

40th Anniversary

The UN Sustainable Development Goals Short Courses in Africa and Latin America

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UN Sustainable Development Goals (SDGs)

- A universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity
- 17 goals that build and expand on the Millennium Development Goals (MDGs) (8 goals)
- Adopted on September 25th 2015 and took effect in 2016
- Targets to be reached by 2030



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UN Sustainable Development Goals (SDGs)



Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all

- Affordable: Geothermal energy is affordable in comparison with other renewables
- Reliable: Geothermal provides base load power with a high capacity factor
- Sustainable: Appropriate management of resources can ensure long term utilization
- Modern: As modern as any thermal power plant
- Access: Over one billion people on the planet are without access to electricity – in the developing countries



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UNU-GTP training as a contribution towards reaching the SDG targets

- UNU-GTP has offered geothermal training to developing countries since 1979 that is well suited to assist the beneficiary countries in reaching SDG 7
- In addition, the training supports Goals 13 (Climate Action) and Goal 5 (Gender Equality) directly and various other goals indirectly (e.g. SDG 8: Decent Work and Economic Growth; and SDG 9: Industry, Innovation and Infrastructure)
- Since 2016, UNU-GTP has held Short Courses in support of the SDGs in cooperation with local partners in Kenya and El Salvador, which rest on the solid foundations of the earlier Short Course series held in support of the Millennium Development Goals



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The start of the Short Courses

- As part of its effort to support the Millennium Development Goals, the Icelandic Government pledged increased support to UNU-GTP in 2004, allowing the introduction of workshops and short courses in the developing countries, in cooperation with local partners
- Workshops for decision makers were held in Kenya in 2005, El Salvador in 2006 and China in 2008
- These were followed up with the MDG Short Courses in Kenya and El Salvador, targeted mostly towards young professionals in the beginning or early stages of their careers



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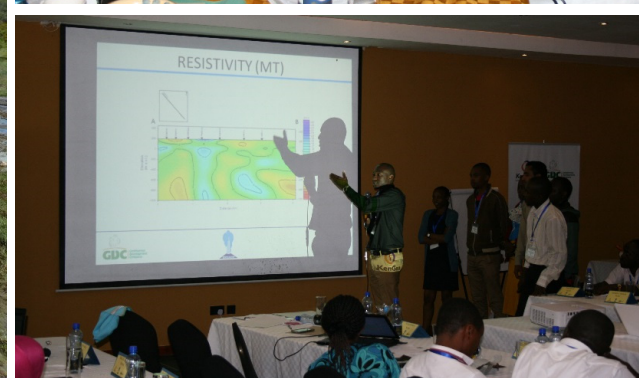
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UN Millennium workshop and short courses for Africa

Event	Main site	Dates	Duration (days)
Workshop for Decision Makers on Geothermal Projects and their Management	Naivasha, Kenya	Nov. 14 – 18, 2005	5
Short Course on Surface Exploration for Geothermal Resources	Naivasha, Kenya	Nov. 13 – 22, 2006	10
Short Course II on Surface Exploration for Geothermal Resources	Naivasha, Kenya	Nov. 2 – 17, 2007	16
Short Course III on Exploration for Geothermal Resources	Naivasha, Kenya	Oct. 24 – Nov. 17, 2008	25
Short Course on Geothermal Project Management and Development	Entebbe, Uganda	Nov. 20 – 22, 2008	3
Short Course IV on Exploration for Geothermal Resources	Naivasha, Kenya	Nov. 1 – 22, 2009	22
Short Course V on Exploration for Geothermal Resources	Naivasha, Kenya	Oct. 29 – Nov. 19, 2010	22
Short Course VI on Exploration for Geothermal Resources	Naivasha, Kenya	Oct. 27 – Nov. 18, 2011	23
Short Course VII on Exploration for Geothermal Resources	Naivasha, Kenya	Oct. 27 – Nov. 18, 2012	23
Short Course VIII on Exploration for Geothermal Resources	Naivasha, Kenya	Oct. 31 – Nov. 22, 2013	23
Short Course IX on Exploration for Geothermal Resources	Naivasha, Kenya	Nov. 2 – 23, 2014	22
Short Course X on Exploration for Geothermal Resources	Naivasha, Kenya	Nov. 9 – 30, 2015	22

Participation in the E-African Short Course Series 2005-2015													
Country	Kenya 2005	Kenya 2006	Kenya 2007	Kenya 2008	Ugan. 2008	Kenya 2009	Kenya 2010	Kenya 2011	Kenya 2012	Kenya 2013	Kenya 2014	Kenya 2015	Tot.
Algeria			1					1					2
Burundi				2	1	2	2	1	2	2	1	1	14
Cameroon										1	1	1	3
Comoros			2			2	3	2	1	1	2	1	14
D.R. Congo				1	1			1	3	3	2	2	13
Djibouti		2	1	2	3	2	2	3	2	3	2	3	25
Egypt			1									1	1
Eritrea	2	3	2	2	1	2		2		2	1	2	19
Ethiopia	5+2	3	1	2	3	3	1	3	3	3	3	3	35
Kenya	6+9	10	13	18		21	31	30	28	32	30	28	256
Malawi							3	3	2	3	1	2	14
Morocco							1						1
Mozambique							1	1	2	1	1	1	7
Niger										1			1
Nigeria									2	2	1	1	6
Rwanda			2	2	1	3	3	4	6	3	2	2	28
Sudan									2	3	2	1	8
Tanzania	2	2	2	2	4	3	3	2	3	2	3	7	35
Uganda	4	3	3	2	5	3	2	2	3	2	3	3	35
Zambia				2	2	2	3	2		3	1	2	17
Zimbabwe											1		1
Yemen			2	2	1	2	1	1	2	2	1	1	15
Others					2					1			3
Total	30	23	30	37	24	45	56	58	61	70	58	62	554

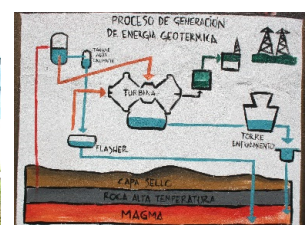


Millennium workshop and short courses for Latin America and the Caribbean

Event	Main site	Dates	Duration (days)
Workshop for Decision Makers on Geothermal Projects in Central America	Santa Tecla	Nov. 27 – Dec. 2, 2006	6
Short Course on Geothermal Development in Central America: Resources Assessment and Environmental Management	Santa Tecla	Nov. 15 – Dec. 1, 2007	7
Short Course on Surface Exploration for Geothermal Resources	Santa Tecla	Oct. 17 – 30, 2009	14
Short Course on Geothermal Drilling, Resource Development and Power Plants	Santa Tecla	Jan. 16 – 22, 2011	7
Short Course IV on Geothermal Development and Geothermal Wells	Santa Tecla	Mar. 11 – 17, 2012	7
Short Course V on Conceptual Modelling of Geothermal Systems	Santa Tecla	Feb. 24 – Mar. 2, 2013	7
Short Course VI on Utilization of Low- and Medium-Enthalpy Geothermal Resources and Financial Aspects of Utilization	Santa Tecla	Mar. 23 – 29, 2014	7
Short Course VII on Surface Exploration for Geothermal Resources	Ahuachapán and Santa Tecla	Mar. 14-22, 2015	8

PARTICIPANTS IN SHORT COURSES IN EL SALVADOR

Country	Workshop 2006	SC 2007	SC 2009	SC 2011	SC 2012	SC 2013	SC 2014	SC 2015	Total
Bolivia					1			3	4
Chile					5	5	4	2	16
Colombia				5	2	4	2	3	16
Costa Rica	X	6	7	6	1	2	3	2	27+
Dominica			2	2	2	1	1	1	9
El Salvador	X	22	9	23	28	18	26	16	142++
Ecuador				1	2	3	2	3	11
Guatemala	X	1	1	2	1	2	2		9+
Honduras		2	2	5	2	4	1	1	17
Mexico		1		3	6	6	3	2	21
Montserrat							1	1	2
Nevis			2	2	1	2	2		9
Nicaragua	X	13	7	13	11	11	5	4	64+
Peru						3	1	2	6
St. Vincent								1	1
Others			2		3		2		7
Total	50	45	32	62	65	61	55	41	411



Launching of the new SDG Short Course series in 2016

- Basic setup similar as in the earlier short courses series, but:
 - It is all about geothermal energy (Goal 7)
 - With greater attention to the **concept of sustainability** (overall theme) and **actions to combat climate change** (Goal 13)
 - The nomination of **women** is encouraged as in earlier courses (Goal 5)



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SDG Short Courses for Latin America and the Caribbean

- The first SDG Short Course for the LAC region was held in El Salvador in cooperation with LaGeo during September 4-10, 2016:
 - SDG Short Course I on sustainability and environmental management of geothermal utilization, and the role of geothermal in combating climate change
 - 68 participants from 14 countries
 - Lectures, project work, field trip
- It was decided to make the course an integral part of the *Geothermal Diploma Course for Latin America*, a 5 month program held at the University of El Salvador with the support of LaGeo and UNU-GTP, and sponsored by the Nordic Development Fund and the Icelandic Ministry for Foreign Affairs



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SDG Short Courses for Latin America and the Caribbean

- The second course was held during September 17-23, 2017
 - SDG Short Course II on Feasibility Studies for Geothermal Projects
 - 66 participants from 14 countries
 - Lectures, project work, field trip
- Launching of the El Salvador chapter of Women in Geothermal (WING)



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SDG Short Courses for Africa: Exploration and Development of Geothermal Resources

- Held in cooperation with KenGen and GDC
- Although the emphasis of the African courses was still on surface exploration, they went through some restructuring, e.g.:
 - New subjects were introduced so that the course now covers most aspects of geothermal development (albeit superficially), including the rational management of resources
 - Project work moved and extended to cover low to medium enthalpy resources in addition to high enthalpy resources
 - Shortened by one day
- There has been discussion to tie the courses to the African Geothermal Centre of Excellence, where it could serve as a first introductory module in a wider geothermal curriculum



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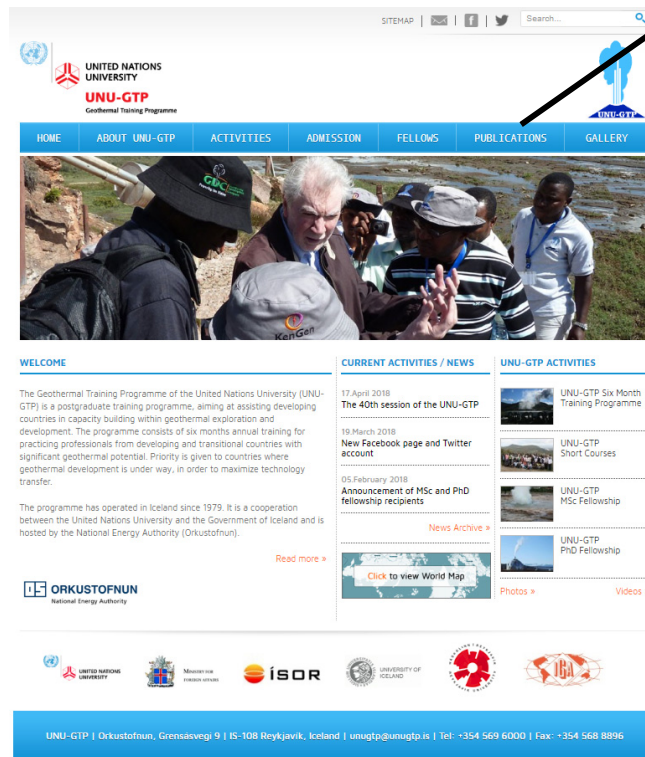
PROGRAMME FOR SDG SHORT COURSE I IN KENYA IN 2016

Dates	Programme	No. lectures	Practicals	Lecturer/Supervisor		
				Local	Neighb.	Iceland
Nov. 10	Arrival at Lake Bogoria					
Nov. 11	Introductory lectures	8		7		
Nov. 12-15	Site visits to geothermal fields / field work		X	16		
Nov. 16	Site visit Menengai, drive to Naivasha		X	3		
Nov. 17	Introduction and geology - Lectures	10		4		3
Nov. 18	Geophysics and geology – Lectures and excursion	7	X	6		3
Nov. 19	Geophysics and geochemistry - Lectures	10		4		2
Nov. 20	Geochemistry and exploration – Lectures and case studies	8	TEST	3		3
Nov. 21	Drilling, borehole geology, logging and testing, resource assessment - Lectures	7	X	7		1
Nov. 22-25	Project work in groups – Conceptual models and siting of wells in high and low temperature fields		PROJECT	9		2
Nov. 25-26	Seminar on geothermal in Africa – Contribution of African guest lecturers	19		2	5 + 10*	1
Nov. 27	Modelling and management of resources, environmental, societal and regulatory issues - Lectures	10		8	6 (+11*)	2
Nov. 28	Field trip to Olkaria – Power plants, flower farm, geoth. spa		X	3		
Nov. 29	Utilization, planning, project management, and economics	12		12		
Nov. 30	Test, question game, course review, closing		TEST			
Dec.1	Departure of participants				* Particip.	

Publication

- Most formal lectures in the UN Millennium Short Course series have been accompanied by a paper published on a CD and on the UNU-GTP website:
 - 102 papers from the 3 MDG workshops (Africa 17; LAC 35; Asia 50)
 - 731 papers from the MDG short courses (Africa 517; LAC 214)
 - 73 papers from the SDG short courses (Africa 53; LAC 20)
 - A total of 906 papers from events supporting the UN development goals
- The MDG and SDG workshops and short course series have promoted reporting on the status of geothermal development in the developing countries and contributed to an extensive body of information that is publicly available in English
- <http://www.unugtp.is/en/publications/workshops-and-short-courses>

The papers



WELCOME

The Geothermal Training Programme of the United Nations University (UNU-GTP) is a postgraduate training programme, aiming at assisting developing countries in capacity building within geothermal exploration and development. The programme 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.

The programme has operated in Iceland since 1979. It is a cooperation between the United Nations University and the Government of Iceland and is hosted by the National Energy Authority (Orkusstofnun).

ORKUSTOFNUN
National Energy Authority

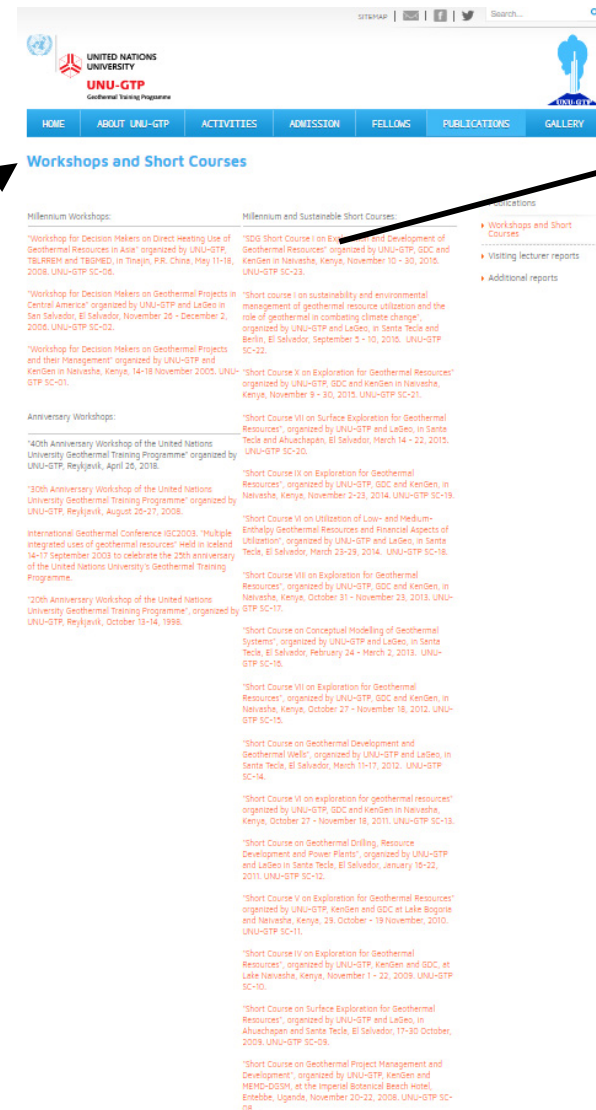
CURRENT ACTIVITIES / NEWS

- 17 April 2018
The 40th session of the UNU-GTP
- 19 March 2018
New Facebook page and Twitter account
- 05 February 2018
Announcement of MSc and PhD Fellowship recipients

[Read more »](#)

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Workshops and Short Courses

Millennium Workshops:

- "Workshop for Decision Makers on Direct Heating Use of Geothermal Resources in Asia" organized by UNU-GTP, TBK/REN and TBQ/RED, in Tianjin, P.R. China, May 11-18, 2008. UNU-GTP SC-08.
- "Workshop for Decision Makers on Geothermal Projects in Central America" organized by UNU-GTP and LaGeo in San Salvador, El Salvador, November 25 - December 2, 2006. UNU-GTP SC-02.
- "Workshop for Decision Makers on Geothermal Projects and their Management" organized by UNU-GTP and KenGen in Naivasha, Kenya, 14-18 November 2005. UNU-GTP SC-01.

Anniversary Workshops:

- "40th Anniversary Workshop of the United Nations University Geothermal Training Programme" organized by UNU-GTP, Reykjavik, April 26, 2018.
- "30th Anniversary Workshop of the United Nations University Geothermal Training Programme" organized by UNU-GTP, Reykjavik, August 20-27, 2008.
- International Geothermal Conference (IGC2008), "Multiple integrated use of geothermal resources" held in Iceland 14-17 September 2003 to celebrate the 25th anniversary of the United Nations University's Geothermal Training Programme.
- "20th Anniversary Workshop of the United Nations University Geothermal Training Programme", organized by UNU-GTP, Reykjavik, October 13-14, 1986.

Millennium and Sustainable Short Courses:

- "SDG Short Course I on Exploration and Development of Geothermal Resources" organized by UNU-GTP, GDC and KenGen in Naivasha, Kenya, November 10 - 30, 2016. UNU-GTP SC-23.
- "Short Course I on sustainability and environmental management of geothermal resource utilization and the role of geothermal in combating climate change", organized by UNU-GTP and LaGeo, in Santa Tecla and Benin, El Salvador, September 3 - 10, 2016. UNU-GTP SC-22.
- "Short Course X on Exploration for Geothermal Resources" organized by UNU-GTP, GDC and KenGen in Naivasha, Kenya, November 9 - 30, 2015. UNU-GTP SC-21.
- "Short Course VII on Surface Exploration for Geothermal Resources", organized by UNU-GTP, GDC and KenGen in Santa Tecla and Ahuachapán, El Salvador, March 14 - 22, 2015. UNU-GTP SC-20.
- "Short Course IX on Exploration for Geothermal Resources", organized by UNU-GTP, GDC and KenGen in Naivasha, Kenya, November 2-23, 2014. UNU-GTP SC-19.
- "Short Course X on Utilization of Low- and Medium-Enthalpy Geothermal Resources and Financial Aspects of Utilization", organized by UNU-GTP and LaGeo, in Santa Tecla, El Salvador, March 23-29, 2014. UNU-GTP SC-18.
- "Short Course VII on Exploration for Geothermal Resources", organized by UNU-GTP, GDC and KenGen in Naivasha, Kenya, October 31 - November 18, 2013. UNU-GTP SC-17.
- "Short Course on Conceptual Modelling of Geothermal Systems" organized by UNU-GTP and LaGeo, in Santa Tecla, El Salvador, February 24 - March 2, 2013. UNU-GTP SC-15.
- "Short Course VII on Exploration for Geothermal Resources", organized by UNU-GTP, GDC and KenGen in Naivasha, Kenya, October 27 - November 18, 2012. UNU-GTP SC-15.
- "Short Course on Geothermal Development and Geothermal Wells", organized by UNU-GTP and LaGeo, in Santa Tecla, El Salvador, March 11-17, 2012. UNU-GTP SC-14.
- "Short Course VI on exploration for geothermal resources" organized by UNU-GTP, GDC and KenGen in Naivasha, Kenya, October 27 - November 18, 2011. UNU-GTP SC-13.
- "Short Course on Geothermal Drilling, Resource Development and Power Plants", organized by UNU-GTP and LaGeo in Santa Tecla, El Salvador, January 19-22, 2011. UNU-GTP SC-12.
- "Short Course V on Exploration for Geothermal Resources" organized by UNU-GTP, KenGen and GDC at Lake Bogoria and Naivasha, Kenya, 29 October - 19 November, 2010. UNU-GTP SC-11.
- "Short Course IV on Exploration for Geothermal Resources", organized by UNU-GTP, KenGen and GDC, at Lake Naivasha, Kenya, November 1 - 22, 2009. UNU-GTP SC-10.
- "Short Course on Surface Exploration for Geothermal Resources", organized by UNU-GTP and LaGeo, in Ahuachapán and Santa Tecla, El Salvador, 17-30 October, 2009. UNU-GTP SC-09.
- "Short Course on Geothermal Project Management and Development", organized by UNU-GTP, KenGen and MEND-DOBM, at the Imperial Botanical Beach Hotel, Entebbe, Uganda, November 22-22, 2008. UNU-GTP SC-08.

Publications

- Workshops and Short Courses
- Visiting lecturer reports
- Additional reports



Publications

Papers presented at "SDG Short Course I on Exploration and Development of Geothermal Resources" organized by UNU-GTP, GDC and KenGen in Naivasha, Kenya, November 10 - 30, 2016.

