

# UNU Geothermal Training Programme in Iceland: Role in Capacity Building for China's Geothermal Energy Development

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What is UNU-GTP?

## The Geothermal Training Program in Iceland (UNU-GTP)

is a postgraduate training program, aiming at assisting developing countries in capacity building within geothermal exploration and development.

The program consists of six months annual training for practicing professionals from developing and transitional countries with significant geothermal potential. Priority is given to countries where geothermal development is under way, in order to maximize technology transfer.

UNU Headquarters in Tokyo



The program has operated in Iceland since 1979. It is hosted by the Orkustofnun, The Icelandic National Energy Authority

The about 600 trained international Fellows have been an important capacity reserve for leading countries in the development of their geothermal resources like China, Kenya, Philippines and Indonesia.

The scientific reports from Fellows, expert lecturers and educational material has over the years accumulated to unique knowledge base that is electronically accessible

WEEK	Geothermal Geology	Geophysical Exploration	Reservoir Eng. & Borehole Geoph.	Chemistry of Thermal Fluids	Environmental Science	Geothermal Utilization	Drilling Technology	Project Managm. and Finances
1								
2								
3	Introductory Lecture Course and Group Project Work							
4								
5								
6								
7	Specialized Training: Lectures, Visits and Excursions							
8								
9								
10	Main Excursion							
11								
12	Specialized Training cont.							
13								
14								
15	Individual Project and Report Writing							
...								
26								

