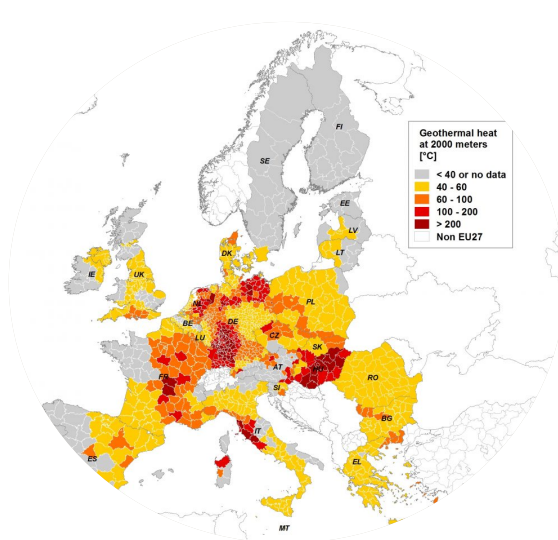


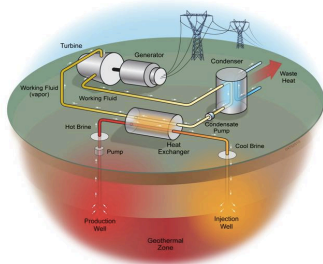
Geothermal Resources and Local Development in Poland

Katarzyna A. Kurek

15th International Scientific Conference on Energy and Climate, 12-14 Oct. 2022, Athens.

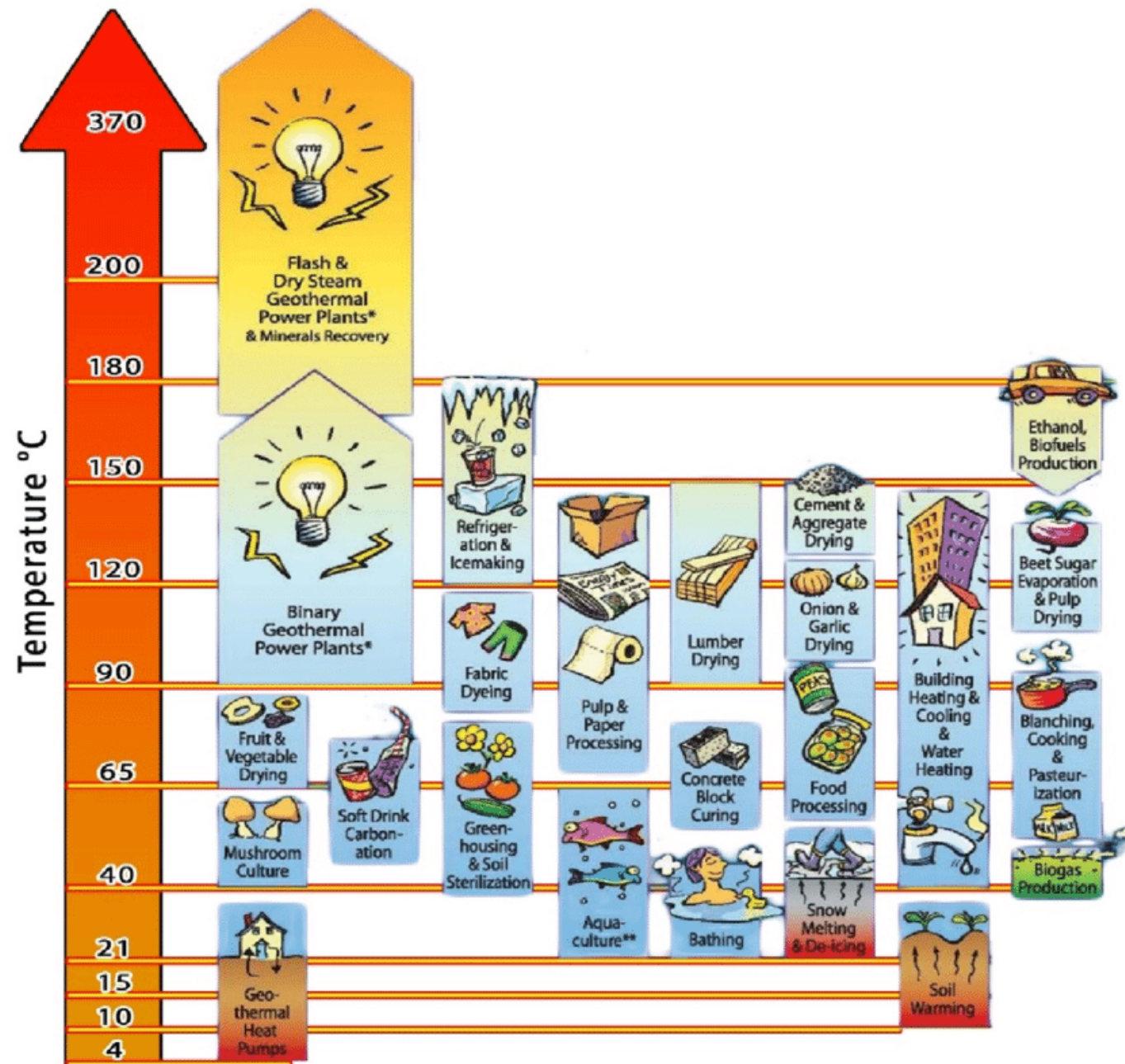


Geothermal exploitation is local



- Geothermal energy is a thermal energy of the Earth's crust and originates from the formation of the planet and radioactive decay of material. Water and/or steam carry the geothermal energy to the Earth's surface.
- Geothermal heat activities at the area of reservoir
- Maximal network transportation <30 km
- Available 24/7, non intermittent resource
- Inexhaustible provider of electricity and heat
- Sustainable source of energy
- No impact on the landscape
- Deep geothermal and local heat pumps

