

Identifying Critical Links of a Transport Network When Affected by a Climatological Hazard

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Abstract : During the last years, the number of extreme weather events has increased. A variety of extreme weather events, including river floods, rain-induced landslides, droughts, winter storms, wildfire, and hurricanes, have threatened and damaged many different regions worldwide. These events have a devastating impact on critical infrastructure systems resulting in high social, economical and environmental costs. These events have a huge impact in transport systems. Since, transport networks are completely exposed to every kind of climatological perturbations, and its performance is closely related with these events. When a traffic network is affected by a climatological hazard, the quality of its service is threatened, and the level of the traffic conditions usually decreases. With the aim of understanding this process, the concept of resilience has become most popular in the area of transport. Transport resilience analyses the behavior of a traffic network when a perturbation takes place. This holistic concept studies the complete process, from the beginning of the perturbation until the total recovery of the system, when the perturbation has finished. Many concepts are included in the definition of resilience, such as vulnerability, redundancy, adaptability, and safety. Once the resilience of a transport network can be evaluated, in this case, the methodology used is a dynamic equilibrium-restricted assignment model that allows the quantification of the concept, the next step is its improvement. Through the improvement of this concept, it will be possible to create transport networks that are able to withstand and have a better performance under the presence of climatological hazards. Analyzing the impact of a perturbation in a traffic network, it is observed that the response of the different links, which are part of the network, can be completely different from one to another. Consequently and due to this effect, many questions arise, as what makes a link more critical before an extreme weather event? or how is it possible to identify these critical links? With this aim, and knowing that most of the times the owners or managers of the transport systems have limited resources, the identification of the critical links of a transport network before extreme weather events, becomes a crucial objective. For that reason, using the available resources in the areas that will generate a higher improvement of the resilience, will contribute to the global development of the network. Therefore, this paper wants to analyze what kind of characteristic makes a link a critical one when an extreme weather event damages a transport network and finally identify them.

Keywords : critical links, extreme weather events, hazard, resilience, transport network

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