(a) Large Reservoir and Small Pump Capacity

In most drainage areas, a pumping station is characterized by storage of flood in a large reservoir placed at the pumping station so as to minimize pump capacity, thus initial cost and operation cost. Table 3.18 includes data of pump capacity and area of reservoir attached. However, as explained in the 1973 Master Plan Study Report, if pumps are small, the reservoir may not yet empty before the next rainstorm.

(b) Complicated Network of Drainage System

The pump drainage areas in the DKI Jakarta have complicated network of drains with a lot of gates. Flood water is so controlled by gates to distribute optimum discharge to downstream in consideration of flow capacity of main drain, pump capacity as well as down stream water level including Sea Level.

(c) Planning without Consideration of Secondary and Tertiary Drains

The other characteristics of drainage system in the DKI Jakarta is that existing pump capacity and starting water level of a reservoir of a pump drainage area are so determined that highest water level or the Design Flood Level along the main drain is lower than the existing bank elevation for one day flood with 25-year return period, assuming that most of rainfall can be drained to the main drain.

However, there are a lot of flood prone areas in pump drainage areas. One cause of inundation in flood prone areas may be improper installation/maintenance of secondary/tertiary drains, though gravity drain can be attained. Also high Design Flood Level of main drain may be other causes why rainwater is difficult to be drained. In several places, the ground elevation is lower than the existing bank elevation of the main drain and thus rain water cannot be drained to the main drain.

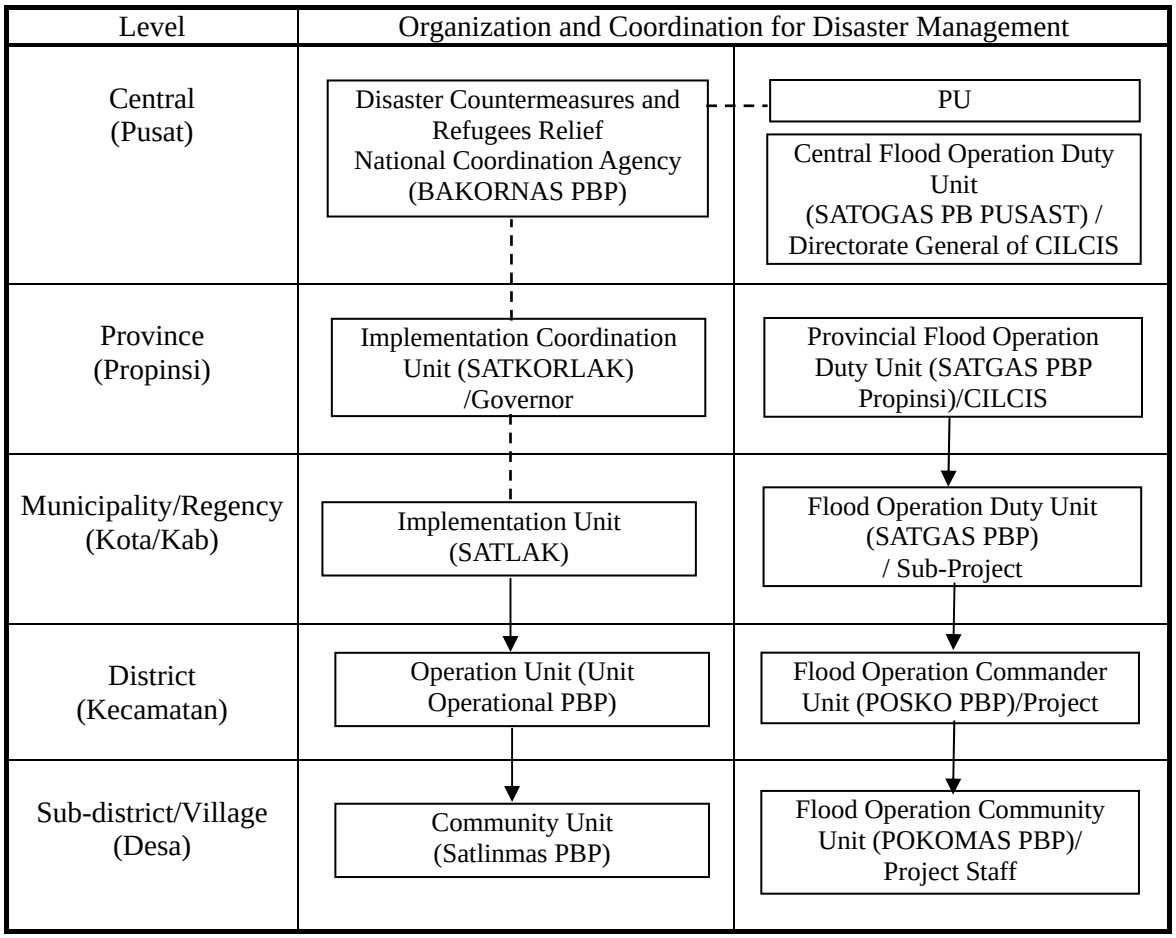
Consequently, local pumps have been installed to drain flood water to main drains. Furthermore, movable pumps have been provided under the Japan's grant aid scheme.

