Business use of geothermal energy

Sveinn Agnarsson
Associate professor
School of Business

UNIVERSITY OF ICELAND
School of Business

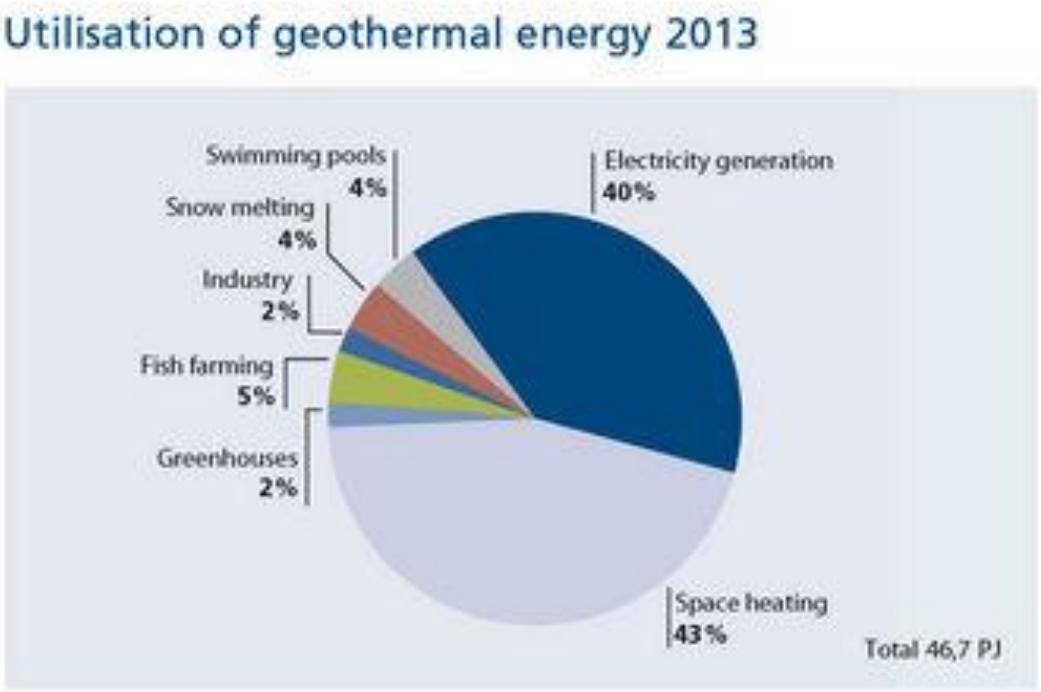
Aim of project: Analyse the social and economic impact of geothermal energy

- Compile time-series data on geothermal energy utilities
- Create geothermal input-output accounts
- Examine some of the social and economic impact

Social and economic impact

- Geothermal water
  - Space heating; homes and firms, 90% of households enjoy geothermal energy
  - Swimming pools and spas; social network, recreation and tourism. Around 140 of the country‘s 170 swimming centres use geothermal heat
  - Snow melting
  - Direct use by firms in the production process
  - Impact on health and general well-being

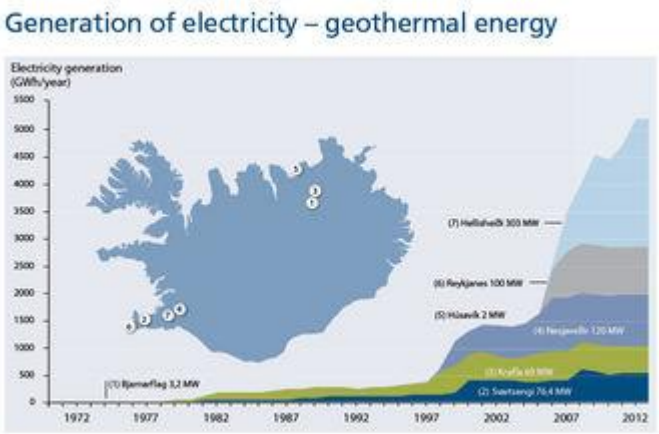
Direct use of the geothermal resource



Source: National Energy Authority

Social and economic impact

- Electricity generation
  - In 2013, installed generation capacity totaled 665 Mwe and the prodution 4,600 GWh, or 24.5% of the country‘s total production