Lindal diagram



(Lindal, 1973)

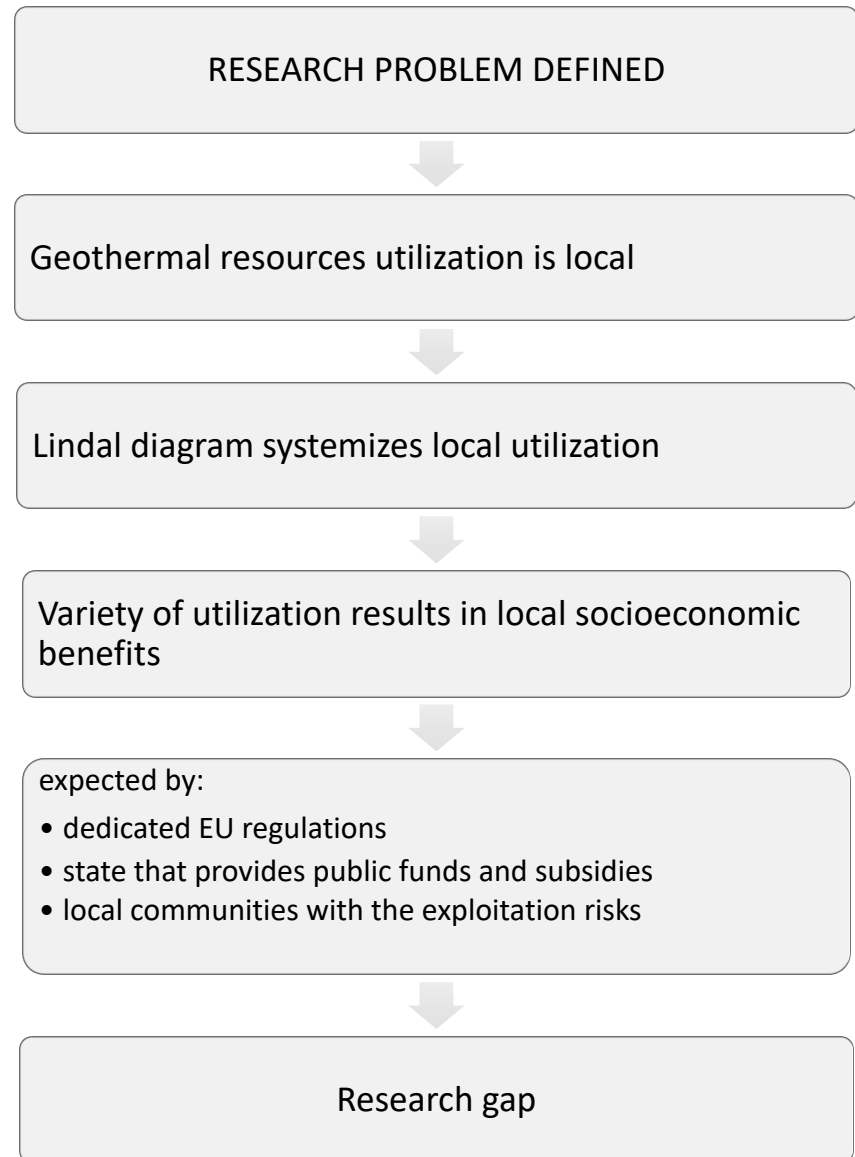
PhD study

- Wageningen University, the Netherlands
- doi:10.18174/542196
- Researcher at CZU, Prague
- CEO of Time & Place Institute, Brussels



Problem definition

- Direct (heat/water), indirect (power) and induced (derived activities) effect of geothermal resources use (Rybach 2003).
- Induced impact: change in the socio-economic structure.
- Research gap about the geothermal impact on local development.
- Need of policy recommendations.



Research Question and Research subject

- Main RQ: What is the impact of the geothermal resources utilization on the development of the municipalities in which they occur?
- Approach:
 1. statistical observation of local socioeconomic indicators of the geothermal municipalities and their relation with the resource usage.
 2. comparative analysis of employment structure between the geothermal municipalities and regions where located.
- Study subject: local development conceptualized as a model of socioeconomic variables for the NUTS-5 level of analysis.
- **reproducible studies**

How a local development is measured?

