No. 6

THE BASIC DESIGN REPORT
ON
THE ESTABLISHMENT PROJECT FOR WATER SUPPLY FACILITIES
IN
THE PEOPLE'S REPUBLIC OF BANGLADESH

(Narayanganj Town)

DECEMBER, 1984

Japan International Cooperation Agency

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P R E F A C E

In response to the request of the Government of the People's Republic of Bangladesh, the Government of Japan decided to conduct Basic Design Study on the Establishment Project for Water Supply Facilities and entrusted the study to the Japan International Cooperation Agency (JICA). The JICA sent to Bangladesh a study team headed by Mr. Yutaka Hosono, Deputy Director of Grant Aid Dept., JICA, from March 31st to June 13th, 1984.

The team had discussions with the officials concerned of the Government of Bangladesh and conducted a field survey in Narayanganj, Narsingdi, Jenidah, Chuadanga, Gaibandha, Kurigram, Feni and Sunamganj.

After the team returned to Japan, further studies were made and the present report has been prepared.

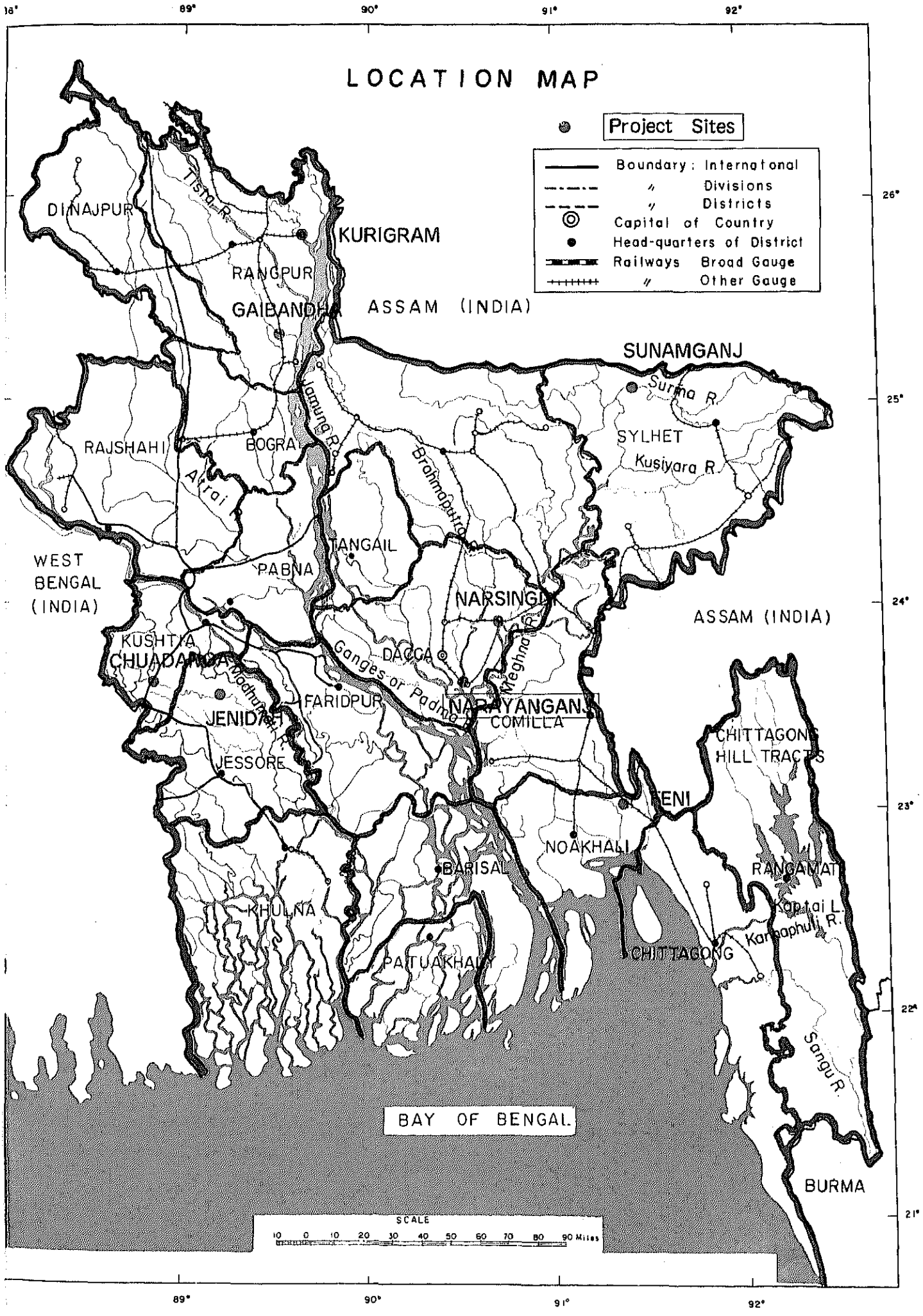
I hope that his report will serve for the development of Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the People's Republic of Bangladesh for their close cooperation extended to the team.

