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The Application of Dynamic Network Process to Environment Planning Support Systems

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Abstract : In recent years, in addition to face the external threats such as energy shortages and climate change, traffic congestion and environmental pollution have become anxious problems for many cities. Considering private automobile-oriented urban development had produced many negative environmental and social impacts, the transit-oriented development (TOD) has been considered as a sustainable urban model. TOD encourages public transport combined with friendly walking and cycling environment designs, however, non-motorized modes help improving human health, energy saving, and reducing carbon emissions. Due to environmental changes often affect the planners' decision-making; this research applies dynamic network process (DNP) which includes the time dependent concept to promoting friendly walking and cycling environmental designs as an advanced planning support system for environment improvements. This research aims to discuss what kinds of design strategies can improve a friendly walking and cycling environment under TOD. First of all, we collate and analyze environment designing factors by reviewing the relevant literatures as well as divide into three aspects of "safety", "convenience", and "amenity" from fifteen environment designing factors. Furthermore, we utilize fuzzy Delphi Technique (FDT) expert questionnaire to filter out the more important designing criteria for the study case. Finally, we utilized DNP expert questionnaire to obtain the weights changes at different time points for each design criterion. Based on the changing trends of each criterion weight, we are able to develop appropriate designing strategies as the reference for planners to allocate resources in a dynamic environment. In order to illustrate the approach we propose in this research, Taipei city as one example has been used as an empirical study, and the results are in depth analyzed to explain the application of our proposed approach.

Keywords : environment planning support systems, walking and cycling, transit-oriented development (TOD), dynamic network process (DNP)
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