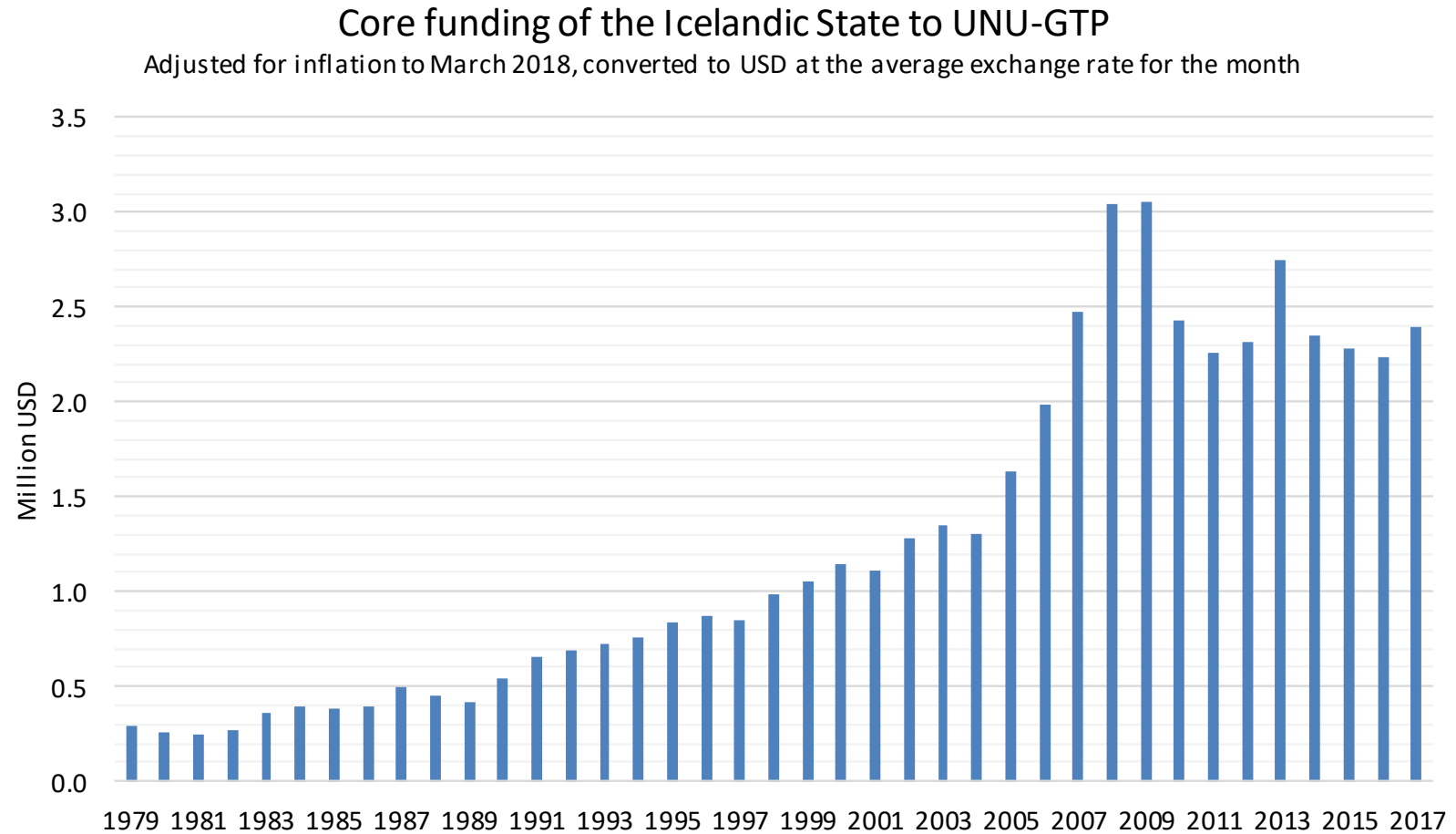
Group Project Work

# Organization Today

- Operated at **Orkustofnun** – the National Energy Authority of Iceland (OS) on a special contract between United Nations University (UNU), Government of Iceland (GoI) and Orkustofnun (OS)
- Five full time staff members
- General activities governed by a Board – meets about 2 times/year
- Academic activities governed by a Studies Board – meets 3-4 times/year
- Annually, 80-120 lecturers and support staff are hired from Iceland's leading geothermal institutes, universities, engineering companies or energy companies in line with the needs of the programme and its trainees at each given time

# Financial Support from the Government

- Base operations financed by Government of Iceland
  - In recent years amounted to **215-220 M ISK**
