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Landslides:

Collapse of a railway line

Erosion:

Caused by water

◀ Complete destruction of a section of road after a storm.

3 IMPROVING THE RESILIENCE OF ROADS TO CLIMATIC EVENTS AND NATURAL HAZARDS

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Technically, resilience refers to the ability of a road to adapt to any external event. A road is considered to be resilient when, repairs can be performed easily and rapidly after a destructive event so as to bring back the level of service as it was before the event.

Why do we need resilient roads

Damages caused by climatic events and/or natural disasters are frequent and diverse. It ranges from the complete destruction of a road section to its obstruction or the loss of its functional quality through cracking, deformation or rutting.

The natural events that occur most frequently:

- earthquakes,
- landslides,
- erosion,
- storms,
- underground cavities, etc.



▲ Collapse of a road as a result of the dissolution of gypsum in the subsoil.

Disasters caused by earthquakes are frequently quoted as an example to explain the need of resilient infrastructures. In a few seconds or minutes, an earthquake can, indeed, causes major damages and many casualties around its epicentre. The physical damages remain steady after the event, but the amount of casualties can double or even triple, if the access to the area is not rapidly restored for the emergency services. The water-networks, telecommunications and energy (electricity, gas), which are often associated with transport infrastructure, are also sorely lacking after an earthquake and supply failures make the situation even worse. Then, a critical health situation can pile-up on the natural disaster. In the case of gas or electricity outage, risks of explosions and fires can be added.

Some recommendations for implementation

The 5th Generation Road should be designed as resilient:

- Road designers will have, in advance, a list of the catastrophic events that are likely to affect the different road sections and a ranking of these events on the basis of the importance of each in the network².

- The infrastructure owner must specify the minimum level of use that must be maintained in case of hazard, and the maximum acceptable period during which the road may be unusable, i.e. the repair time

- The design file will allow the assessment of the economic and social risks if hazard occurs. The infrastructure owner would then be able to select the design solution or compensatory measures which would either enable the infrastructure to withstand the abovementioned hazard or allow it to be repaired under acceptable conditions.

“The 5th Generation Road should be designed as resilient.”

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2. To give an example, the RN2 on Reunion Island, which is priority road, has greater importance than a municipal road.



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Credit: left, J-L Durville;
right, Manier

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