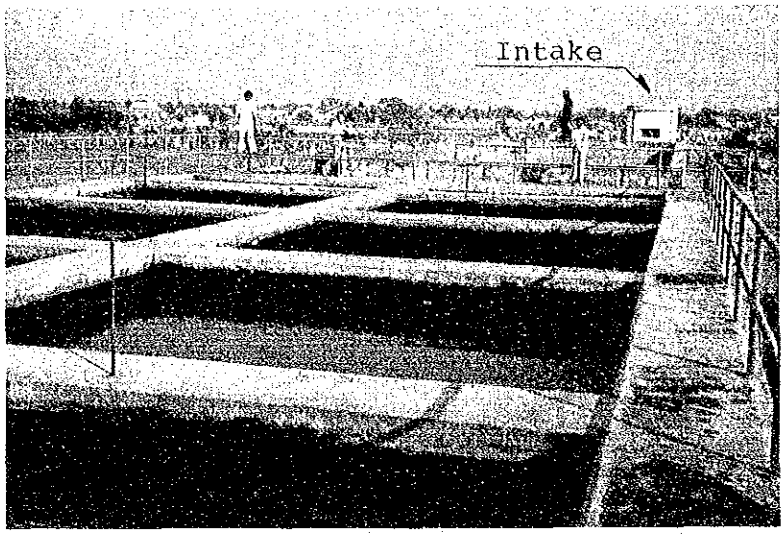
December, 1984

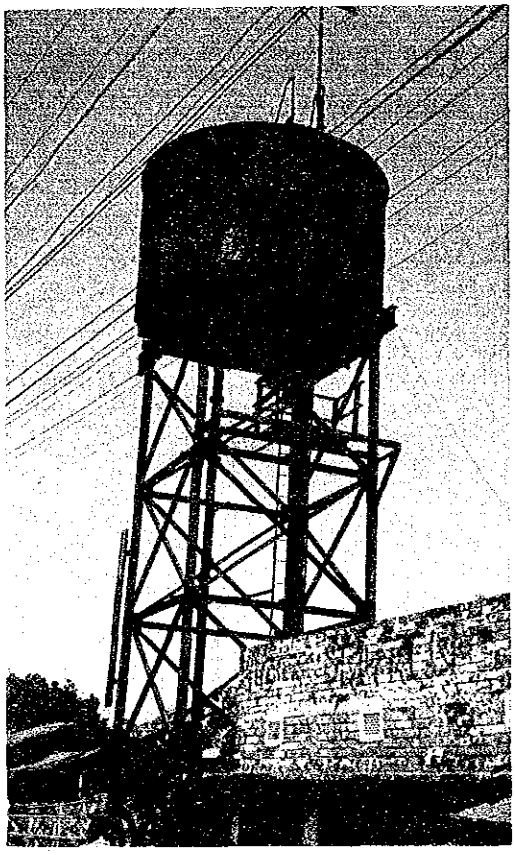
Keisuke Arita

Keisuke Arita
President
Japan International Cooperation Agency

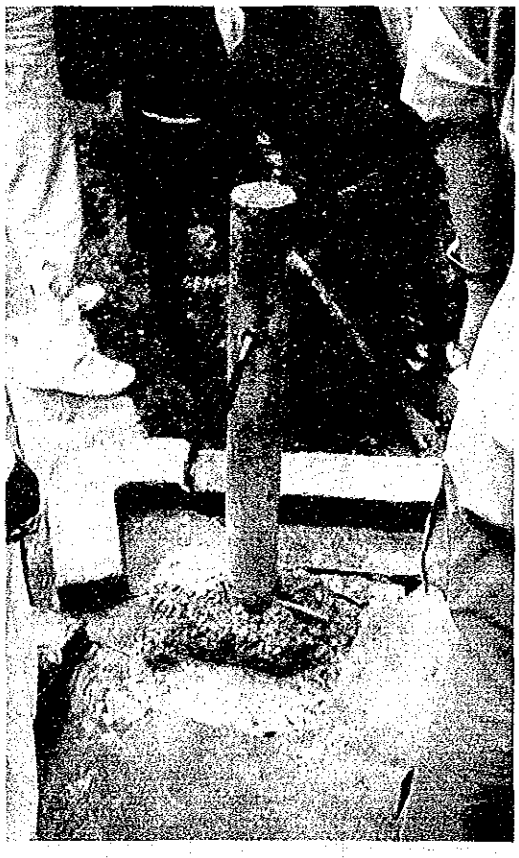

LOCATION MAP
Project Sites
Boundary : International
" Divisions
" Districts
Capital of Country
Head-quarters of District
Railways Broad Gauge
" Other Gauge
DINAJPUR
Tista R.
KURIGRAM
RANGPUR
GAIBANDHA
ASSAM (INDIA)
SUNAMGANJ
Surma R.
Jamuna R.
RAJSHAHI
BOGRA
Atrai R.
Brahmaputra R.
SYLHET
Kusiyara R.
TANGAIL
WEST BENGAL (INDIA)
PABNA
NARSINGDI
ASSAM (INDIA)
KUSHTIA
CHUADANGA
Ganges or Padma R.
DACCA
Meghna R.
Madhumati R.
FARIDPUR
NARAYANGANJ
COMILLA
JENIDAH
JESSORE
CHITTAGONG HILL TRACTS
FENI
NOAKHALI
BARISAL
RANGAMATI
Kaptai L.
KHULNA
Karnaphuli R.
CHITTAGONG
PAITUAKHALI
Sangu R.
BAY OF BENGAL
BURMA
SCALE
10 0 10 20 30 40 50 60 70 80 90 Miles
89°
90°
91°
92°
26°
25°
24°
23°
22°
21°

▶ An existing water purification plant on service constructed by DPHE





◀ An existing overhead tank on service constructed by DPHE



▶ An out-of-order public post constructed by DPHE

▶ A public post on service constructed by DPHE

◀ A main street scene

▶ A back street scene

S U M M A R Y

The great majority of the people in the People's Republic of Bangladesh are using shallow wells, rivers, ponds or the standing water as the water for their living. Those water sources are frequently found coexisting with sewage facilities and are considered insanitary for supplying living water. It is said that 80% of diseases in Bangladesh are related with the water, with 30% of children's deaths being associated with diarrhea caused by the water. The amount of water supply from those sources is also short, and the assurance of adequate water supply for the people is difficult.

In order to improve the living environment for the people, the Government of the People's Republic of Bangladesh is striving for the construction of water supply facilities to ensure safe and hygienic drinking water and improvement of sanitary facilities. As for drinking water, the construction and improvement of the piped water supply system are being promoted in urban areas and the construction of hand pump tube wells in rural areas.