  - An increase in 2018 to **249 M ISK**
- Sponsored activities created **35-40%** extra income in 2012-2016 and more importantly extra job opportunities for Icelandic geothermal industry
- Current strong ISK is **difficult**



# Selection

Candidates for 6-month training are selected **by personal interviews** usually during site visits to the respective country or at short courses

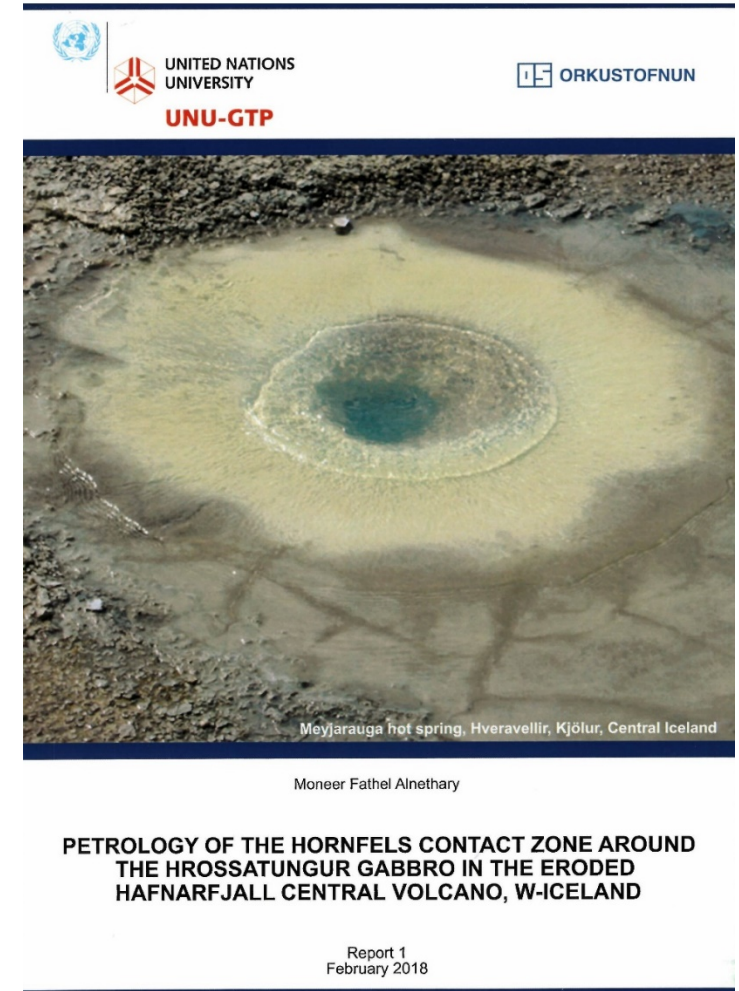
## Candidates

- .. must have a **permanent position** at a governmental energy company, research institution or university, and be nominated for this training by their institution
- .. should have at least **one year's practical experience** in geothermal work
- .. need to be fluent in **English**
- .. must have a **university degree in science, engineering** (or economics)
- .. should normally be **under 40 years** of age