Source: National Energy Authority

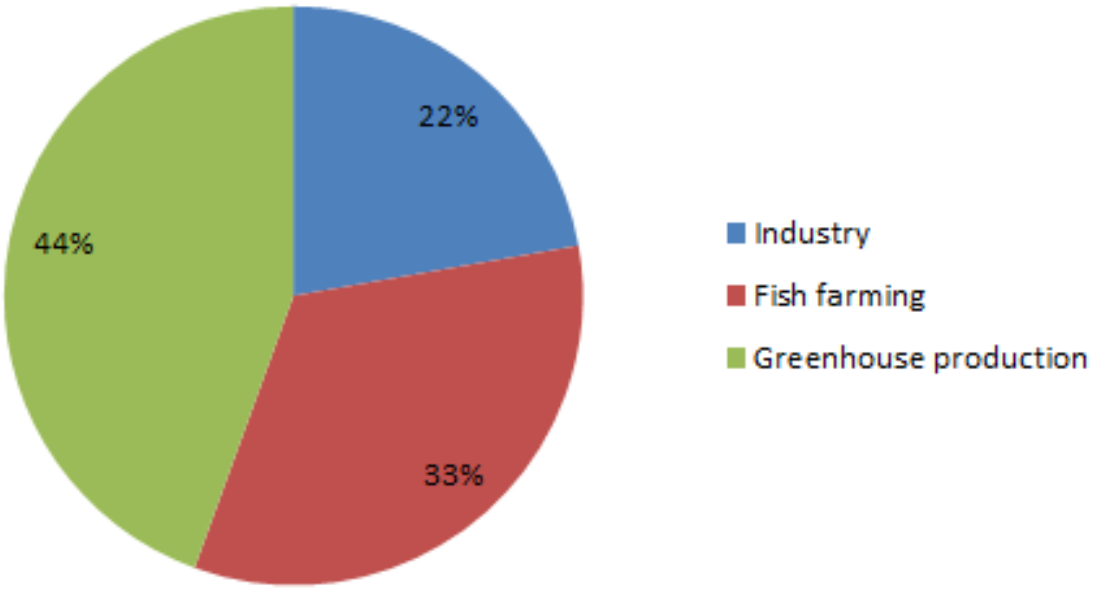
Firms directly using geothermal resources

Region	Community	Firm	Activity
Capital region	Garðabær	Toyota	Industry
	Reykjavíkurborg	Robwolf Fishing ehf.	Fish farming
	Mosfellsbær	Stofnfiskur	Fish farming
West	Akraneskaupstaður	Laugafiskur ehf.	Industry
	Borgarbyggð	Laxeyri ehf.	Fish farming
		Laugaland hf.	Greenhouse production
		Garðyrkjust. Varmalandi	Greenhouse production
		Svona ehf.	Greenhouse production
		Sólbyrgi ehf.	Greenhouse production
		Reitur	Greenhouse production
		Skrúður	Greenhouse production
	Eyja- og Miklaholtshr.	Fiskþurrkunin Miðhrauni	Industry
Westfjords	Ísafjarðarbær	Klofningur ehf.	Industry
		Dýrfiskur ehf.	Fish farming
	Reykhólahreppur	Hvanngarðar (áður Garðar)	Greenhouse production
		Þörungaverksmiðjan	Industry
	Súðavíkurhreppur	Saltverk	Industry
	Tálknafjarðarhreppur	Tungusilungur	Fish farming
		Dýrfiskur	Fish farming
	Vesturbyggð	Eldisvörr ehf.	Fish farming
Northwest	Húnaþing vestra	Gróðurhúsið Reykjum	Greenhouse production
	Sveitarfélagið Skagafj.	Hólalax	Fish farming
		Laugamýri	Greenhouse production
Northeast	Dalvíkurbyggð	Hausaþurrkun Samherja	Industry
	Norðurþing	Silfurstjarnan	Fish farming
		Fiskeldið Haukamýri	Fish farming
		Rifós	Fish farming
		Garðræktarfélag Reykhverfinga	Greenhouse production
		Léttsteypan	Industry
		GPG Fiskverkun	Industry
		Norðurlax hf.	Fish farming
	Þingeyjarsveit	Laugafiskur ehf.	Industry
East	Breiðdalshreppur	Veiðiþjónustan Strengir	Fish farming
	Fljótsdalshérað	Haustak	Industry

