

***APPENDIX:***  
***FLOOD DETENTION/RETENTION POND IN JAPAN***

## APPENDIX: FLOOD DETENTION/RETENTION POND IN JAPAN

### 1. Brief History

The Japanese economy had highly grown in the 1960s. In parallel with the economic growth, the population had concentrated on the metropolitan and major city areas. Rapid urbanization had accompanied both the reduction of natural areas in the headwaters and the accumulation of private and social assets in the flood-prone areas. Furthermore, the construction of flood control structures had not been able to catch up with the rapid increase of flood discharge caused by the urbanization. As a result, serious flooding had frequently occurred in the urbanizing/urban areas.

In 1971, the first edition of the “Technical Manual for Regulation Pond in Large-Scale Land Development” was published to guide land developers on the construction of detention ponds in their development areas. In 1976, the River Council submitted an interim report in response to the Minister’s inquiry concerning comprehensive flood control measures in urbanizing or urbanized areas. After these efforts to cope with the urban flooding problems, flood control plans and construction works have been urgently implemented for rivers in major urban areas. Among the measures for urban flood control, the detention pond has become one of the indispensable ones.

Meanwhile, research on an effective infiltration method has been made continuously in the 1970s. In 1981, an experiment on the diffusion type to infiltrate rainfall over a residential estate in the suburbs of Tokyo was commenced. Based on the successful results of the experiment, several guidelines and manuals were prepared to popularize the rainfall infiltration method. In line with the technical progress, the Ministry of Construction subsidized projects to support the installation of rainfall infiltration facilities. Furthermore, a number of local governments prepared their own technical guidelines for flood detention or retention including rainfall infiltration facilities. As a result, the diffusion type of rainfall infiltration facilities has been widely adopted as one of the effective measures for urban flood control.

From the late 1980s to the 1990s, new directions have been sought in designing flood and rainfall detention/retention facilities, as follows:

- To upgrade detention ponds into environmentally and ecologically sound ones such as open spaces for recreation and relaxation of urban residents;
- To store and utilize rainwater for miscellaneous purposes: garden watering, toilet flushing and car washing; and
- To restore or improve the basin-wide hydrological cycle by the infiltration of rainwater: the restoration of abandoned waterways and dried-up springs.

This paper explains the historical progress of detention ponds among the flood detention/retention facilities, which have been constructed in line with the large-scale land development.

## **2. Technical and Institutional Development of Detention ponds for Large-scale Land Development**

### **2.1 The Dawn of Detention Ponds in the 1970s**

In the 1960s and the first half of 1970s, a great number of large-scale development projects had taken place in the suburbs of major cities in parallel with the high economic growth of Japan. As described in the preceding section, serious floods had occurred in the urbanizing/urbanized areas. To cope with this unfavorable condition, the following governmental efforts have been made.

#### **Establishment of Subsidized Projects**

- 1972: Flood Regulation Pond Project
- 1979: Comprehensive Flood Control Project in Urbanized/Urbanizing Areas

#### **Manual and Guidelines**

- 1971: Technical Manual for Regulation Pond in Large-Scale Land Development
- 1975: Technical Manual for Flood Regulation Pond

In this period, the local governments of major cities and prefectures prepared their own guidelines for the construction of flood detention ponds. The administrative guidance to construct the detention ponds started for large-scale land development with areas ranging from 0.1 to 1 hectare or more.

The following features were particular to detention ponds constructed in the 1970s (refer to Photo 1):

- Ponds have a single purpose, only flood detention, and a simple shape. Usually, they were dead spaces in urban areas.
- The structural components were mainly made of concrete and steel products.
- Sometimes the ponds did not function well, due to lack of technical knowledge in designing the outlet, inlet and collector channel networks. (The engineering staffs of local governments, consulting firms and contractors were not still familiar with these kinds of structures.)

### **2.2 Development and Spread of Detention Ponds in the 1980s**

In 1983, a government directive for the deregulation of land development was issued to local governments in response to the excessive guidance by the local governments. In accordance with this directive, the Ministry of Construction recommended the multiple use of detention ponds to save on areas necessary for open spaces such as parks and playgrounds.