**All candidates adhere to these criteria** including those privately sponsored

# MSc and PhD studies

- Carried out at the University of Iceland (UI) or Reykjavik University (RU)
- The 6-month training can fulfil 25% of the requirements (30 out of 120 ECTS units) for an MSc degree
- UNU-GTP Fellowships cover costs associated with living and studying in Iceland
- Research projects published by UNU-GTP
- PhD studies at the University of Iceland (to date)
- Dr Pacifica Ogola from Kenya was the first African to defend a PhD degree at University of Iceland in 2013 – Dr Thecla Mutia joined her in 2016



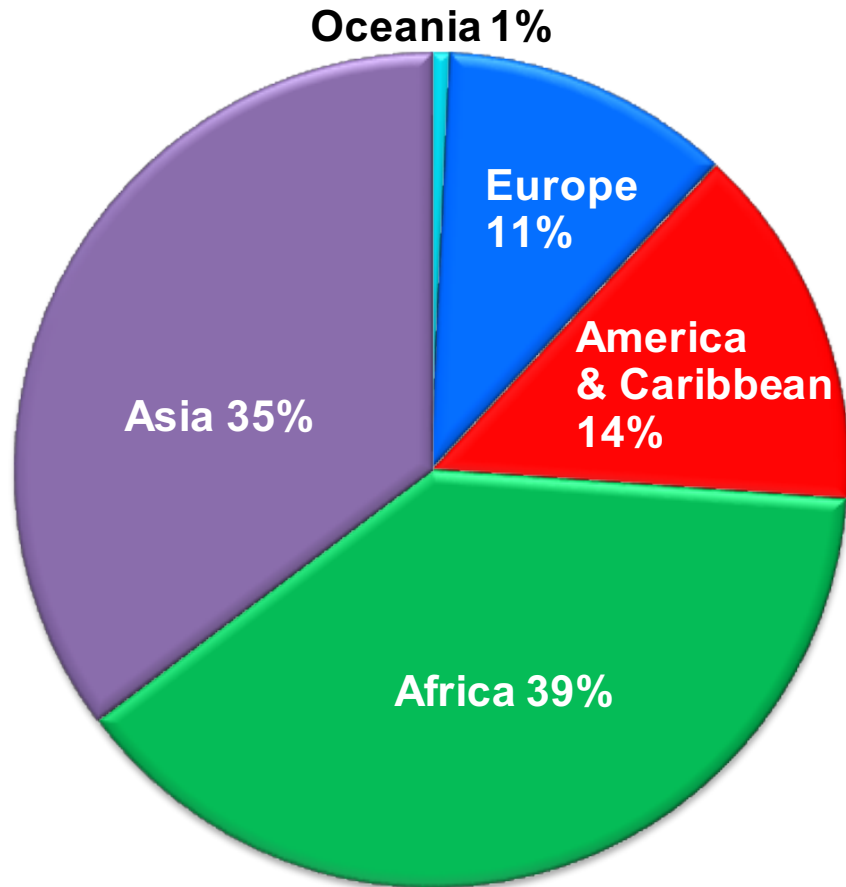


# Short Courses in Support of the UN Development Goals

- A special contribution of the Government of Iceland
- Series of Annual Short Courses on Geothermal Exploration and Development given in two continents, Africa, and Latin America and the Caribbean (LAC)
- UN Millennium Short Course series given during 2005-2015 – in Africa a total of 12 events with about 550 participants from 22 countries, and 8 events in LAC with 410 participants from 15 countries, adding 1 event in China with 120 participants
- Close cooperation partners in the African series have been the Kenyan geothermal companies **KenGen** (from the start) and **GDC** (from its establishment in 2009), and in the LAC series, the Salvadorian energy company **LaGeo**
- Series relaunched in 2016 in line with the recently agreed upon UN Sustainable Development Goals - SDGs with the same main partners