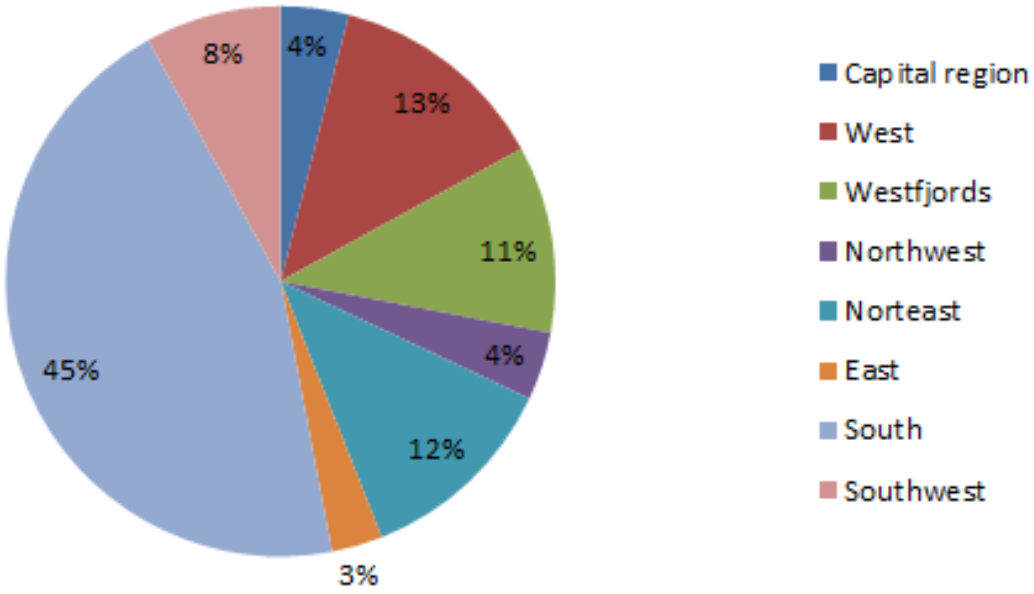
Firms directly using geothermal resources

Region	Community	Firm	Activity
South	Bláskógabyggð	Friðheimar	Greenhouse production
		Gufuhlíð	Greenhouse production
		Heiðmörk ehf.	Greenhouse production
		Bleikjubær ehf.	Fish farming
		Hveratún	Greenhouse production
		Garðyrkjustöðin Ösp	Greenhouse production
	Grímsnes- og Grafningsl	Garðyrkjustöðin Sunna	Greenhouse production
	Hrunamannahreppur	Gulrótaræktun í Auðsholti	Greenhouse production
		Flúðasveppir	Greenhouse production
		Garðyrkjustöðin Jörfi	Greenhouse production
		Bý ehf.	Greenhouse production
		Gróður ehf.	Greenhouse production
		Laugarland	Greenhouse production
		Land og synir	Greenhouse production
		Íslenskt grænmeti ehf.	Greenhouse production
		Silfurtún	Greenhouse production
		Varmalækur	Greenhouse production
		Reykjaflöt	Greenhouse production
		Flúðafiskur	Industry
	Hveragerðisbær	Garðplöntusalan Borg	Greenhouse production
		Garðyrkjustöð Birgis S. Birgissor	Greenhouse production
		Garðyrkjustöð Ingibjargar	Greenhouse production
		Græna félagið ehf.	Greenhouse production
		Kjörís	Industry
		Íslandsbleikja hf.	Fish farming
	Rangárþing ytra	Íslensk matorka	Fish farming
		Veiðifélag Eystri-Rangár	Fish farming
	Sveitarfélagið Hornafj.	Jöklableikja ehf.	Fish farming
	Sveitarfélagið Árborg	A.B.-skálinn	Industry
	Sveitarfélagið Ölfus	Stofnfiskur	Fish farming
		Íslandslax	Fish farming
		Ísþór	Fish farming
Southwest	Grindavíkurbær	Haustak	Industry
		Íslandsbleikja ehf.	Fish farming
		Stofnfiskur	Fish farming
		ORF líftækni	Greenhouse production
	Reykjanesbær	Stofnfiskur	Fish farming
	Sveitarfélagið Garður	Nesfiskur	Industry

Classification by industry



Geographical distribution



Geographical distribution

- Firms that directly utilise geothermal resources are found in 29 of the country‘s 74 communities
- Most of these firms are located in Hrunamannahreppur (12), Borgarbyggð (7), Hveragerði (7) and Norðurþing (7).