3.6 FLOOD OPERATION

3.6.1 Organization for Flood Operation

For flood operation, the following organizations have been established in accordance with "President Decree No.3/2001 on National Coordination Agency for Disaster Countermeasures and Refugees Relief.

Table 3.4 Organization for Flood Operation



Note: ⟶ Command Line, - - - - Coordination Line

3.6.2 Flood Operation in DKI Jakarta

Flood operation in DKI Jakarta is explained hereunder based on the two (2) Flood Operation Manuals for the year of 2004/2005 prepared by the CILCIS and the DKI Jakarta.

(1) Flood Prone Areas

It is explained that “Large flooding such as the 1996 flood and the 2002 flood does not occur every year and thus, location of 78 flood prone areas (Figure 3.9), which may occur every year, are defined and indicated in the manual” for flood operation.

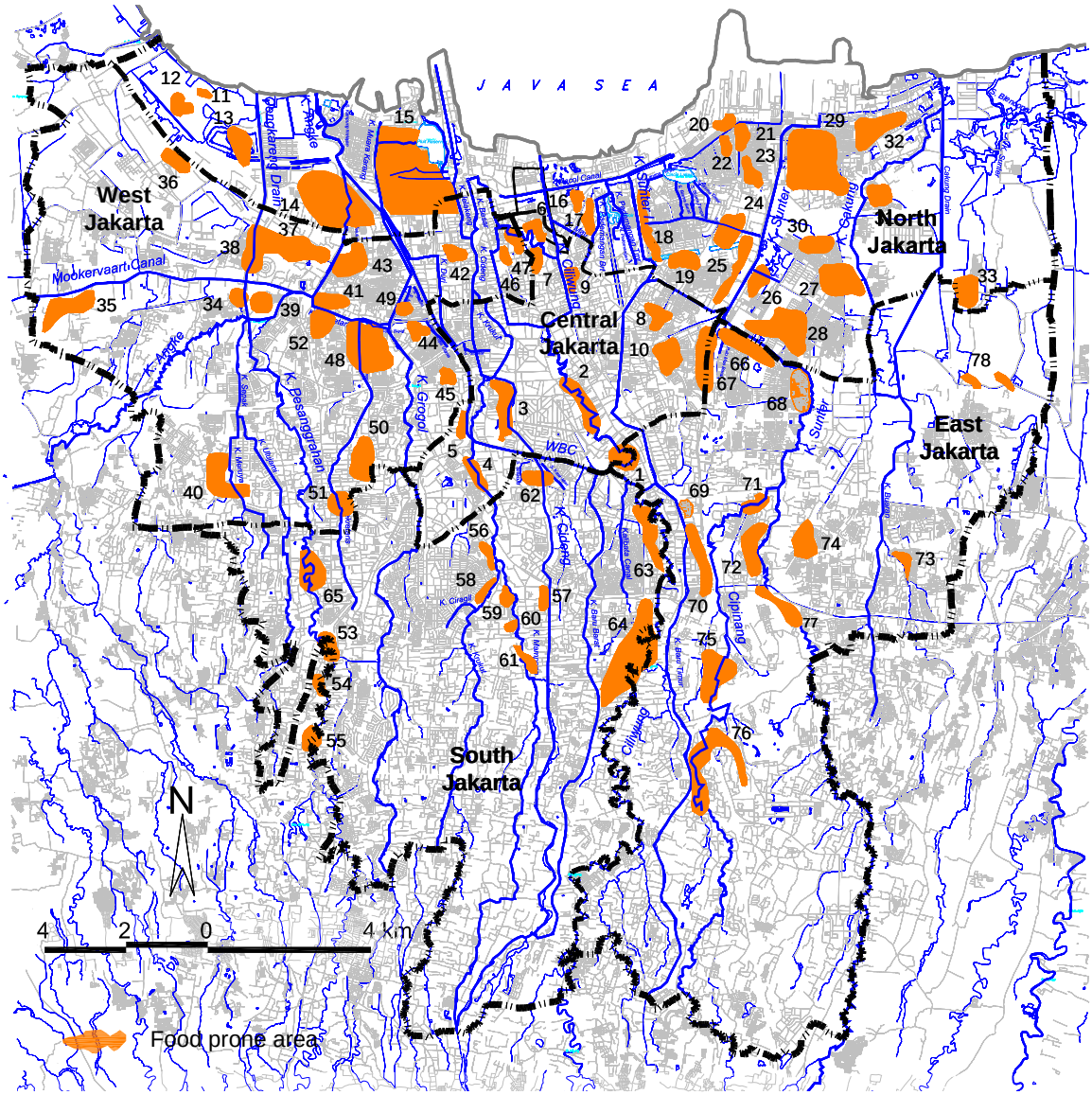


Figure 3.9 Flood Prone Areas for the year of 2004/2005 (DKI Jakarta)

(2) Flood Alert Water Levels

During rainy season, water level is monitored at the 12 water level gauging stations (Flood Alert WL Gauging Stations) located at the rivers/drains in the DKI Jakarta and upper stream of these rives/drains to issue the four (4) levels of flood alerts to the related organizations tabulated in Table 3.4.

(3) Information Routes of Flood Alerts

When water level at the predetermined water level gauging stations reaches/enters water level range for flood alert, the corresponding Flood Alert is issued and notified to the related personnel/organizations in charge as shown in Figure 3.10.

Figure 3.10 Notification Routes of Flood Alerts

(4) Responsibility for Flood Operation