# Participation in UNU-GTP in Iceland

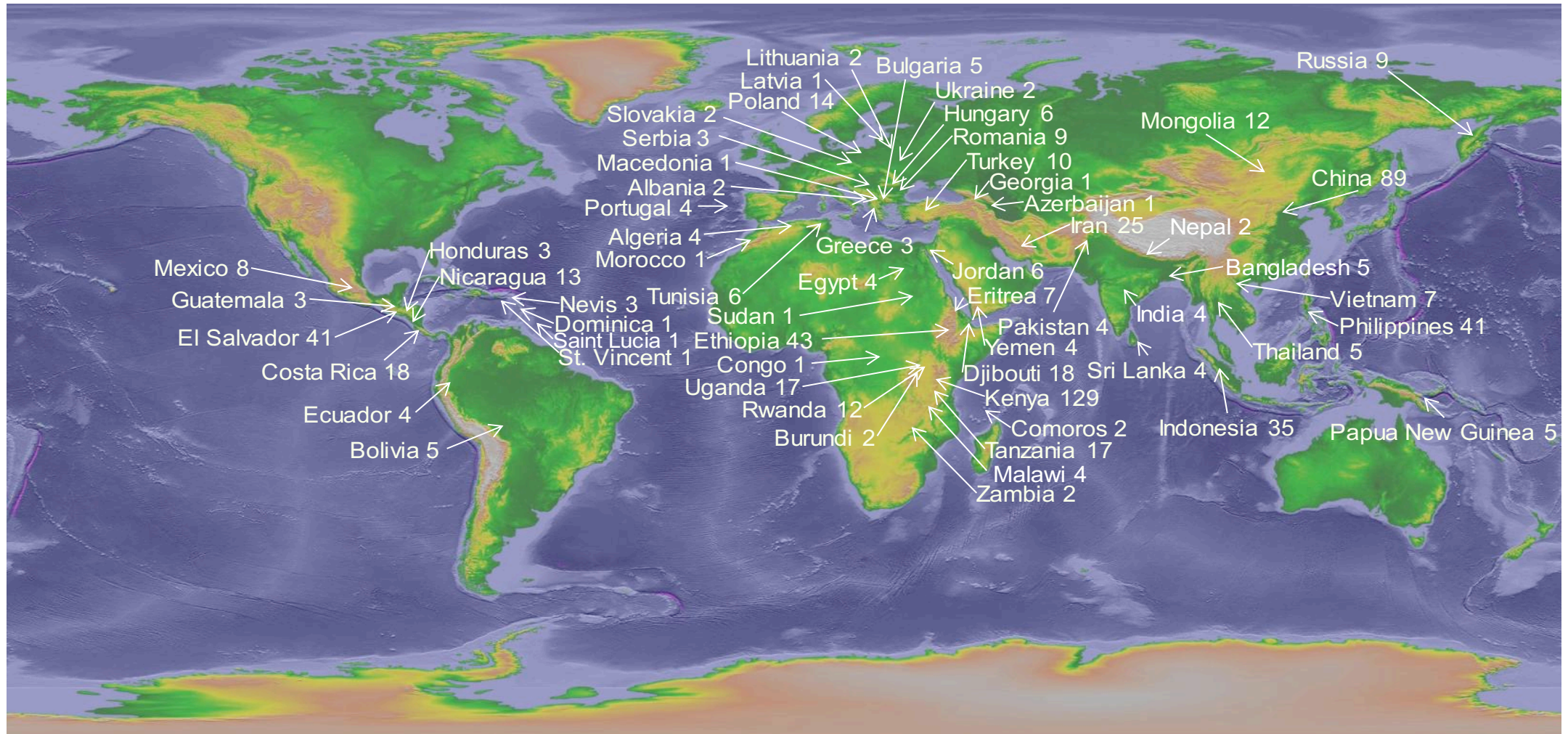
**1979 – 2018**



- 719 scientists and engineers from 61 countries have completed the 6-month specialized course – now given in 8 different lines of study
- Thereof 169 are women (24%) – in 2010s female participation has been 32%
- MSc programme with University of Iceland since 2000, and Reykjavik University since 2013: 61 graduates (Sept. 2018) – 10 presently enrolled
- PhD programme with UI from 2008 – first two defended PhD thesis in 2013 and 2016 – currently four are pursuing their studies
- Support to former UNU Fellows to attend WGC and UNU anniversaries, and other conferences