Direct utilisation

- Greenhouse production; indoor or outdoor heating of soil or atmosphere to increase productivity of enable the growing of certain products
- Fish farming; raise water temperature to increase the growth rate of fish and enable the farming of certain species

Direct utilisation

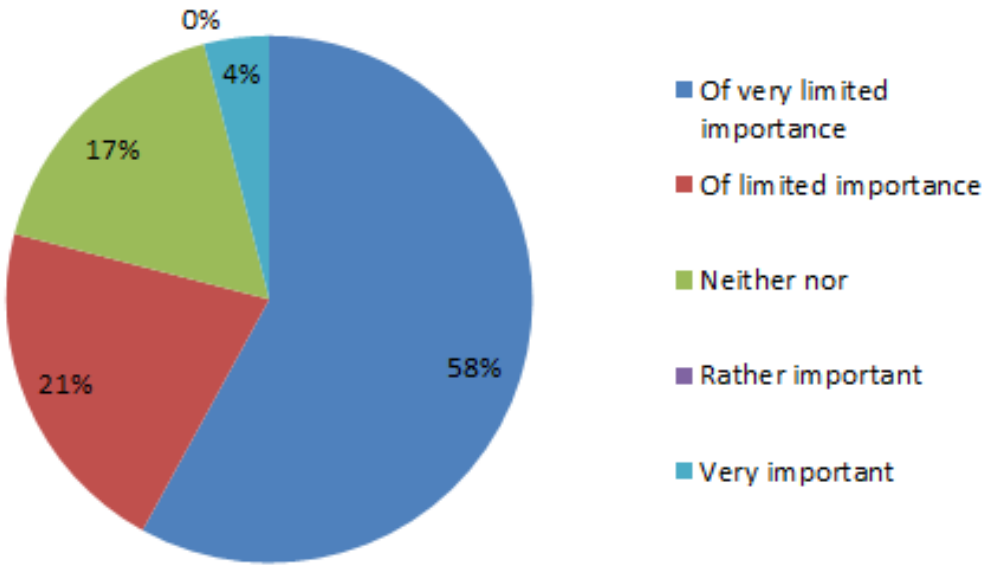
- Industry
  - Indoor drying of salted fish, stockfish, cod heads, small fish etc.
  - Drying of seaweed
  - Heating used in the pasteurisation of milk products in icecream production
  - Waterheated paintcabins used for spraypainting cars
  - Pre-heating, boiling and the drying process in salt production

Survey

- Survey undertaken in the summer of 2013
- Included firms that used geothermal energy directly in their production process
- 72 firms identified, 68 firms contacted, 24 took part

A question of clustering

- How important is it that your firm is close to others in the same branch?



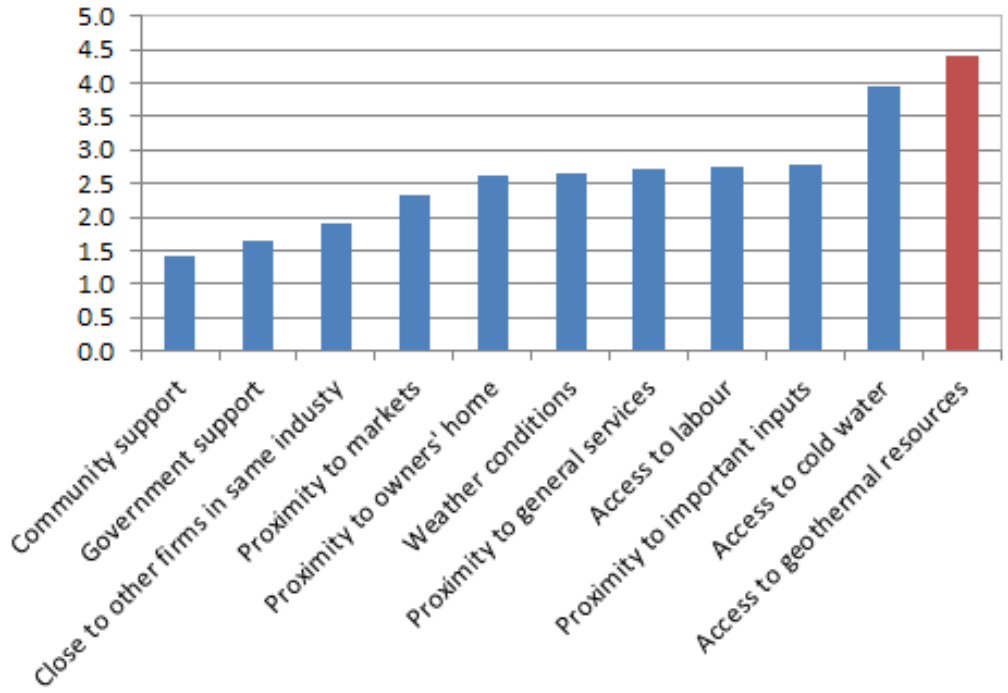
A question of clustering

- Replies coded from 1 (of limited importance) to 5 (very important). Average scores
  - Greenhouse production 2.0
  - Fish farming 1.43
  - Industry 1.57