The personnel, who are responsible for flood operation of the respective levels of Flood Alerts, are as follows.

(a) Alert I: Governor of the DKI Jakarta

(b) Alert II: General Project Manager of the CILCIS

(c) Alert III: Project Managers of the CILCIS

(d) Alert IV: Observers of water level monitoring units, gate operators and pump operators

(5) Pump Operation

The respective manuals of the CILCIS and the DKI Jakarta cover/explain in detail how to operate the respective pumps and gates under their responsibility. Pump operation by the CILCIS and the DKI Jakarta is characterized by that one pump unit is always stand-by in turn. In the Cideng Pumping Station, which drains to the WBC, the DKI Jakarta Flood Operation Manual explains pump operation procedures, in which five (5) pump units are operated at maximum, corresponding to water level of the main drain and at least one (1) pump units is stand-by.

(6) Activities of POKOMAS

Sub-district offices establish Emergency Station (POKOMAS), which is

responsible for monitoring water level and taking emergency actions. The POKOMAS of Bukit Duri Sub-district prepares a siren, buoys and rubber boats as well as evacuation centers. Flood information and Flood Alerts are informed to the POKOMAS from the operators of gates/pumps located upstream, using radio, telephone line and mobile telephone.

3.7 SOLID WASTE MANAGEMENT

Cleaning Service Office, which is an independent organization under Governors of Provinces including DKI Jakarta, is in charge of solid waste management except rivers. The responsibility of garbage collection in rivers is under the PU organization under Governors, such as the DPU DKI.

