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Study on Runoff Allocation Responsibilities of Different Land Uses in a Single Catchment Area

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Abstract : In recent years, the rapid development of urban land in Taiwan has led to the constant increase of the areas of impervious surface, which has increased the risk of waterlogging during heavy rainfall. Therefore, in recent years, promoting runoff allocation responsibilities has often been used as a means of reducing regional flooding. In this study, the single catchment area covering both urban and rural land as the study area is discussed. Based on Storm Water Management Model, urban and rural land in a single catchment area was explored to develop the runoff allocation responsibilities according to their respective control regulation on land use. The impacts of runoff increment and reduction in sub-catchment area were studied to understand the impact of highly developed urban land on the reduction of flood risk of rural land at the back end. The results showed that the rainfall with 1 hour short delay of 2 years, 5 years, 10 years, and 25 years return period. If the study area was fully developed, the peak discharge at the outlet would increase by 24.46% -22.97% without runoff allocation responsibilities. The front-end urban land would increase runoff from back-end of rural land by 76.19% -46.51%. However, if runoff allocation responsibilities were carried out in the study area, the peak discharge could be reduced by 58.38-63.08%, which could make the front-end to reduce 54.05% -23.81% of the peak flow to the back-end. In addition, the researchers found that if it was seen from the perspective of runoff allocation responsibilities of per unit area, the residential area of urban land would benefit from the relevant laws and regulations of the urban system, which would have a better effect of reducing flood than the residential land in rural land. For rural land, the development scale of residential land was generally small, which made the effect of flood reduction better than that of industrial land. Agricultural land requires a large area of land, resulting in the lowest share of the flow per unit area. From the point of the planners, this study suggests that for the rural land around the city, its responsibility should be assigned to share the runoff. And setting up rain water storage facilities in the same way as urban land, can also take stock of agricultural land resources to increase the ridge of field for flood storage, in order to improve regional disaster reduction capacity and resilience.

Keywords : runoff allocation responsibilities, land use, flood mitigation, SWMM
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