# Investigation on Peak Flow of the Single Cadastral Base Development by Urban Design Codes Regarding Water Retention in the Tanhai New Town, Taiwan

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## Highlights

- After installing of the detailed plan of the new town of Danhai, the recommended drainage and permeable water retention facilities for the retracted belt-shaped open space, the effect on regional flood reduction.
- With/without the urban design codes regarding water retention (which the retreat pedestrian area base for install drainage, permeation and water retention facilities) will be discussed the peak flow of short-duration intense rainfall intensity during the return period of 2, 5, 10 and 25 years.
- The results shows that keeping proper space in the single cadastral base development to set up drainage, permeation and water retention facilities will help reduce the risk of flood disasters in urban areas.

## Introduction

Taiwan is a subtropical island with an annual rainfall of 2500 mm. About 80% of rainfall concentrates in monsoon and typhoon seasons during April to October. Both of the metropolitan area's rapid land development and the climate change extreme rainfall's impact results in urban flood inundation, which inflicts disastrous losses of life and economy. Thus, the concept of disaster reduction has gradually incorporated into the code of the Taiwan's urban design in last years. For example, the Low Impact Development (LID) are used to increase the storage and infiltration of land, thereby delaying the time and decreasing discharge of peak flow into the drainage system.

The main purpose of this article is to follow the revised draft of the regional urban design review specification for the first phase of the detailed plan of the new town of Danhai, New Taipei City, Taiwan. after installing its recommended drainage and permeable water retention facilities for the retracted belt-shaped open space, the effect on regional flood reduction , Through the literature review, this research includes: storm management, low-impact development and water permeability specifications in the research area, understand the concept of storm management in urban planning, and set up low-impact development facilities, and the basis for setting up low-impact development facilities Refer to the relevant water retention specifications of Danhai New Town, and finally conduct follow-up analysis and discussion through the flow calculation results of runoff simulation software.

## Methodology

In this study, the Tanhai New Town of the New Taipei City located in northern Taiwan was used as the research area and the Storm Water Management Model (SWMM) was established using the sub-catchment of single cadastral base development. Then, with/without the urban design codes regarding water retention (which the retreat pedestrian area base for install drainage, permeation and water retention facilities) will be discussed the peak flow of short-duration intense rainfall intensity during the return period of 2, 5, 10 and 25 years.

Table 1 Summary of context settings

| Situation | Facility of LID | Area |
|---|---|---|
| Situation 1 | None | None |
| Situation 2 | Rain barrrel | Base area*0.045 |
| | infiltration gutter<br>permeable pavement<br>rain garden | Retreat ribbon open space area |

Table 2 LID facility installation detailed design suggestion table for facility installation

| (Retreat ribbon open space area) | Facility of LID | | |
|---|---|---|---|
| | (infiltration gutter) | (permeable pavement) | (Rain garden) |
| 3m(meter) | 1m | 2m | - |
| 6m | 1m | 3m | 2m |
| 8m | 1m | 3m | 4m |
| 10m | 1m | 6m | 3m |

## Results and discussion

The results present that the research area without the urban design code regarding water retention, the peak flow for the 2, 5, 10, and 25-year recurrence periods is 9.15 CMS, 10.87 CMS, 11.36 CMS, and 12.27 CMS, respectively. And the research area with the urban design code water retention, the peak flow for the 2, 5, 10, and 25-year recurrence periods is 7.70 CMS, 9.10 CMS, 9.63 CMS, and 10.94 CMS, respectively. Form the values indicate, using the urban design code water retention can effectively reduce the peak flow. The discharge decreased about 1.45 CMS (15.85%) in the 2-year return period, 1.77 CMS (16.28%) in the 5-year return period, 1.65 CMS (14.52%) in the 10-year return period, and 1.28 CMS (10.43%) in 25-year return period. Among them, the effect of 10-year recurrence period is the best. It shows that keeping proper space in the single cadastral base development to set up drainage, permeation and water retention facilities will help reduce the risk of flood disasters in urban areas.

## Conclusions and future work

The results shows that keeping proper space in the single cadastral base development to set up drainage, permeation and water retention facilities will help reduce the risk of flood disasters in urban areas.

In addition, the peak flow will be affected due to the size of the pedestrian areas space and the configuration of different drainage, permeation and water retention facilities settings by discussing the sub-catchment area divided base on a single cadastral base development. The subsequent research will focus on the pedestrian areas space and explore the peak flow reduction effects when different drainage, permeation and water retention facilities are configured.

# References

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