  - For biological reasons not desirable to locate fish farms too close to one another

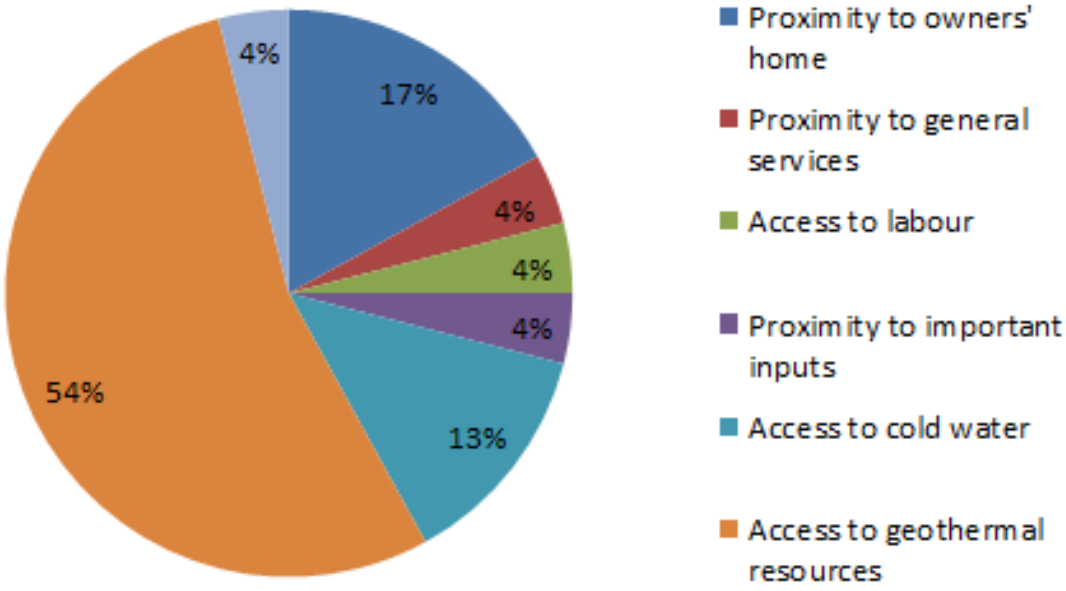
Importance

- How much did the following matter for the location of your firm?



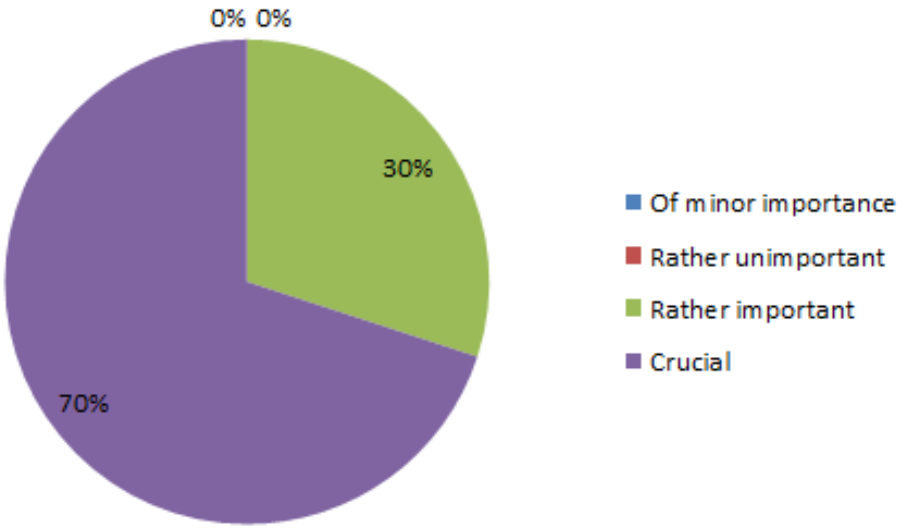
Importance

- What mattered most?



