

## **Annex H6.2.6 Examples of Projects of Floodplain Management**

### **(Allowing Flooding and Inundation, Regulating and Guiding Land Use, and Flood-proofing of Structures)**

#### **(1) Allowing flooding and inundation**

Floodplain management in a developing country must be planned after careful consideration of the stage of development and economic condition of the host country and the conditions in the area to be protected from floods. Depending on these conditions, it may be necessary to devise measures that aim to live with floods while allowing a certain degree of inundation and flooding, instead of aiming to achieve complete control of floods.

#### **[Explanation]**

- It is difficult to prevent flooding and inundation in an area that has an urbanized floodplain, an area where land subsidence is underway or an area that lacks an adequate drainage system. In these areas, it is necessary to develop a flood control plan that aims to live with floods while allowing a certain degree of flooding and inundation.
- Another possible approach is to systematically leave some unurbanized areas through land use regulation coordinated with a city plan and utilize the unurbanized areas as retarding basins.
- In reality, there are cases where the degree of flooding to be allowed in a river plan in a developing country is determined not only by the degree of safety from floods to be achieved, but also by its balance with other factors such as the economics of the project.

#### **<Examples of projects>**

##### **Flood Protection, Drainage Project in Eastern Bangkok (JICA, 1985)**

- The master plan proposes using 44 km<sup>2</sup> of unurbanized areas (as of 2000), out of the 260 km<sup>2</sup> covered by the master plan, as retarding basins where flooding and inundation are allowed.

##### **Greater Dhaka Protection Project (Study in Dhaka Metropolitan Area) of Bangladesh Flood Action Plan (JICA, 1987)**

- As a basic policy for planning, small-scale short-period inundation is allowed to a certain degree.

#### **(2) Regulating and guiding land use**

- Low-lying lands along the rivers function as natural retarding basins that store and retard flood flows by letting them infiltrate into the soil. In order to protect this natural flood control function, it is necessary to regulate and guide land use so that

large-scale, haphazard residential and other development does not take place on the floodplain.

**[Explanation]**

- In line with the economic growth of developing countries, rapid concentration of population in cities has been underway in those countries. Consequently, in the areas along the rivers, large-scale residential, industrial and other development has taken place without regard to flood control. This has resulted in a decrease in the water-holding capacity of natural floodplains, a shorter time of concentration and a marked increase in flood peak discharge. Similar development has also occurred on the floodplains along the lower reaches of the same rivers, resulting in concentration of property, formation of cities susceptible to floods and greater inundation damage.
- The governments of many developing countries are trying to regulate and guide land use to solve such land use problems, but it is difficult to enforce laws to this end in practice. When trying to devise measures associated with land use control, it is necessary to thoroughly study the social background and actual conditions and to adopt a realistic and flexible approach.

**<Examples>**

**Thailand**

- In the city of Bangkok in Thailand, effort is being made to conserve land that has a water-holding or retarding function, such as land in agricultural areas specified in the Bangkok Metropolitan General Plan (a 1992 ordinance of the Ministry of Interior), and development activities are being regulated in order to secure the retarding (detention) function under the monkey cheek project.
- Development regulation in Thailand is under the jurisdiction of the Building Control Division. Urban plans are reviewed every five years, and development activities in areas that have not been designated as development areas are not permitted.

**Philippines**

- Although laws do exist, they do not seem to be functioning properly.
- Not only lands along natural rivers but also lands along human-made channels such as the Mangahan Floodway are occupied by squatters.

**Malaysia**

- Land designated as "river reserve" is being encroached by squatters.
- In Malaysia, ponds at tin mining sites, which function as retention ponds in times of flood, are protected by regulations. In reality, however, they are gradually being filled up for the purpose of development.

**Laos**

- There appears to be no land use regulation for securing the retarding (detention) function in effect. Some river experts have pointed this out as a problem, but no discussion or deliberation seems to be underway.

## **Nepal**

- There are laws regulating individual harmful acts and allowing measures to be taken to control land use, but the laws do not seem to be functioning. There are ongoing discussions in the newspapers as to the development of mountain areas.

### **<Examples of projects>**

#### **Study on Comprehensive River Water Management Plan in Jabotabek (JICA, 1997)**

- In 1987, a detailed design of the west flood canal was developed with an OECF fund. However, large-scale haphazard residential development on the right-of-way in subsequent years rendered the project practically impossible. To prevent a similar situation from occurring again, it has been recommended again that development on the right-of-way of the west flood canal proposed in an emergency project (with feasibility study) be regulated strictly.
- The master plan, which incorporates the concept of comprehensive flood control planning, divides the project area (6070 km<sup>2</sup>), mainly according to topographic characteristics and from the viewpoint of the flood control function, into (1) detention areas (mountains and hills, terraces), (2) retarding areas (valley bottom plains) and (3) low-lying areas (coastal deltas: areas to be protected from floods).
- It has been recommended that for retarding areas of (2) above, the competent government agency clearly indicate the future river rights-of-way and regulate land use accordingly to protect the storage function of the river channels. It has further been recommended that measures be taken to prevent land-expropriation problems that might hamper project implementation.

#### **Urban Drainage and Waste Water Disposal System in Hanoi City (JICA, 1994)**

- The drainage master plan proposes regulating land use in the western and southern suburbs of Hanoi, for which Hanoi's master plan for development to be implemented by 2010 does not include specific plans so that lands in those areas can be used temporarily as retarding basins in the event of an extreme flood.
- This is beyond the scope of the drainage master plan, but parts of the flood channels (i.e., river-side land) of the Red River are practically urbanized. Since it is practically impossible to move the houses in such areas, it has been recommended that construction of new housing be restricted and bulletin boards showing flood level information be set up to alert the local residents.

#### **Study on Drainage Improvement and Flood Control in the Municipality of Phnom Penh (JICA, 1998)**

- Phnom Penh, the capital of Cambodia, does not yet have an official development plan, which is the root cause of many inconsistent development projects in progress in the city. This situation is not only destroying the environment of the city but also rendering existing flood protection and drainage facilities ineffective.

- The master plan, therefore, proposes formulating municipal development plans (zoning control, development and building regulation) taking into consideration the conservation of waters and agricultural lands.

#### **Flood Protection, Drainage Project in Eastern Bangkok (JICA, 1985)**

- Guided by the concept that inundation damage can be effectively mitigated by designating detention areas (retarding basins), land uses in 2000 have been proposed. In addition, the master plan proposes utilizing the eastern suburbs (241 km<sup>2</sup>) of Bangkok outside the master planning area as detention areas (retarding basins).
- Only nonstructural measures are applied to the detention areas (retarding basins) mentioned above.
- It has also been proposed that development by the year 2000 be limited to within the master planning area so as to prevent urban sprawl into other areas.

#### **Greater Dhaka Protection Project (Study in Dhaka Metropolitan Area) of Bangladesh Flood Action Plan (JICA, 1990)**

- It has been proposed that out of the low-lying wetlands in the master planning area (about 137.5 km<sup>2</sup>), 264 ha be set aside as retarding basins through appropriate land use control measures.

#### **Study on Flood Control and Drainage Project in Metro Manila (JICA, 1990)**

- Under the framework plan outlining future flood control policies, Manila's 1982 zoning ordinance has designated almost all districts as residential areas. For the purposes of new land use regulation and conservation, the current zoning ordinance needs to be amended, but it would bring about steep declines in land prices. For this reason, it is judged that land use regulation for protecting the water-holding and retarding functions of the river basins and for restricting urbanization in flood-prone areas cannot be applied to Metro Manila.

### **(3) Flood proofing of structures**

On urban floodplains, flood-proofing measures, such as forming embankments and raising building floors, need to be taken to mitigate inundation damage.

#### **[Explanation]**

- One of the characteristics of flooding in urban areas in developing countries, particularly in cities on deltas of international rivers, is that, because the slope of topography is gentle, flood flows are much slower. Thus, partly because the likelihood of houses being washed away is low, traditional piloti-supported buildings constructed by local residents have proved effective in flood proofing their houses.
- Detention (retarding) of floods on floodplains effectively reduces discharges downstream. If, therefore, a low-lying flatland is developed and embankments are constructed, the retarding function of the land might be destroyed. The embankment

method, therefore, needs to be applied carefully so that adverse effects on the downstream areas can be minimized. One possible solution is the method of collecting development charges from house builders and using them as funds for flood control projects. The applicability of such an approach needs to be judged after careful consideration of the stage of development.

#### <Examples>

- Piloti-supported house construction is a representative example of a traditional means of building flood proofing found in floodplain areas in Southeast Asian developing countries.
- In Thailand, floods are annual events in the Chao Phraya delta area, and rice cultivation dependent on such floods and the method of building piloti-supported houses along Klongs (human-made canals) have been practiced traditionally. In urban areas, it is common practice to build houses on embankments for protection from floods.
- On the floodplain in the Dhaka area in Bangladesh, there are many traditional houses whose raised floors are three to four meters higher than the ground surface.

#### <Examples of projects>

##### **Flood Protection, Drainage Project in Eastern Bangkok (JICA, 1985)**

- The master plan of this project proposes a number of methods for flood proofing structures, along with a land use plan for the year 2000.
- The traditional methods of structural flood proofing practiced by individual home owners, such as embankments on building lots and flood proof walls, should continue to be used. Houses to be built in newly developed areas (82 km<sup>2</sup> out of the 260 km<sup>2</sup> under the master plan) should be built on embankments whose flat tops are level with the surface of existing building lots or built as piloti-supported structures.
- To ensure traffic flows even in times of inundation, the height of existing and new roads is to be not less than +1m.

##### **Greater Dhaka Protection Project (Study in Dhaka Metropolitan Area) of Bangladesh Flood Action Plan (JICA, 1987)**

- It has been proposed that administrative guidance be given to encourage the practice of building structures on embankments higher than the design river-side water level or adopting piloti-supported construction in newly developed areas along the periphery of the master planning area (about 137.5 km<sup>2</sup>).

(Source: Guidelines for Construction Technology Transfer (Urban Rivers), October 2001, Infrastructure Development Institute-Japan)