Where do we begin?

Natural disaster has at ceased, information on blocked road links has been collected. Road network is broken up into several parts.

People and important biocultural heritage are cut off from the main network.

Once two or four remedial units are deployed at several stations and ready to work, connectivity and evacuation time are about to start, but which node should we cut?

Necessary steps:
1. Collect data from the entire network to know which road links are blocked.
2. Plan routes for remedial units which are available.
3. Repair immediately only the most important road links to secure connectivity of the road network. Other road links can be repaired later.

Road is not a graph, however, roads are usually planned from scratch.

Why is this issue still so complicated?
- Blocked links may cause road network break-up into several isolated components.
- This issue is an NP-hard problem, similar to the vehicle routing problem (VRP). The VRP components, as every entry and exit node exist in contrast to the common VRP however.
- NP-hard problems are not solvable in reasonable time by deterministic algorithms and therefore it is impossible to obtain the best solution.

This issue viewed from the graph theory:
1. A directed network with a set of which links which are undirected and blocked.
2. The number and localization of repair units is known in advance.
3. Minimize repair time spent by a unit if minimal routes are deployed, minimize the longest time.

Future works:
1. Implementation of the algorithm to allow an automatic construction of best road links.
2. Implementation of the loss function and the algorithm to cover further optimization criteria as: the number of cut-off people, importance of some nodes for the entire network, etc.

Behavior of the optimization process:
- Decrease of the number of cut-off people over simulation.
- Value of the loss function.

Publications: