

## An Iberian Study about Location of Parking Areas for Dangerous Goods

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**Abstract :** When lorries transport dangerous goods, there exist some legal stipulations in the European Union for assuring the security of the rest of road users as well as of those goods being transported. At this respect, lorry drivers cannot park in usual parking areas, because they must use parking areas with special conditions, including permanent supervision of security personnel. Moreover, drivers are compelled to satisfy additional regulations about resting and driving times, which involve in the practical possibility of reaching the suitable parking areas under these time parameters. The “European Agreement concerning the International Carriage of Dangerous Goods by Road” (ADR) is the basic regulation on transportation of dangerous goods imposed under the recommendations of the United Nations Economic Commission for Europe. Indeed, nowadays there are not enough parking areas adapted for dangerous goods and no complete study has suggested the best locations to build new areas or to adapt others already existing to provide the areas being necessary so that lorry drivers can follow all the regulations. The goal of this paper is to show how many additional parking areas should be built in the Iberian Peninsula to allow that lorry drivers may park in such areas under their restrictions in resting and driving time. To do so, we have modeled the problem via graph theory and we have applied a new efficient algorithm which determines an optimal solution for the problem of locating new parking areas to complement those already existing in the ADR for the Iberian Peninsula. The solution can be considered minimal since the number of additional parking areas returned by the algorithm is minimal in quantity. Obviously, graph theory is a natural way to model and solve the problem here proposed because we have considered as nodes: the already-existing parking areas, the loading-and-unloading locations and the bifurcations of roads; while each edge between two nodes represents the existence of a road between both nodes (the distance between nodes is the edge's weight). Except for bifurcations, all the nodes correspond to parking areas already existing and, hence, the problem corresponds to determining the additional nodes in the graph such that there are less up to 100 km between two nodes representing parking areas. (maximal distance allowed by the European regulations).

**Keywords :** dangerous goods, parking areas, Iberian peninsula, graph-based modeling

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