Under the above circumstances, the following subsidized projects, manual and guidelines were made in the 1980s:

#### **Subsidized Projects**

- 1983: Basin Flood Detention/Retention Project

- 1984: Flood Detention Improvement Project
- 1988: Basin Flood Regulation Project

**Manual and Guidelines**

- 1984: Technical Guidelines for Basin Flood Detention/Retention Facilities
- 1987: Guidelines for Multiple Use of Flood Regulation Pond

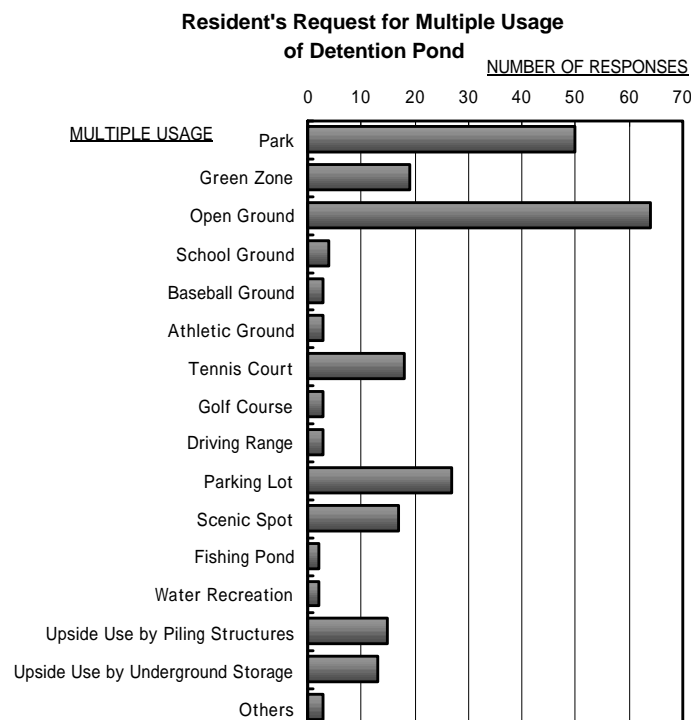
In this period, numerous cities prepared their own guidelines for the construction of flood detention/retention facilities. The local governments actively guided land developers in the construction of various types of detention ponds for multiple use.

The following features were particular to the detention ponds constructed in the 1980s (refer to Photo 2):

- Multiple use of ponding areas of ponds constructed for parks, playgrounds, parking lots and so on.
- In line with the progress of multiple use, various types of structural designs were made to suit the site conditions, e.g., underground storage and building with pile structures above the pond area. (Engineers in local governments, consulting firms and contractors became familiar with detention ponds, being supported by computerized planning and designing.)

**2.3 Further Progress of Detention Ponds in the 1990s**

In the 1990s, detention ponds had further progressed to the environmentally sound ponds in accordance with the increase of environmental concern among residents. The requests of residents for the multiple use of ponds have diversified, as shown in the following figure that was based on the questionnaire accomplished in 1993.





For a long period, some similar projects subsidized were established to meet the needs of the time. To simplify and easily execute the subsidized projects, the various projects were integrated into the following three projects:

- 1991: Basin Flood Detention/Retention Project
- 1994: Small-Scale River Improvement Project
- 1996: Regulation Pond Improvement Project

In accordance with the increase of resident's requests, the guidelines for ecologically sound detention ponds (ecological pond) and multiple use (community pond) were published as follows:

- 1997: Guidelines for Planning and Designing of Ecological Pond
- 1998: Guidelines for Planning and Designing of Community Pond

The following features were particular to detention ponds constructed in the 1990s (refer to Photo 3).

- Multiple use of detention ponds shifted from secondary to primary importance to enhance the value of residential estates.
- An elaborate design was worked out for the multiple use of detention ponds, and natural materials were used on major parts of facilities for multiple use instead of concrete and steel products.

### **3. Toward the twenty-first century**

#### **3.1 Brief Review of the Past Three Decades**

Almost three decades have passed since the commencement of construction of detention ponds for large-scale development projects. Thinking back on the past, thoughts are crowded with deep emotion as a toddling child growing into maturity. The successful progress is mainly owed to the following governmental efforts:

- Timely establishment of subsidized projects to resolve the problems arising from time to time.
- Research work in related fields to establish the technical background.
- Timely publication of technical guidelines and manuals to support engineers in the local governments, consulting firms and construction companies.
- Improvement of technology in planning and designing through the demo-projects of upgraded ponds.

#### **3.2 Future Perspective**

The direction of detention pond improvement to meet the various requirements of people is summarized in the following table.

Function of Detention Pond	Requirements for Detention Pond
Fulfillment of various requirements	To create the space/facility for multiple use based on requests of the locality.
	To facilitate public awareness of the necessity for flood detention.
Utilization of limited land	To step up the multiple use of space.
	To create open space united with the residential space.
	To provide road network for pedestrians and bicycle riders.
Creation of enhanced urban scenery	To create scenery harmonious with the surrounding urban areas.
	To enhance the urban scenery in newly developed areas.
Creation of space with abundant nature	To introduce natural materials for structural components.
	To create ecologically sound space.
	To facilitate residents to easily come in contact with nature.