FINAL REPORT

Geothermal economic impact data base

Project ID:	09-02-017
Coordinator:	Sveinn Agnarsson / University of Iceland
Start date:	March / 2010
Duration:	41 month
Partners:	Faculty of Economics, University of Iceland Natinal Energy Authority of Iceland Institute of Economic Studies, University of Iceland

1 Project summary

<Explain the projects achievements during whole project period, milestones and goal achieve. Inform about possible delays and complications and explain who it was handled. >

The specific objectives of this project were the following:

1. Compile time-series data from all geothermal energy utilities in Iceland, which show the number of customers (households and firms), how these customers have used the energy, prices and quantities.

2. Gather data from Statistics Iceland that can be used for input-output accounts.

3. Merge the compiled data set with data from Statistics Iceland to create geothermal input-output accounts, which maps how geothermal energy is used in Icelandic society.

Subtask	Start	Finish	Deliverable/Milestone
Compile data base	1. March 2010	31. Agust 2011	Data base
Create national I-O accounts	1. September 2011	31. August 2012	National I-O accounts
Create regional I-O accounts	1. September 2012	31. August 2013	Regional I-O accounts

The first stage of the project consisted of compiling and collecting data on the utilisation of geothermal resources from the National Energy Authority (NEA). This was completed in the spring of 2011. The dataset covers all public utilities during the period 1994-2009, for some utilities the data series are even longer. This includes information on number of consumers, technical issues, total revenue and sales to individual sectors and households.

The second stage consisted of assembling national input-output (I-O) accounts which details the flows of inputs and outputs in production within an economy. The input-output tables thus compiled were then used as a base for a social accounting matrix (SAM) which is a concise way of summarizing the national accounts. This in turn served as the basis for a computable general equilibrium model (CGE) written in the general algebraic modelling system (GAMS) language. As the name suggests, these models are general equilibrium models which hare heavily based on microeconomic theory, and are normally intended to describe the interaction of markets within a single economy, although they can be extended to encompass other countries. At first, a simple 2x2 model, with two sectors – geothermal and other sectors – was constructed and the model was then used to analyse the effects of changes in factor tax rate (capital and labour), as well as increases in each of the value-added tax rates. More complex 9x9 (with nine sectors) input-output tables were also developed where the energy sector was split, a little arbitrarily perhaps, into a geothermal sector, an electrical energy sector and a hydropower sector. These tables were then used to calculate impact multipliers that describe how changes in demand for one sector affect the rest of the economy.

The third stage of project consisted of analysing the regional importance of the geothermal resource. Originally, the intention was to construct regional input-output tables, but the data available did not allow for such disaggregated analysis. Instead, a thorough analysis was undertaken of how and to what extent Icelandic firms use geothermal water or heat in their production process. To this purpose, we conducted a survey among Icelandic firms which yielded interesting insights.

2 Project Management

The project is lead by Sveinn Agnarsson, Institute of Economic Studies, University of Iceland (UoI). Smaller decisions have been taken by the project leader, but larger decisions in consultation with Brynhildur Davisdottir, Faculty of Economics, UoI. Jonas Ketilsson, National Energy Authority has also been consulted and he served a pivotal role in combining and collecting data on utilisation of geothermal resources.

The first two parts of the project progressed pretty much as had been anticipated but we ran into difficulties with completing the third main objective, the regional input-output tables. The data available from Statistics Iceland and other sources do not allow for such disaggregated and spatial analysis, and after consultation with the GEORG management team it was decided instead to approach this objective from a slightly different angle, by conducting instead a survey on the geothermal-utilisation of Icelandic firms. The survey results give a fair account of the local importance of the geothermal resource.

3 Student involvement

Páll Kristbjörn Sæmundsson, MSc-student in financial economics, worked on the project during early 2011. He wrote his thesis on a topic linked to the project.

Guðmundur S. Guðmundsson, who completed his MSc in economics from LSE in the summer of 2011, worked on task 2 in the second year of the program (2011-2012). He was also responsible for constructing the input-output tables, the multiplier analysis and building the CGE model.

Önundur Páll Ragnarsson, BS-student in economics at UoI, conducted the survey among Icelandic firms on the utilisation of geothermal water and heat in their production process.

4 Publications and disseminations

Páll Kristbjörn Sæmundsson. 2012. Rekstur hitaveitna á Íslandi. Arðsemi og náttúruleg einokun. MS thesis in economics. University of Iceland. Available at: http://skemman.is/stream/get/1946/11367/28035/3/REKSTUR_HITAVEITNA_%C3%81_%C3%8DSLANDI_Lokaskjal.pdf.

Sveinn Agnarsson: Geothermal economic impact data base. Paper presented on GEORG Open House November 22nd 2012.

Sveinn Agnarsson. Business use of geothermal energy. Paper presented on GEORG Open House, January 14th 2015.

Páll Kristbjörn Sæmundsson. 2011. Hagræn áhrif nýtingu jarðvarma og gerð aðfanga- og afurðareikninga. Available at: http://hhi.hi.is/sites/hhi.hi.is/files/Annad_efni/2012/GEORG_hagraen_nyting_jardvarma.pdf.

Guðmundur S. Guðmundsson. 2012. The GEOEQ Model. A simple computational general equiilbrium model for the Icelandic geothermal sector. Available at: http://hhi.hi.is/sites/hhi.hi.is/files/Annad_efni/2012/GEORG_Geoeq_model.pdf.

Guðmundur S. Guðmundsson.2012. Input-Output Tables and Multipliers. Available at: http://hhi.hi.is/sites/hhi.hi.is/files/Annad_efni/2012/GEORG_I_O_9_model.pdf.

Önundur Páll Ragnarsson. 2013. Mikilvægi beinnar jarðhitanýtingar í atvinnustarfsemi á Íslandi. Available at: http://hhi.hi.is/sites/hhi.hi.is/files/Annad_efni/2012/GEORG_jardhitanyting_atvinnustarfsemi.pdf.

5 Cost statement

Most of the costs were incurred in the first two years of the project. Almost all costs consisted of wages and associated costs, as well as participant in-kind costs. The following table shows total costs and how the project was financed.

		Financing	
	Total costs	GEORG	IoES
Year 1	4.616.259	2.530.000	2.086.259
Year 2	5.319.052	3.000.005	2.319.047
Year 3	1.977.098	3.000.005	-1.022.907
Total	11.912.409	8.530.010	3.382.399