E213

Enhancing Urban Resilience: The Impact of Extreme Rainstorm and Early Warnings on Beijing's Traffic Dynamics (English Presentation)

Xiaoyan LIU

Climate change leads to frequent and intense extreme weather, posing threats to densely populated urban areas. The non-engineering measure (early warning system, school closure, work from home) is an effective strategy for future adaptation, but research in megacities of developing countries remains limited. In this context, our study focuses on Beijing, the capital of China, examining a case of the 140-year rainstorm that occurred in late July 2023. Using 30-minute interval road congestion data, our study conducts a quantitative analysis of the urban operational rhythms. We found that citizens actively responded to the disaster event, reducing traffic pressure and travel exposure on rainy days. Specifically, when the red warning was issued, road congestion experienced a slight increase with an early rush hour, reflecting the preparatory actions before the rainstorm; while in the following three days, road congestion was below normal levels, indicating the cancellation of numerous activities during the rainstorm. The complex congestion dynamics can be categorized into three modes: the intensely changing evening peak, the locally changing off peak, and the relatively stable morning peak. We then clustered the urban internal spaces based on typical mode proportion and finally classified them using multi-source variates. It was found that population characteristics, location accessibility, and built facilities can effectively explain the road congestion change. Based on these findings, policy suggestions for extreme disaster response and future resilience enhancement are proposed.

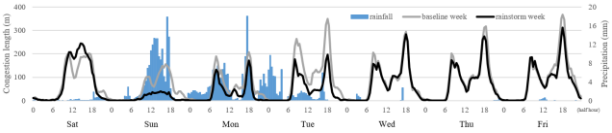

Fig1. Half-hour congestion sequences and rainfall sequence

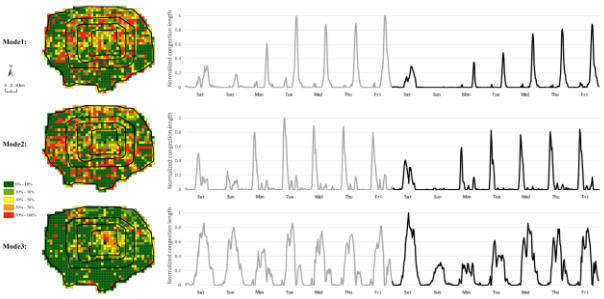

Fig2. Three modes obtained from matrix decomposition

Tab1. Average values of potential traffic influencing factors

Variable	Mode 1	Mode 2	Mode 3
Residential population	10907	11041	10642
Working population	8280	6354	8237
Entertainment population	11572	10078	12915
Time to Tiananmen	8.40	8.97	7.92
Time to CBD	8.98	9.97	8.42
Government agency number	18	17	19
Hospital number	7	6	8
Daily service number	31	27	31
Accommodation number	8	7	10
Catering number	63	46	71
Sports venue number	6	5	6
Leisure facility number	6	4	6
Scenic spot number	6	4	6