Creation of discolored water survey manual based on Tama area case study in collaboration with Tokyo Urban Planning and Development Corporation

Year of Research	2013	Implementation of anti-inundation measures

(Purpose)

Part of the Tama region of Tokyo contains many residential complexes that were constructed by private developers between 1965 and 1975, and the culverts in these residential complexes were later transferred to public control where they remain to this day. In areas that have a high underground water level, these transferred culverts generally tend to cause discolored water in many cases, and problems occur at basin treatment plants. Discolored water can be divided into floodwater during rain and floodwater under normal conditions (clear weather), but this research mainly investigated countermeasures for floodwater during rain as this causes the most problems. We implemented a questionnaire concerning countermeasures for discolored water in towns and villages in the Tama area, gained an understanding of the state of problems caused by discolored water, and performed onsite and offsite surveys for the identification of areas in which discolored water is found. We also aim to contribute to the formulation of policy concerning discolored water in the Tama area by proposing methods and points for attention in countermeasures.

(Results)

1) Questionnaire for Tama local authorities

Although half of the thirty local authorities in the Tama region experience some kind of problems with discolored water, only 10 (or around 1/3) of them have implemented countermeasures or plan to implement countermeasures, meaning no progress is being made in many local authorities.

2) Causes and indicators of floodwater during rain

Table 1 sets forth the assumed indicators for each cause of floodwater. Tama has many old privately developed residential complexes, and it can be assumed that flooding occurs during rain due to misconnections and culvert deterioration (there are many Z pipes). Furthermore, it can be assumed that flooding is increased along the course of large rivers such as the Tamagawa and the Akikawa, areas in which the underground water level is high due to the effect of underground water flow from the Tama and Sayama hills, and areas where there is much underground spring water. We deemed the results of these offsite surveys (cause analysis) to be the characteristics of the Tama region and set forth the impacts of the floodwater during rain for each local authority.

Table 1: Causes and indicators for floodwater during rain

Type	Route of assumed floodwater	Cause of floodwater	
		Assumed indices	Assumed causes
Direct floodwater	Direct floodwater from misconnection	Presence of privately developed residential complexes	Many misconnections in privately developed residential complexes
		Installation period	Many misconnections in work performed a long time ago when the change was made from convergent to divergent types
	Surface floodwater from manhole cover	Manhole structure/density	Much surface floodwater where manhole structures have large covers or the manhole density is high.
Seeping floodwater	Seeping floodwater from poor water tightness in public inlet	Manhole density	Much seeping floodwater where manhole density is high
		Installation period (years elapsed)	Public inlets installed a long time ago have deteriorated and are prone to a loss of watertightness which leads to seeping floodwater
	Seeping floodwater from manhole joints or pipe openings	Manhole density	Much seeping floodwater where manhole density is high
		Installation period (years elapsed)	Manholes installed a long time ago have deteriorated and are prone to a loss of watertightness which leads to seeping floodwater
		Underground water level	High underground water level results in vulnerability to seeping floodwater
		River level	The treatment area along the river links to the river water and the underground water level rises meaning seeping floodwater occurs from locations with poor water tightness.
	Seeping floodwater to main sewage pipes or attached pipes with poor water tightness	Installation period (years elapsed)	Pipes installed a long time ago have deteriorated and are prone to a loss of watertightness which leads to seeping floodwater
		Pipe type	Depending on the pipe type, the rate of cracking differs and watertightness is adversely affected
		Subterranean water level	Seeping floodwater prone to occurring when underground water level is high
		Terrain type	Permeability of ground depends on differences in terrain grade and earth chambers.
		Land use	Special waste water such as that from factories puts a load on pipes and increases deterioration
		Presence of springs	Seeping floodwater prone to occurring if springs are present in the vicinity.
		Main road	Pipes under roads in areas with heavy traffic are prone to damage from the weight of vehicles.
		Flow speed	Culverts with a high flow speed are prone to damage from erosion.
		Earth covering	Seeping floodwater occurs at locations where watertightness is poor because of a deep earth coverings below the water level of the river.
		River level	The treatment area along the river links to the river water and the subterranean water level rises, and seeping floodwater occurs from locations with poor water tightness.

3) Survey and countermeasures for floodwater during rain

We narrowed the area down efficiently into large blocks with an offsite survey taking into account the characteristics of the Tama area. Furthermore, in the offsite survey evaluation and narrowing down to medium size blocks, we presented methods for qualitative evaluation of the rise in water levels with a water level meter and digital photography as well as ones that identify floodwater by taking advantage of technology to measure water temperature, etc.

In places such as old residential complexes, some locations use manhole covers with a holes even for branched sewage pipelines, so covering these holes is a simple and cheap countermeasure. We also noted that attention should be paid to the fact that investigations should made into whether it is possible to implement countermeasures such as pipe renewal, etc., as a national subsidized operation by undertaking works classified as life extension plans regarding floodwater from culvert cracks and coupling misalignments.

(Summary)

The content of this research is planned to be distributed to the relevant towns and villages as the “Tama Area Rain Floodwater Countermeasure Promotion Manual”. By making use of this research and manual, contributions can be made to countermeasures for floodwater during rain in the towns and villages of the Tama area, and appropriate and effective sewage works can be implemented.

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