Chapter 12

Damage to Lifeline Facilities

12.1 Water Supply System

The general plan of water distribution facilities for Banda Aceh city is shown in Figure 12.1. Major break places of the distribution network by the tsunami disaster are shown in the figure. Also in the figure, the tsunami-affected area and its run-up area are distinguished by different colors.

Topographically the city is mostly low-lying area. Since well water is occasionally saline in the area, treatment facilities for surface water to ensure the domestic water were built before the disaster. The water supply pervasion rate, which is defined as the percentage of the population served by public water supply to total population in the area, was 75% before the disaster. However, it went down to 25% by the damage caused by the earthquake and the tsunami.

As for the water supply system, raw water is taken at the intake seen in Photo 12.1 and the water is transmitted to the treatment plant shown in Photo 12.2 and then the treated water is transmitted to the elevated Tank 1 by the dual steel pipes with diameters of 500 mm and 600 mm.

The elevated tank 1(2,000m^3) of Photo 12.3 had not been functioning before the earthquake. However, the foundation of the tank was seriously damaged by the bending stresses caused by the earthquake. The tank should be demolished as soon as possible for safety reasons. The pipe next to the bridge nearby the Great Mosque crossing the Aceh River was washed away by the tsunami. As seen in the left picture of Photo 12.4, a rubber hose is temporarily installed on the river bed for water transmission to the other side of the river. The elevated Tank 2 of Photo 12.5 was also damaged with some minor cracks by bending stress in its foundation. Now the tank is used for emergency raw water supply from the nearby river. The water supply in the city is still critical now.

Distribution pipe network was broken in many places, and the public hydrants installed on the fringe area are not connected with the distribution network. Therefore, the supply of water in the most part of the city depends on the well and the deterioration of quality of well water, which is contaminated by salinity and drainage intrusion, is feared. Incidentally, three members of the JSCE reconnaissance team suffered from diarrhea immediately after the site trip.

2.2. Drainage system

Figure 12.2 shows the location of drainage pump stations and main drains in Banda Aceh City. The area, where the pump stations are located, is a low-lying urban area. The tsunami affected zone are back shaded in the same figure. All the pump stations from P2 to P9 except P1 were washed away by the tsunami and the drainage system is almost out of order. The drain ditch in the low-lying area has been clogged by debris, mad and sand carried by the tsunami, as shown in Photo 12.6. The backhoe during the cleaning work of debris is seen behind. The stocked water supply pipe has been scattered in mud at a water supply pump station as shown in Photo 12.7.

As domestic wastewater is flowing into the drainage system and water in the drains is stagnated at the moment, the hygienic environment is extremely poor. Immediate improvement is required.

Since the city suffered from floods every year even the rainfall for less than two hours and from frequent attacks of high tide, drainage system augmentation is one of the most critical issues for the area. The improvement as well as reconstruction of the drainage system is one of the most important issues for the city.

12.3 Electricity

The power generation in the earthquake affected area is attained through thermo-electric power plants located on the land and on barges at the shore. The power generation plants (38MW) built on higher ground were not affected by the ground shaking, and they are operational. However, the power generators on barges at the seashore were displaced from their mooring wharfs into the land. For example, the barge with thermo-electric power generator (7.5MW) in Ulhe Lhee district was displaced 3km inland by the tsunami (Photo 12.8). Since almost one third of the city and its population were destroyed by the tsunami, the loss of power generators on the barges does not directly affect the excess supply capacity of electricity for Banda Aceh city.

Many RC electric poles were broken in the area affected by the tsunami (Photo 12.9). However, either ground shaking or the tsunami did not damage transmission facilities from Medan (10MW).

Figure12.1

Water Supply Map and Disconnected Point of Banda Aceh City

(A local company of water works provided information, which the author drew on the city map.)