Cleaning Service Office has responsibility to; 1) collect garbage at the transitory location, and 2) convey and dispose to final disposal place at the sanitary landfill of Bekasi. But number of transitory locations is limited and thus, the transitory locations are far from the houses. Therefore, households tend to hire attendant persons to bring garbage to the transitory locations or may throw it to nearby rivers, drainage canal and so on.

The DPU DKI is colleting garbage in whole reaches of rivers/drainage channels by manual operation from banks as well as at the pumping stations and gate points. The colleted garbage volume by the DPU DKI totals 176 thousand m^3/year. The DPU DKI transports the colleted garbage to the sanitary landfill of the Bekasi.

3.8 LAND ACQUISITION

Figure 3.11 is a case of land acquisition procedures actually on-going for the Eastern Banjir Canal.

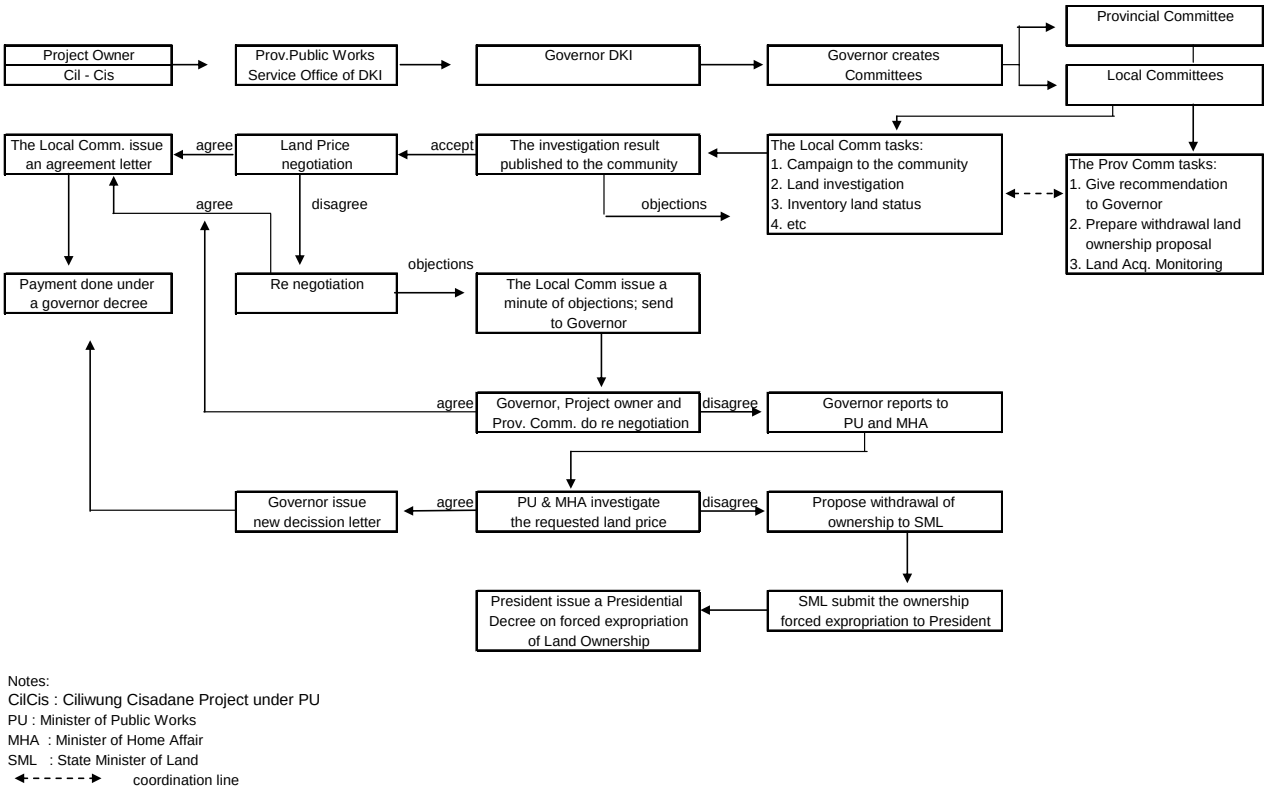


Figure 3.11 Procedures of Land Acquisition for Eastern Banjir Canal

3.9 DEVELOPMENT OF JAKARTA AND LAND USE PLANNING

3.9.1 Development of Jakarta

Jakarta was established originally in 16th century on natural levees of the Ciliwung River near its estuary. Jakarta became a special province (DKI Jakarta) in 1966 due to its important role in Indonesia. Rapid development occurred particularly in 1970s and Jakarta has extended to the neighboring regencies of Bogor, Tangerang and Bekasi of West Java Province. Further growth of Jakarta has made it necessary to coordinate management and development plan with neighboring regencies/municipalities and thus, JABOTABEK or the metropolitan area has been created consisting of DKI Jakarta, Municipality and Regency of Bogor, Municipality and Regency of Bekasi and Municipality and Regency of Tangerang. At present, the metropolitan area is called as JABODETABEK including Depok Municipality, since it is newly created in the Bogor Regency of the West Java Province.

Figure 3.12 shows urban area of Jakarta in 1950's. In 1950', urban area (orange color portion) was limited only in the present Central Jakarta and continuation of this area in north-south direction. Other areas were mostly used as paddy fields.