The drinking water supply operation is done by two organizations, namely the Department of Public Health Engineering (DPHE) of the Ministry of Local Government, Rural Development & Cooperatives and the Water and Sewage Authorities (WASA) in Bangladesh. The WASA covers two major cities of Dhaka and Chittagong only, while the DPHE covers the entire territory of the People's Republic of Bangladesh excluding the two big cities named above.

The WASA, with aids from the World Bank, is carrying out the operation of improving the piped water supply system, while the DPHE is doing the same with aids from the Asian Development Bank (ADB), UNICEF, the Government of the Netherlands, etc. For the district towns and the sub-divisional towns (which were changed into district towns as of February, 1984) totalling 64 towns, the DPHE is planning 10 water supply schemes, of which nine schemes (covering 62 towns) are currently in implementation. Of the nine schemes, six schemes (for 30 towns) are being implemented by the aids of the Government of the Netherlands and ADB, and the remaining three schemes (for 32 towns) are being implemented by the funds of the Government of the People's Republic of Bangladesh alone. UNICEF is giving the aid for the construction of hand pump tube wells in rural area.

While the progress of schemes under foreign nations' aids is said to be 60% or more of the target, the progress of schemes by the Bangladesh national funds is within the range of 24 to 35%. Since an adequate appropriation of funds by the Government of the People's Republic of Bangladesh cannot be expected in coming years, a substantial delay is anticipated in the completion of the projects. The water supply facilities are not being improved fast enough to catch up with the rise in demand for drinking water due to the increase in population, and the gap between supply and demand shows a tendency to widen rather than narrow each year.

The Government of the People's Republic of Bangladesh, having been placed under such a dilemma, requested the Government of Japan to provide them with funds without compensation for the water supply scheme to cover 27 sub-divisional towns (now included in the district town) out of three schemes which are now being implemented by the national funds.

In response to the request, the Government of Japan decided to carry out a preliminary study, which was undertaken by the Japan International Cooperation Agency.

During this preliminary survey, the Government of the People's Republic of Bangladesh came up with additional requests locally for the following two projects.

(1) Narayanganj Town Water Supply Project (one of projects being implemented by the national funds); and

(2) Sanitary Facility Improvement Project

As a result of the preliminary survey, the Government of Japan recognized the necessity and appropriateness of a basic design study, and decided to carry it out for following eight towns.

(1) Narayanganj Town
(2) Narsingdi Town
(3) Jenidah Town
(4) Chuadanga Town
(5) Gaibandha Town
(6) Kurigram Town
(7) Feni Town
(8) Sunamganj Town

In line with the decision, the Japan International Cooperation Agency sent the "Basic Design Study Team for the Establishment Project of Water Supply Facilities" to the People's Republic of Bangladesh from March 31, 1984, to June 13, 1984, in order to have the survey team consult with the concerned Ministry and Agency in Bangladesh and to collect data and to carry out the investigation.

The Basic Design Study Team prepared the Drinking Water Supply Facility Improvement Project documents for the eight towns. Of the eight projects, the project document for Narayanganj Town had been prepared separately from the rest. Seven of the eight towns, excluding Narayanganj Town, are dealt with in a separate volume, and this report refers to the establishment project of potable water supply facilities in Narayanganj Town.

The potable water supply project is drawn up on the following design conditions.

(1) Planned target fiscal year : 1990

(2) The volume of water to be supplied, including non-household use water (for restaurants, hospitals, schools, commercial establishments, cottage industries, etc.), is planned on the following premises.

(a) 50% of the population subject to water supply will be served by house connection, assuming a consumption rate of 113.7 liters/person-day (25 gallons).

(b) The remaining 50% of the population subject to water supply will be served by public posts, assuming a consumption rate of 34 liters/person-day (7.5 gallons).