Lúdvik S. Georgsson, 2018

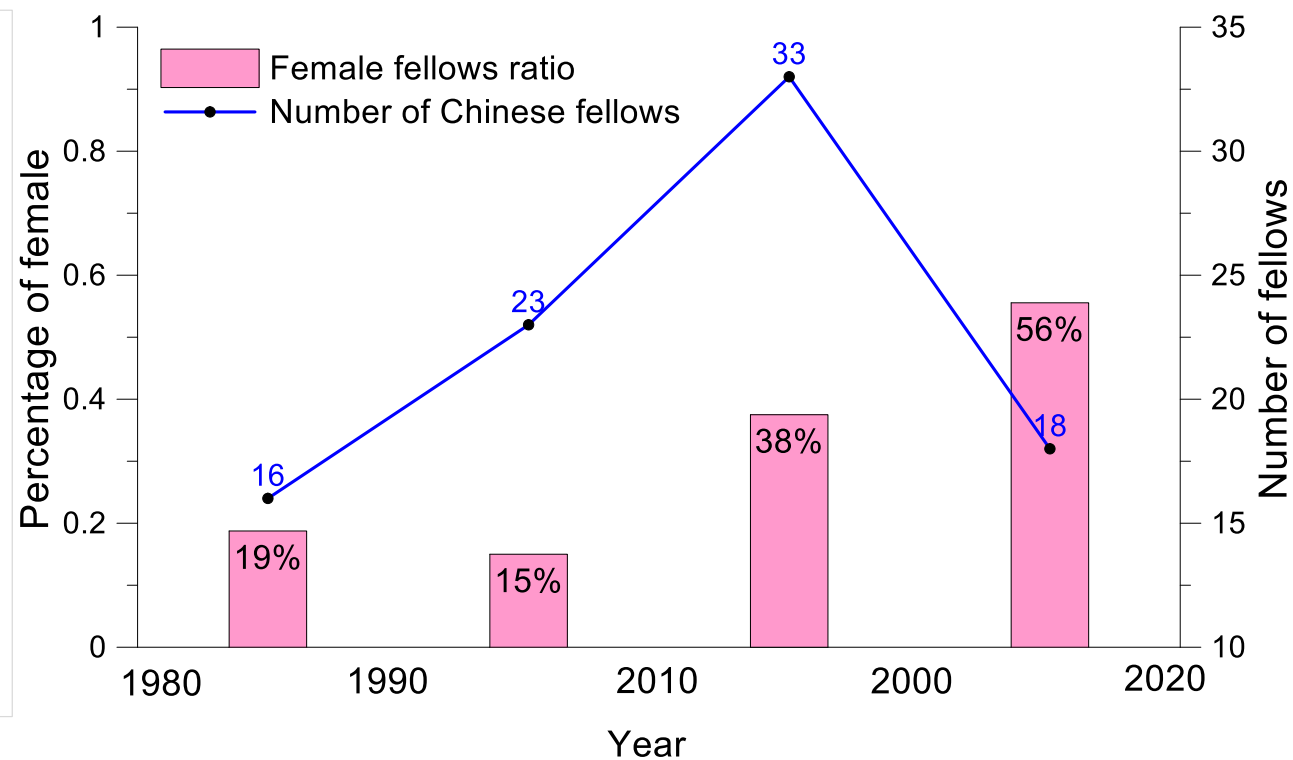
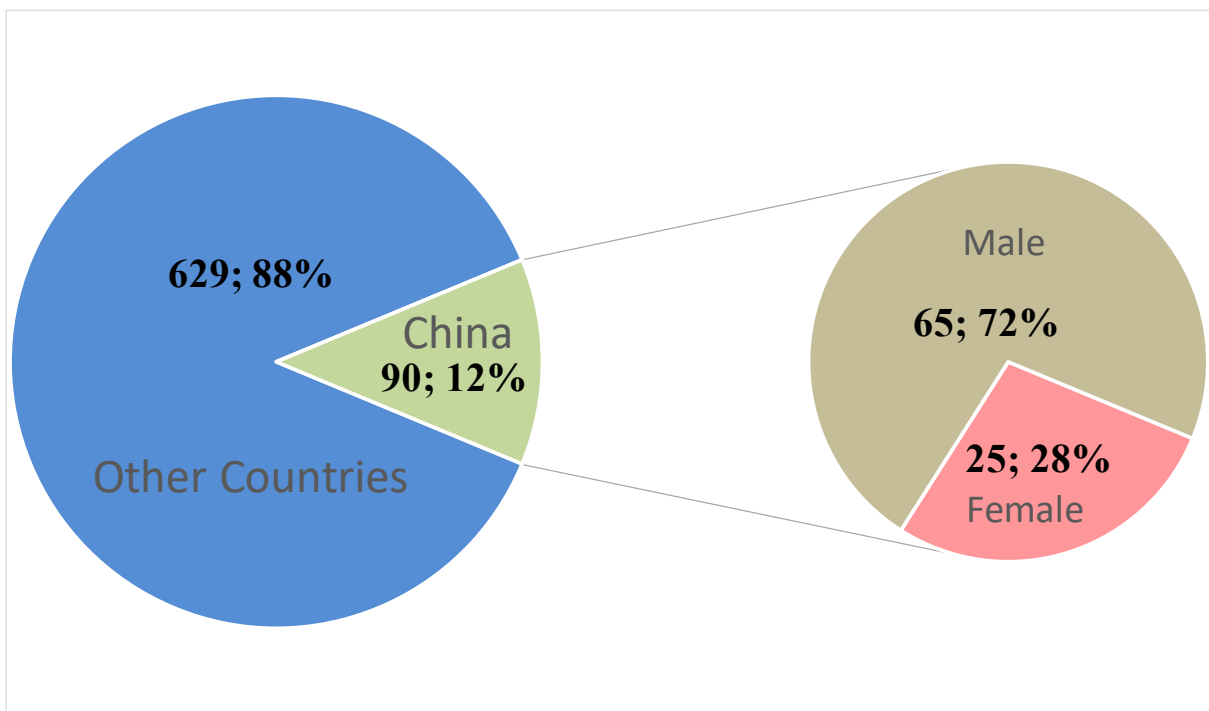
# Home Countries of UNU Fellows 1979-2018