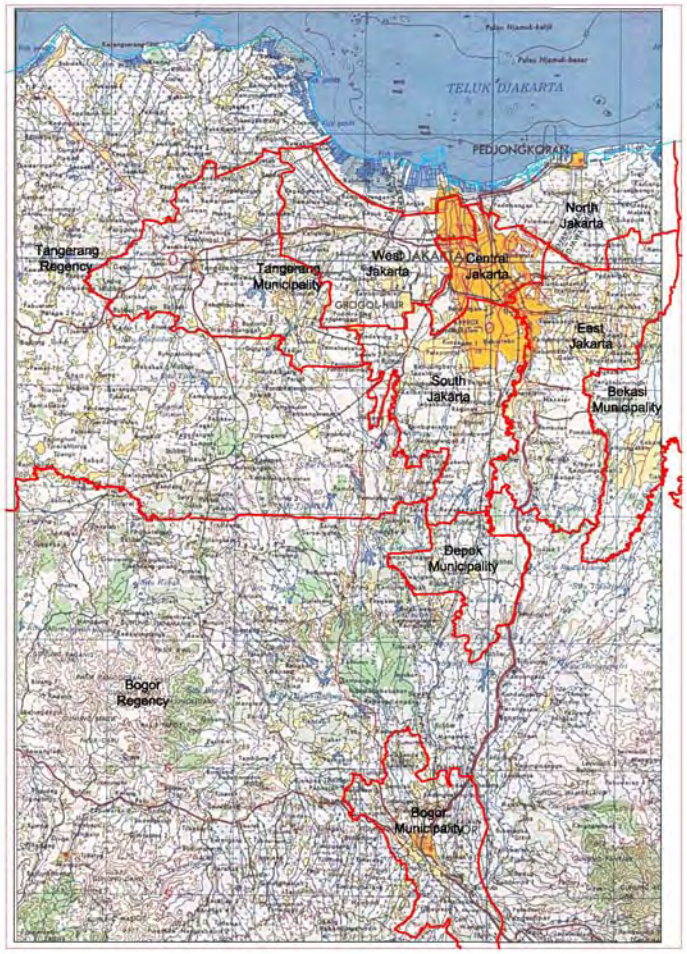


Figure 3.12 Urbanized Areas in 1950's in and around Jakarta

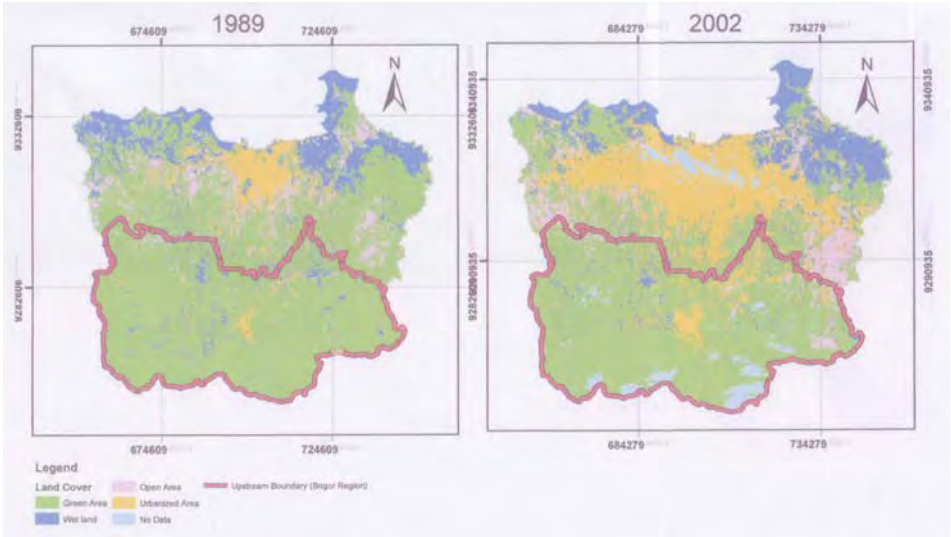


Figure 3.13 Urbanization of JABOTABEK
(from Urgent Inventory Study on Damage of Flood 2002
in JABODETABEK Area in Indonesia, JICA, 2003 May)

Figure 3.13 indicates land cover change in JABOTABEK from 1989 to 2002 based on the Landsat image. In JABOTABEK, urbanization (yellow portion in Figure 3.13) occurred in east-west direction, namely, Tangerang and Bekasi Municipalities and then started in the south, namely to Bogor Municipality.

In 2000, population of JABOTABEK is 21.2 million, which increased 2.6 times of that in 1971. Out of regencies/municipalities, order of population increase rate