(c) 30% of the sum of (a) and (b) above is estimated as the loss.

(3) In connection with the water source, we carried out the comparative study of the groundwater alternative (wells) and the surface water alternative (purification plant) and as a result we decided to adopt the surface water alternative (purification plant) in view of its merits in terms of construction cost, ease of maintenance and management, ease of acquisition of the construction site and ability to cope with future growth of demand for water. Under the proposed plan, water of the Sitalakhya River will be purified and supplied to the people of the town for potable use.

(4) Cast iron pipes will be used in the pipeline from the purification plant to the overhead water tank.

(5) For the water distribution piping, PVC pipes produced in the People's Republic of Bangladesh will be used with priority. Layout of pipeline networks and location of overhead water tanks, etc., will be determined on the basis of the results of hydraulic studies. Since PVC pipes produced in the People's of Republic of Bangladesh are 200 mm or less in caliber, cast iron pipes will be used where pipes of 250 mm or greater caliber are required for piping.

(6) Overhead water tanks will be made of reinforced concrete, with the capacity of 20% of the daily water consumption. The height of the overhead water tank will be determined in such a way to make it possible to secure an internal pressure of 15 m (1.5 kg/cm^2) at the terminal ends of the distribution pipe. Since the existing overhead water tanks (21.5 m in height) will be used in this project, the new tanks as well will be

designed to be 21.5 m in height on the basis of hydraulic calculation results, because overhead tanks with different height would bring about problems in hydraulics.

(7) Only multi-stage turbine pump for well is manufactured in the People's Republic of Bangladesh, and there is no manufacture of any other type of pump in the country. Pumps to be used in the purification plant will be imported from Japan because centrifugal-type ones will be used therein.

(8) The house connection construction cost shall be borne by the beneficiaries, and the construction will be carried out by the authorities of the People's Republic of Bangladesh. In Narayanganj Town there are already more than 3,200 households provided with house connection, in addition to 528 public posts. Therefore, the construction of house connections and public posts will not be considered in this Project.

The project for construcing potable water supply facilities in the Narayanganj Town, drawn up on the aforementioned design conditions, has the following contents.

(1) The water source shall be the Sitalakhya River, and purification plants shall be planned accordingly.

(2) No data is recorded on the dry season discharge of the Sitalakhya River as reliability of data is considered low, being affected by tidal level. However, the combined volume of water intake for the west and east districts is only 0.67 m^3/sec, and it is presumed to be perfectly possible to pump that volume of water, because the river discharge seems to surpass it by far. The river has the LLWL of EL 0.65 m and the HHWL of EL 5.93 m.

According to the results of laboratory analyses, the quality of the river water poses no problem for potable use with respect to heavy metals. The turbidity as of August 1984 (flood season) was of the order of 85, and compared with the turbidity of other rivers it is believed to rise to about 150 at most. Results of jar test proved that turbitity of this extent is readily removable by mixing aluminum sulfate.

(3) According to the censuses conducted in 1974 and 1981, the population of Narayanganj Town was 196,879 and 298,359, respectively, and is estimated to have been about 350,000 in 1983. The estimated annual population growth rate was 6.1% in the 1974-1981 period and 8.3% in the 1981-1983 period. In this Project, the population of the town was projected on the basis of a growth rate of 2.4% in areas with particularly high population density and 6.0% in other areas. As a result, the 1990 population was projected to reach 493,400 with an average annual growth rate of 5.7%. Of this population, about 95% or 470,000 - the breakdown of which is 356,000 on the western side and 114,000 on the eastern side - will be covered by the water supply scheme.

(4) The planned water consumption is 34,176 m^3/day on the western side and 10,944 m^3/day on the eastern side, totalling 45,120 m^3/day. Deducting the volumes of water available from the existing producing wells and purification plants, the volumes of water to be developed anew are 25,622 m^3/day on the western side and 10,944 m^3/day on the eastern side, totalling 36,566 m^3/day.