Lúdvik S. Georgsson, 2018

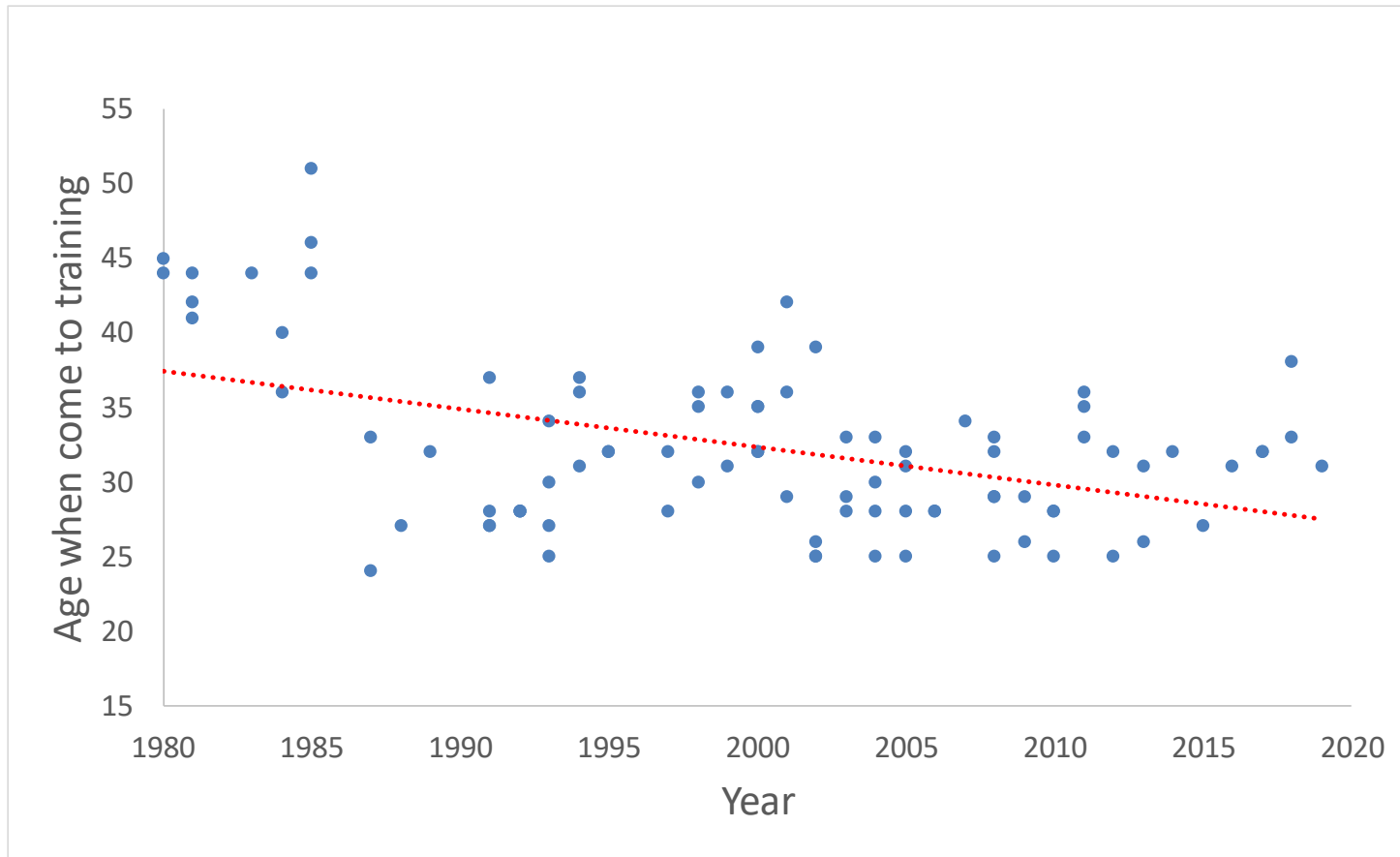
# The UNU-GTP Chinese Fellows

# Number and Gender



Passed by Kenya some year ago, become to the second largest group in the 6-month UNUGTP fellows.  
2 MSc, 1 PhD candidate, 1 visiting lecturer.  
Average female fellow ratio of all UNUGTP fellows ~24%, in 2010s ~32%.

# Age



- More project in geothermal industries.
- More people go to geothermal industries.



