Hub location

1. Problem description

Hydrogen is one of the core components of industrial transition towards climate neutrality. It is used as energy carrier to produce heat and electricity in energy-intensive industry and as a feedstock for producing green fuels, green steel, and green chemicals. In order to supply German industry with hydrogen, an infrastructure is required. To store hydrogen in large quantities, salt caverns are usually used. The cost to build salt caverns is approximated to 330 €per MWh hydrogen storage capacity (assuming a lifespan of 30 years). The data set "hydrogen_demand_-industry.xlsx" contains forecasts of yearly hydrogen demand in 2050 for each county in TWh.

2. Task

Formulate a hub location problem for building hydrogen storages to supply industrial hydrogen demand. Assume that hydrogen storages shall cover hydrogen demands for 30 days. Stock holding costs are assumed to be 3 €per MWh and month. Transport costs of hydrogen are set to 0.16 € per km and kg. Find locations and sizes of hydrogen storages such total distribution cost are minimized. Visualize demand in a heat map and assume that distances between counties can be approximated by Euclidean distances between county centroids. I.e., county centroids are assumed to be the storage sites of a county.