example, in 1993, the amount of inflow is 116704m^3/s (37791+78913), and that of outflow is 78913m^3/s . That is, 37791m^3/s was reserved in the dams to control floods. The sequential line graph in Fig.4 indicates the sum of damage reduction that means how much economical damage was reduced in the basin. If the sums of damage reduction from 1987 to 1999 are added, it will be 3,600,000,000,000 yen. Moreover, if this trial calculation is applied in next 100 years, the sum will be about 27 trillion yen. Roughly speaking, this means that the damage of about 300,000,000,000 yen annually will be reduced.

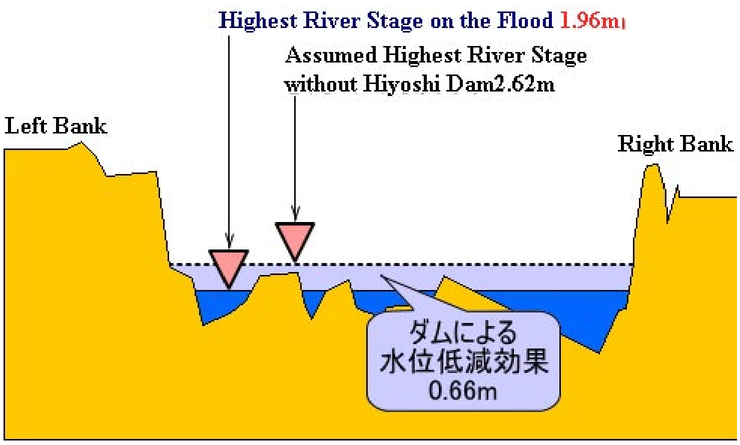

Fig.3 Effect of Flood Control by Hiyoshi Dam

Of course, there is a difference of the amount from year to year, but reducing the flood damage by dam has a great benefit for economical effect. Since the sum of economical damage reduction, or sum of flood damage reduction, is abstract and invisible, it might be difficult to understand.

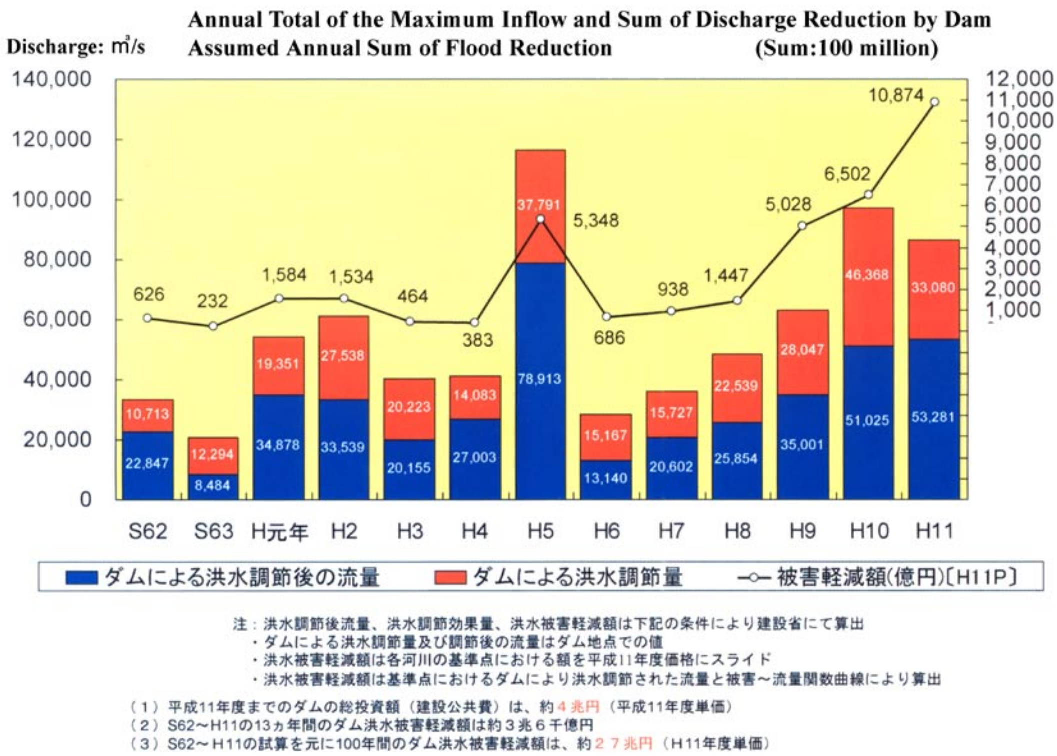

Fig.4 Past Record of Flood Control by Dam
and Envisioned Sum of Flood Damage Reduction