from 1971 to 2000 is Bekasi (Regency and Municipality) of 4.0 times, Tangerang (Regency and Municipality) of 3.9, Bogor Municipality of 3.8, Bogor Regency with Depok Municipality of 2.8 and DKI Jakarta of 1.8 times.

3.9.2 Spatial Planning

In Indonesia, future land use is directed by system of spatial planning. Followings indicate spatial planning of DKI Jakarta and Bogor Regency. Most areas of DKI Jakarta are designated as housing areas or industrial areas, while in Bogor Regency, 38 % of land is newly designated as built-up area, in addition to the existing built-up area (26 % of total area),

(1) DKI Jakarta (2010)

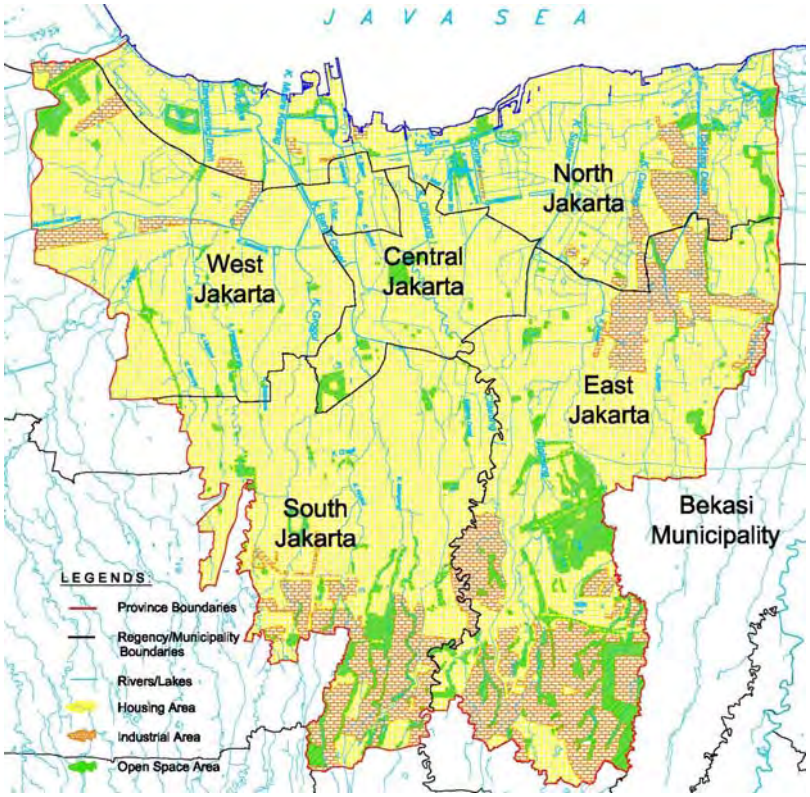


Figure 3.14 Spatial Planning of DKI Jakarta

(2) Bogor Regency (2009)

