What drive my research is the necessity to find new energy solutions, accessible, local and extensively available, to reduce CO2 emissions. Energy from coal mines is one of the possibilities available in the UK. Indeed, most of the territory has been mines from coal, but today, these underground mines are abandoned, and flooded with a water that can reach 20 to 30 degree C. It is not the Icelandic heat, but using a GSHP system, this heat can be extracted and used to heat up space or water, for both domestic or industrial heating. The availability and accessibility of the resource is a real asset in the UK and in the Midland Valley of Scotland. In addition, mine reservoirs can be used to store heat from other input (i.e. data center), and this heat could be reused later on (i.e. winter time).

What interests me about this is the science behind it. Studying the geothermal potential of flooded mines involves understanding the hydrology and the heat sources in mines, the transfer mechanisms in a complex geological reservoir that has been modified by past the human activities. Mines can be a maze, formed of galleries, open voids (i.e. shafts, tunnels), and get a better understanding is necessary to understand the long term potential of heat extraction. The existence of shafts is another asset, avoiding the necessity to drill new borehole to access the heat. Moreover, the Coal Authority is already pumping water at some sites to avoid the discharge of polluted water on the surface environment. The opportunity is there, so why not using it?

One of the main issues in to know, to who belongs this heat? Even is delineating hydrological system can be possible and allow predicting the extent of the water resource used, this is not as simple for heat. Heat transfers can go through rocks. If extracting water implies exhausting the heat resource stored in rocks through conductive heat transfers between the water and the host rock and no balanced recharge is found, how will we know that we wont still some heat from the neighbour?

I am trying to establish a model (conceptual or numerical) that would help estimating the resource, by simplifying the complexity of mine reservoirs.

Seasonal production would moreover involved cooling/warming cycles that would impact stability of structure sin mines (pillars). And this is studies by Fiona.