STORMWATER STORAGE

Shouichi Fujita
Director General of Regional Sewerage Center, Tokyo Metropolitan Government, Japan

Masahiro Maeda
Director General of O&M Division, Sewerage Bureau, Tokyo Metropolitan Government, Japan

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Summary

Stormwater management used to mean mainly flood control in the past. But water quality preservation of rivers, lakes and sea has become an important task of stormwater management especially in urban area.

These days stormwater utilization is being paid attention as multi-purpose measures not only for water resource but for water quality preservation as well as flood control. Stormwater storage plays an indispensable role in various measures of stormwater management.

This paper presents mechanism of runoff and pollutant generation especially in urban areas. Their adverse effects on environment and state-of-the-art measures to protect them are also described.

1. Introduction

Stormwater storage is a quite effective measure for both flood control and water quality preservation. Due to urbanization, discharge rate of stormwater runoff rushing into sewer systems, rivers or channels increases. And various pollutants are washed into rivers or sea by stormwater to cause water pollution. In flood control, peak flow is abated by diverting it into stormwater storage facilities or by infiltrating it through

infiltration facilities.

In water pollution control, first flush of stormwater carrying highly concentrated pollution load is collected into stormwater storage facilities and treated after wet weather. Infiltration facilities are also used to intercept polluted stormwater runoff. These stormwater detention facilities such as storage and infiltration facilities may play important rolls to restore comfortable water environment and sound water recycling system in urban areas in future.

2. Runoff

Runoff is the phenomenon of changing rainwater or snow water into river water or waters of lakes and marshes, or sometimes means its changing process. About three types of runoff are recognized; surface runoff, subsurface runoff and underground runoff. Surface runoff is the water flow that is transported directly into receiving streams passing through the ground surface after rainfalls.

Subsurface runoff is the water flow that enters the streams after passing through the shallow strata of the earth. Underground runoff is the water flow in underground that penetrates into underground after rainfalls and reaches to the underground water stratum. These three types of runoff are called “3 runoff components”.

Rapid runoff in these 3 runoff components such as surface runoff or the part of subsurface runoff (rapid subsurface runoff) is called “direct runoff”. On the other hand, underground runoff or slow subsurface runoff is called “indirect runoff” which flows for a long period, though its flow rate is small.

Besides, runoff is classified into “short-term runoff” and “long-term runoff”. Short-term runoff mainly means the direct runoff and is used for researching, observing, and analyzing which apply to continuous rainfalls in order to control floods.

On the other hand, Long-term runoff is the portion of precipitation that flows not constrained by watershed, season unit or year unit, such as runoff of underground water, penetration, evaporation and melted snow. Long-term runoff is regarded as important water resources providing water stably.

In recent years, precise runoff prediction is getting more important, and prediction models are being researched and developed with the advance of computers. Many models have been developed, but conventional models simply express relations between precipitation (as an input data) and runoff volumes (as an output data) only by numerical values. As these models can not cope with the spatial distribution of rains, their limits of adaptability have come to be pointed out.

So, in recent years, solving physical runoff mechanisms came to be regarded as important and various new runoff prediction models has got developed and put to practical use.

These prediction models have been developed in order to solve various problems such

as flood problems or water pollution problems caused by combined sewer overflows in public water bodies. In models, surface runoff at an arbitrary point or complicated flows in sewerage pipes can be calculated in time series and analytical methods combining runoff models with pollutant load models are adopted.

They have various functions such as making hydrographs at an arbitrary point, making ichnography or longitudinal section of water levels in sewers, and representing by animation.

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