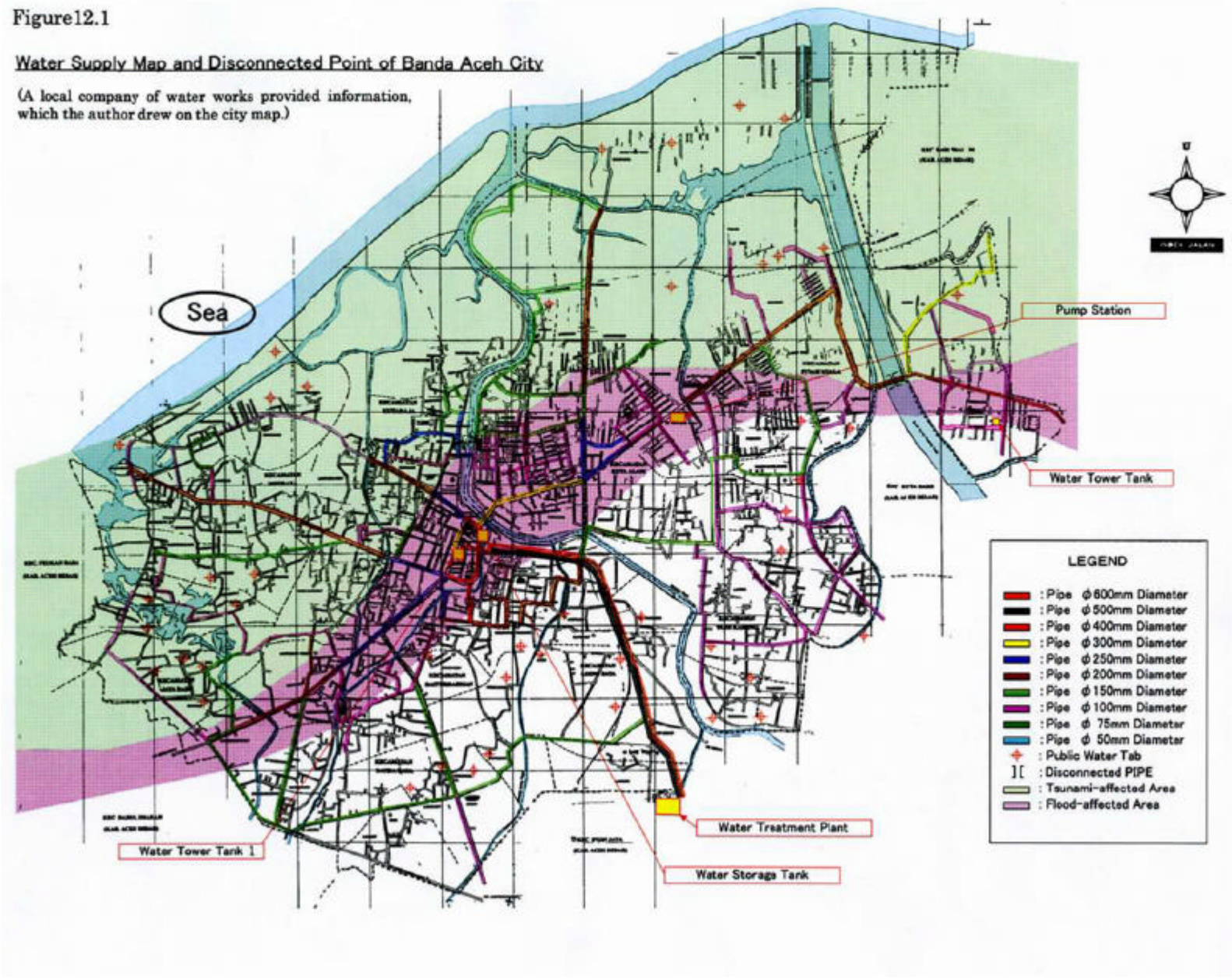

Figure12.2

Pump Station and Main Drain Map of Banda Aceh City

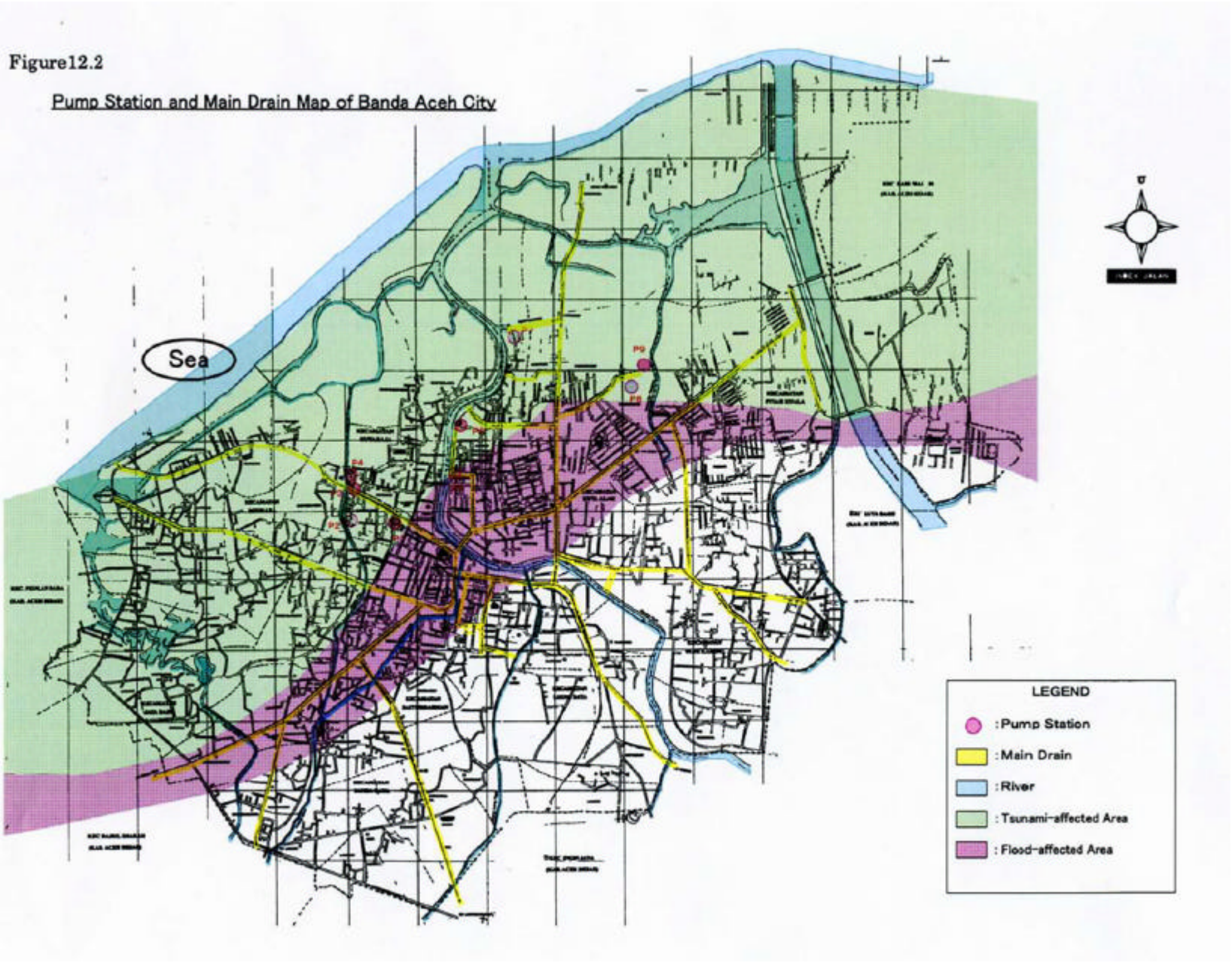

Photo 12.1 Intake site

Photo 12.2 Emergency measure at the treatment plant

Photo 12.3 Water tower tank 1

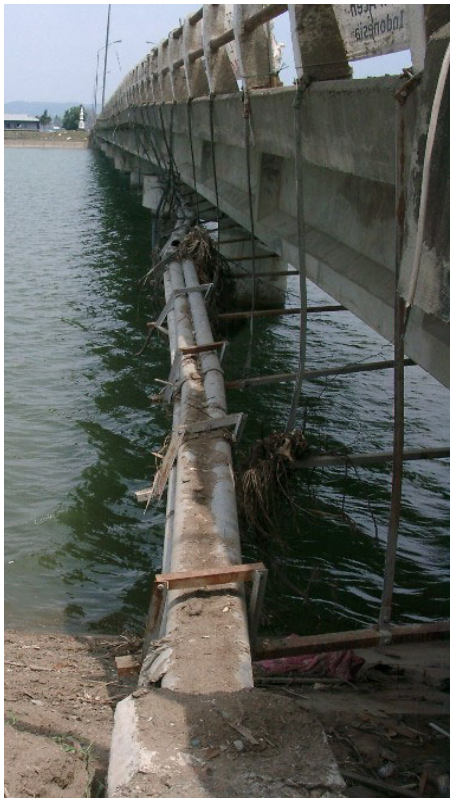

Photo 12.4 Broken water pipes nearby or attached to bridges

Photo 12.5 Slightly damaged elevated water tank 2

Photo 12.6 Drain ditches are clogged with mud and debris. Backhoe is operating for removal of deposit of the flood.

Photo 12.7 Scattered transmission pipe around pump station

Photo 12.8 Displaced barge with a thermo-electric power generator

Photo 12.9 Broken electric distribution poles

(Author of this chapter: M. Takeuchi)