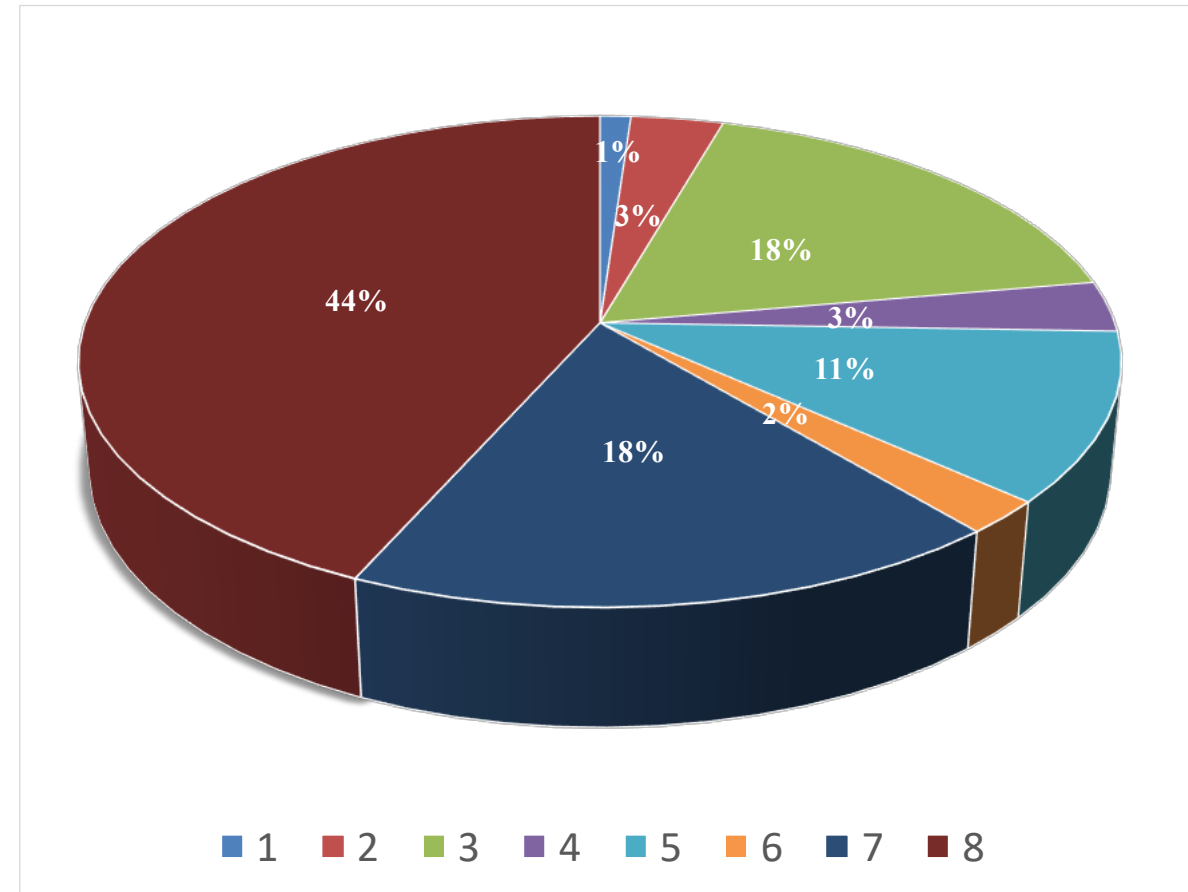
# Geographical distribution

- Fellows from 15 different cities, provinces and autonomous regions.
- Beijing (28), Tianjin (25), Hebei (13) and Tibet (5).
- Map shows well fellows played important role in the key geothermal development projects in China.



# Specialities

#	Specialities	Number of fellows	Female ratio
1	Borehole Geology	1	
2	Borehole Geophysics	3	
3	<b>Chemistry of Thermal Fluids</b>	<b>16</b>	<b>25%</b>
4	Drilling Technology	3	
5	<b>Environmental Science</b>	<b>10</b>	<b>50%</b>
6	Geophysical Exploration	2	
7	<b>Geothermal Utilization</b>	<b>16</b>	<b>31%</b>
8	<b>Reservoir Engineering</b>	<b>39</b>	<b>23%</b>



Focus on: (1).sustainable management of geothermal reservoirs, (2).chemistry of thermal fluids study, (3).design and engineering of geothermal utilization (mainly space heating) , (4)environment science for reduce the environment problems.



# World Geothermal Congress - WGC2015

## 96 UNU Fellows Attended the Melbourne Congress

More than 260 papers published from about 180 UNU Fellows  
WGC2020 in Iceland will hopefully be a great success



# WGC 2020 Abstract Situation

#	Chinese Author	Former/current fellows	Ratio
WGC2020(Reykjavik)	~170	~70	~40%
WGC2015(Melbourne)	~70	~20-30	~30%

# Communication and Cooperation

- Sino-Icelandic Geothermal Research and Development Center
- MOU between Orkustofnun and China Geological Survey
- Iceland School of Energy (RU)- Tianjin University, China Msc. Dual Degree Project
- Arctic green energy and Xiong'an geothermal space heating
- **Apply for WGC 2023 in Xiong'an, China**
- Arctic Circle China Forum
- **The ministry of educations signed mutual recognition of academic qualifications**
- **Iceland to help establish Sino-Icelandic Geothermal Training Programme in China/University**

# Future



- Will start operations in the next ten months.
- First be located in Beijing, but in the future in the green city of Xiong'an.
- Icelandic experience of direct geothermal utilization for heating is coming directly to utilization in China.
- Plan to take up to 150 students/yr
- About or over hundreds of Icelandic experts and scientists will come to the school under the guidance of the National Energy Authority.
- This collaboration can lead to companies coming to geothermal development in China

- Opportunities and Challenges !
- But the Future is surely to be bright!



Thanks for the Attention