Métodos de Apoio à Decisão – Assignment 1

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Your company dominates the market of deliveries of small packets to home consumers in Portugal, and it currently needs to increase the capacity of its distribution center (DC). For that purpose, the company will reposition its DC in a strategic place, with the objective of minimizing delivery costs.

In continental Portugal, the forecasts for the number of yearly deliveries in each town are 3 deliveries per thousand inhabitants (rounded up to an integer).

For each delivery, consider a cost of 1 euro per kilometer. For computing the distance, consider the L1 norm: the sum of the distance along a meridian plus the distance along a parallel of latitude (the so-called *Manhattan distance*). Consider the Earth as a sphere with radius 6371.009 km.

For data concerning the towns considered and the respective population, see https://www.dcc.fc.up.pt/~jpp/mad1920/PopulationContPT-2020.csv.

1. Write a mathematical optimization model for the problem of minimizing the sum of the Manhattan distances from each of the cities to the DC. Solve the problem with GLPK and report the solution obtained. Identify the town which is closest to the optimal position of the DC.

2. Repeat the previous exercise, but consider the minimization of the total delivery costs.

3. With a DC at the optimal location, which is the town with the largest distribution cost?

Describe all the assumptions you have considered.

Note: *the deadline for handing the report is 13/MAR. Your report should ideally have 4 pages. Each working group should hand a printed version and send an e-mail with the report and programs. For ecological reasons, please to not bind your report; just insert it in a transparent file folder.*