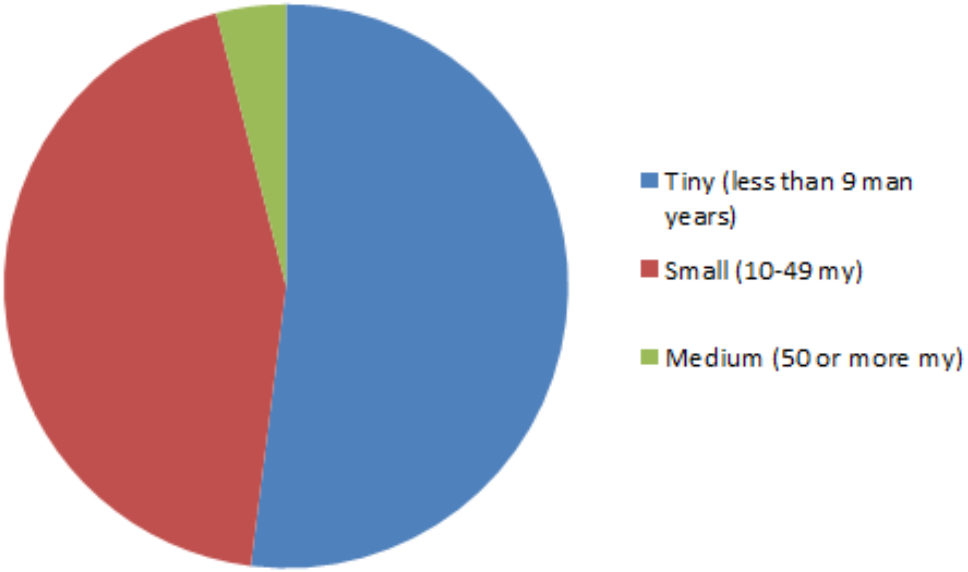
Importance

- How important is access to geothermal resources for your firm today ?



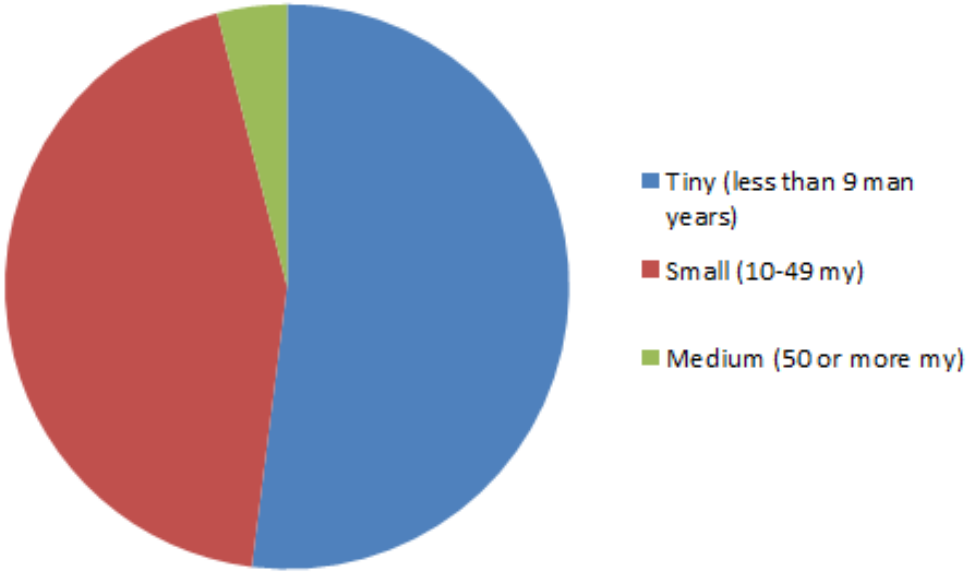
Firm size

- Size of firms employing geothermal resources directly in their production process. Man-years



Firm size

- Size of firms employing geothermal resources directly in their production process. Man-years
- Employed on average 13-14 peole.



Firm size

- Firm turnover in 2010-2012
- Larger than the average Icelandic firm

	2010	2011	2012
Total (ISK billion)	5.2	6.0	6.7
Average (ISK million)	322.9	377.0	419.3
All Icelandic firms (ISK billion)	2,856.4	3,025.0	3,261.3
Average (ISK million)	46.9	49.0	51.8

Importance for local economy

- How much of inputs (costs) is bought from local providers?
- How much of the products is sold locally?

Costs	
Share within local area	48.74%
Share within country area	56.09%
Revenue	
Share within local area	2.48%
Share within country area	3.95%

Conclusions

- Geothermal water used directly by 72 firms, most of which are involved in greenhouse production or fish farming
- Proximity to other firms not important
- Access to the geothermal resource usually crucial
- Employ around 14 people
- Higher turnover than the average Icelanic firm
- Depend on the local economy for inputs, sell to others.

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