Papers from the Short Course series are published in a CD format

- Chiang, L., 2016: Overview of geothermal surface exploration methods
- Nye, L. H., 2016: Geological field mapping
- Legall, L., 2016: Hydrothermal alteration mineralogy in geothermal fields with case examples from Olkaria domes geothermal field, Kenya
- Wanjohi, A. W., 2016: Geophysical field mapping
- Wanjohi, A. W., 2016: Integrated geophysical methods used to site high potential geothermal wells
- Kongole, J. and Kanda, J.H., 2016: Introduction to geothermal mapping
- Mwango, G. H., 2016: Geothermal mapping using temperature measurements
- Kubo, R. M. et al., 2016: Environmental baseline studies for geothermal developments
- Wanjohi, A. W., 2016: Environmental baseline study for geothermal developments: Case study Arua-Bogoria geothermal prospects, Kenya
- Saunders, K., 2016: Geothermal systems in global perspective
- Mukua, J. et al., 2016: High resolution airborne thermal infrared remote sensing study, Siati Geothermal Prospect, Kenya
- Wanjohi, A. W., 2016: The use of GIS in geothermal resource management: A case study of Olkaria geothermal project
- Henderson, B.S., 2016: The western branch of the East African Rift: A review of tectonics, volcanology and geothermal activity
- Kanda, R., 2016: Surface rift structural geology, tectonics, volcanology and geothermal activity
- Mwai, S., 2016: Introduction to types and classification of rocks
- Saunders, K., 2016: Geology and geothermal systems
- Saunders, K., 2016: Seismicity in geothermal exploration
- Georgeson, L. S., 2016: Geophysical methods used in geothermal exploration
- Georgeson, L. S. and Kanda, R., 2016: Seismicity methods: DC and TSM with examples and comparison from the Reykjavik peninsula and Chaudhury, Iceland
- Wanjohi, A. W. and Amann, K., 2016: Seismicity methods - MT
- Lemire, C. H., 2016: Gravity and magnetic methods
- Smeyers, H. S., 2016: Application of micro-seismic methods to geothermal exploration: Examples from the Kenya Rift
- Mwango, G. H., 2016: Magnetotelluric (MT) data processing
- Lemire, C. H., 2016: A comparison of 1-D, 2-D and 3-D approaches of interpreting electromagnetic data of Siati geothermal area
- Okunow, K. and Amann, K., 2016: Geothermal methods in geothermal surface exploration
- Amann, K. et al., 2016: Geothermal sampling and analysis
- Kamath, C. W., 2016: Chemical geothermometers for geothermal exploration
- Mwai, S. J., 2016: Geothermal monitoring practices
- Kamath, C. W., 2016: Geothermal reservoir monitoring: A case study of Olkaria Northward Field in Kenya
- Okunow, K., 2016: Exploration and development of a conceptual model for the Thairiweye geothermal field, Naivasha
- Kanda, R., 2016: Geothermal exploration of geothermal prospects: A case study of Menage, Kenya
- Wanjohi, A. W., 2016: Chemistry in exploration of a geothermal field
- Wanjohi, A. W., 2016: Geophysical survey of a high-temperature field, Olkaria
- Mwai, S., 2016: Geothermal exploration of the Menage geothermal field
- Mwai, S., 2016: Introduction to geothermal drilling
- Kibungu, C., 2016: Geothermal well drilling
- Kwambwa, A., 2016: Drilling in the Menage geothermal field: Drilling equipment and well design
- Kwambwa, A., 2016: Drilling in the Menage geothermal field: Major challenges and recommendations
- Okunow, K., 2016: Introduction to geophysical well logging and flow testing
- Mwai, S. J., 2016: Geothermal exploration and utilization in Kenya
- Kibungu, C., 2016: Geothermal exploration and development in Ethiopia: Country update
- Yohannes, K., 2016: Geothermal exploration in Ethiopia: Country update
- Mwai, S. J., 2016: Geothermal exploration in Tanzania: Country update
- Kato, Y., 2016: Geothermal exploration in Uganda: Country update
- Bullagamba, U., 2016: Geothermal exploration in Rwanda: Country update
- Susai, J., 2016: Basic hydrogeology in geothermal systems
- Barua, P. J., 2016: SIA - General procedures
- Mwango, G. H., 2016: Legal requirements for geothermal development in Kenya
- Mwai, T.H., 2016: Biodiversity conservation assessments around geothermal power plants: Bio-indicators, data acquisition and processing protocols
- Kwambwa, C., 2016: High temperature geothermal power plants and overview of wellhead generators
- Mwai, S. J., 2016: Geothermal Project Management
- Kibungu, C., 2016: Geothermal well drilling technology: A case study of Menage geothermal field

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Positive side consequences

- With the UN development goals short course series, the UNU-GTP has been able to reach out to a much larger number of people than is possible with training in Iceland
- The courses have proven good venues to select UNU Fellows for the more involved training in Iceland
- The courses have catalyzed increased regional cooperation
- The courses have proven a good venue not only for sharing knowledge between geographical regions, but also between generations – e.g. experts nearing retirement sharing their expertise with a new generation of geoscientists and engineers just starting their careers

Looking ahead

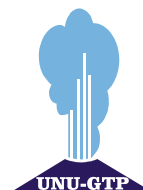
- UNU-GTP plans to continue the SDG Short Courses in Kenya and El Salvador, supporting progress towards reaching the targets of Goal 7 and other SDGs
- The courses may increasingly be tied to wider local geothermal training as is already the case in El Salvador and has been discussed for Kenya
- Although the workshop in China in 2008 was not followed up by short courses in a similar way as in Kenya and El Salvador (for economic reasons), UNU-GTP is open to the possibility in the future



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SDG Short Course I in El Salvador, September 2016



SDG Short Course I in Kenya, November 2016



Thank you !!