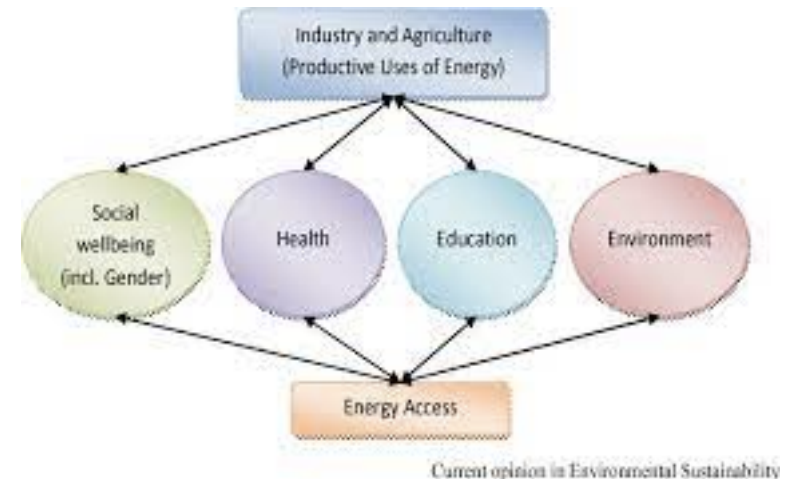
- Single indicator e.g. GDP
- Theoretical approach: i) normative: institutional framework, e.g.: UN- HDI; ii) theoretical: imposed by an economic theory, e.g. utility measures
- Data driven approach: no of socioeconomic indicators constructs a single series
- Choice of multicriteria measures: 1) what it to be measured, 2) how complex is the problem
- Choice of a multicriteria measures in the development economics or regional economics:
 - Universal measures: assessing progress toward a common goal (e.g. poverty alleviation- HDI, GDP etc)
 - Measures towards unique goals of a community- own measure (this study)

Studies overview

- **H: Introduction of a geothermal spa accelerates the socioeconomic development of the municipality in which it is established.**
 - Geothermal recreational and spa centers accelerate the socioeconomic development of a municipality.
 - Municipalities with lower development index observe faster trend of development related to the establishment of geothermal centers.
- **H: Exploitation of the geothermal resource has a positive impact on the competitiveness of a municipality.**
 - Significant relationship between local socioeconomic indicators and geothermal parameters.
 - Geothermal GJ production increase impacts 45% and geothermal bathing centers establishment 20% the increase of socioeconomic indicators growth of a municipality.
- **H: Geothermal resources utilization leads to an increase of employment in the trade and service sectors at the municipality level.**
 - Significantly higher employment is observed in the geothermal municipalities than in the reference regions.
 - Use of the geothermal resources in time notably changes local employment structure. Shift towards services and trades jobs, decreased traditional sectors employment (agriculture and heavy industry).

Theoretical background

- J. Schumpeter's legacy
- Endogenous growth theory
- Location theory
- Local development
- Cluster theory



Renewable Energy Communities legal background

- EU climate policies: Clean Energy Package, RED II, Electricity Directive.
- Concept emerged from actions of regionalising the energy transition.
- It acknowledges the development function of renewables beyond the energy provision.
- Generating energy locally means that profits and energy costs do not flow out of the region, and can help to bring down the cost of energy in the long run, whilst also inducing the emergence of local value chains. As installations are owned and operated at the regional level, new jobs are created both directly and indirectly.
- Geothermal: cases of regions, where the communities are owning/ managing the resources. Identification of socioeconomic benefits of geothermal energy for local economies is an important element for the future resources development.
 - Geothermal royalties system

Community based approach

- Geothermal energy harnessed in local communities is assumed to influence the economic landscape of a region. The research problem is hence to conceptualize theoretical determinants of the geothermal resources development impact on local communities.
- Geothermal resources development theories research.
- Research Question: *what is the theoretical background for analysing the development of the geothermal resources?*
- Communities discourse in the geothermal literature and EU policies (CORDIS, Green Deal programme- Coal Region Transitions).
- Clean energy for islands programmes based in developments funds e.g. Madeira, Azores, Martinique, Galapagos.

Power for everyone concept

- Development concepts place the communities in the center of energy transition, democratization of energy.
- Jeremy Rifkin's work shifts attention to decentralization of energy production and related benefits. Geothermal energy production is included in Rifkin's pillars of Third Industrial Revolution. Future in geothermal technology.
- Following Elinor Ostrom analysis, geothermal resources are the commons (natural resources in climate change actions). Sustainable local use of geothermal resources, cascade uses, creation of socio-technological networks, community managed exploitation.
- Evolution of Julian Steward Cultural Ecology concept. It bases on local resources use and creates identification. Introduces ecological culture. Modern interpretations lay foundation for local energy clusters.

Some conclusions

- Further regulatory accents on the RES community and dedicated programs (including geothermal energy). Introducing regional incentives, tax write-offs, risk insurance, etc.
- Case studies of successful geothermal communities and socioeconomic benefits of going 100% geothermal.
- Recommendation to search for theoretical and practical hybrid solutions.
- Further regionalization of the use of geothermal energy and incentives for greater commercialization of resources (apart from heating). Fit for 55?

Thank you

katarzyna.kurek@wur.nl