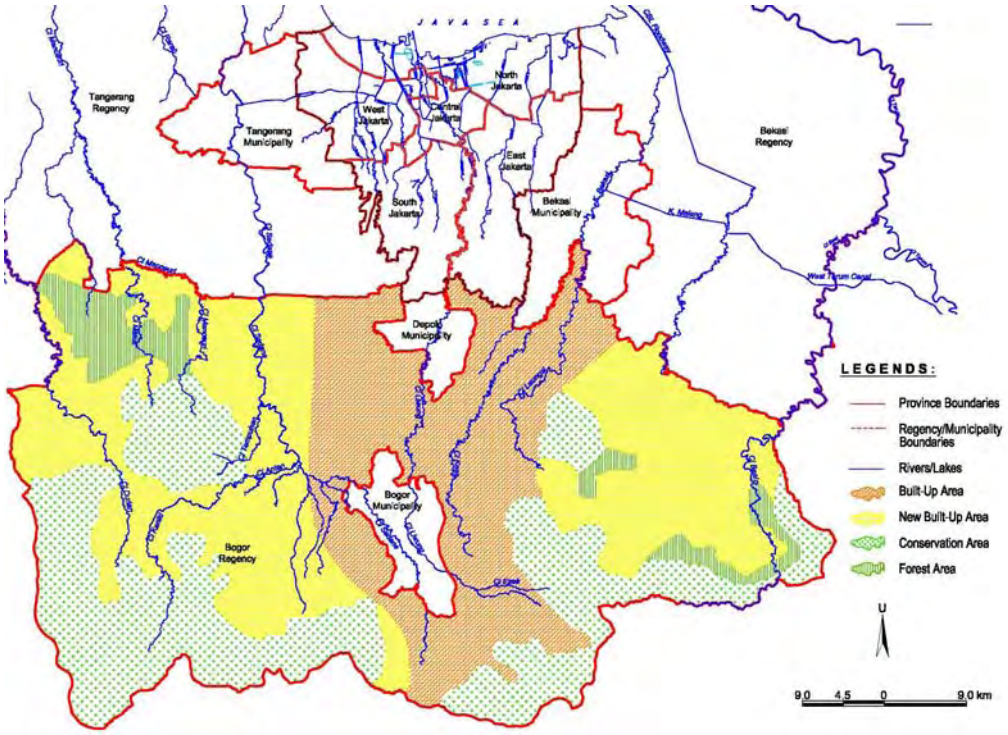


Figure 3.15 Spatial Planning of Bogor Regency

3.10 LAND SUBSIDENCE

The CILCIS office conducted leveling survey in 2002 at 279 bench marks situated in DKI Jakarta. In 1978, the NEDECO conducted leveling survey at 22 benchmarks. Moreover, leveling survey was undertaken in 1981 by Project Banjir, 1989 by the DPU DKI and 1994 by the CILCIS. In Figure 3.16, land subsidence for 24 years from 1978 to 2002 is shown in parentheses in unit of cm besides benchmarks at which leveling was conducted. Values with red color means that subsidence is more than 100 cm, while those in blue color are less than 100 cm. Land subsidence is approx. 50 cm near the Manggarai, while it exceeds 100 cm in the northern low-lying areas.

Figure 3.17 indicates change of subsidence rate at the benchmarks at which subsidence exceeded 100 cm for 24 years. According to these data, subsidence rate may decreases in some places such as NWP 21 and PB 71, while, in lower areas such as PB 166, subsidence rate may not be changed.