1. Research field
   1. Research questions
   2. Research aim and objectives
   3. Take home message
2. Research design
   1. Methods
   2. Modeling code
   3. Case studies
      1. Bilston Glen
      2. Dawdon
3. Chapters
   1. Chapter 1:  heat extraction from borehole heat exchanger and shallow recharge potential
      1. GSHP technology
      2. Heat exchanger
   2. Chapter 2: Heat sources and distribution in coal mines
      1. Conceptual models
      2. Hydrology
      3. Heat flow
   3. Chapter 3: Mine modelling – importance of geometric features from mine plans
      1. Mine geometry (type of mining / mining methods)
   4. Conclusion: geothermal potential and sustainability opportunities
4. Time plan (Gantt chart)
5. Resources
   1. Budget (ressources available / needed)
   2. Data management plan
      1. Data repositories and version control
      2. Codes
   3. Training
   4. Conferences
   5. Teaching experiences
6. Supervisory arrangements and collaborations
7. Ethical and Health and safety considerations
8. References
9. What are the key heat recharge mechanisms in flooded coal mines?
   1. What are the sources of heat and the rate of heat production in coal mines?
      1. What is the share of radiogenic heat production?
      2. Are exothermic reactions (i.e. pyrite oxidation) a sustainable source of heat?
   2. What is the relative contribution from heat advection / diffusion during water/heat extraction and heat recovery/flooding?
      1. Where does the water come from and at which rate?
      2. What is the nature of the heat fluxes during production and recovery?
   3. Can thermal steady state (energy balance between heat extracted and heat recharge) be reached?
      1. What is the heat input required to get a long-term energy balance (no change in heat flux, temperature distribution in the mine and production temperature)
      2. What is the footprint area of heat extraction (i.e. volume of rock depleted in heat – where temperature drop relative to the initial undisturbed temperature can be measured)
10. What is the heat distribution /thermal state in mines?
    1. Has the geothermal gradient in mines returned to its initial undisturbed state after a mining period with dewatering and subsequent water recovery?
       1. Does dewatering and ventilation during mining affect the rock temperature?
       2. How long does it take to the local geothermal gradient to re-equilibrate with the regional gradient?
       3. What is the effect of water circulation in large voids on the heat distribution?
    2. Are the mine waters at equilibrium with the host rock temperature?
       1. How long does it take for the volume of water in tunnels to heat up to the surrounding rock temperature?
       2. What defines the temperature profiles within the shaft during periods without production and with production (i.e. number / depth of intersected coal seams, inflow temperature…)?
11. What are the key mine features needed to assess the heat potential of coal mines, at the scale of a mine or a network of interconnected mines?
    1. What is the effect of the followings on the rock-water heat exchange rate (i.e. rate of heat mining) and evolution of the production temperature?
       1. Flow path (i.e. tunnel) length
       2. Properties of the host rock (i.e. porosity, permeability) and/or contrasts in material properties with the mining area
       3. The geometry of the mining voids (i.e. room-and-pillar, goaf, roadway interconnections)
       4. Total void volume (i.e. galleries, goaf, fractured zone…)
    2. Does the mine geometry affect the heat distribution during heat extraction?
       1. How are the induced flux disturbed by the level of details of the mine geometry (i.e. from mine plans)?
       2. What is the footprint area of heat extracted?
       3. Can 2D vertical and horizontal models can faithfully represent 3D processes?
    3. Does the mine geometry (i.e. mining geometry, roadway network, depth of galleries) contribute to the heat recharge rate and return to equilibrium during flooding/heat recovery?