

**Report on the 10<sup>th</sup> International German Summer School on Hydrology  
14 – 28 September 2016, Bochum**

**10. "International German Summer School on Hydrology (IGSH 2016 – Groundwater and Agriculture)"**

The tenth "International German Summer School on Hydrology (IGSH)" was held at Ruhr-Universität Bochum (RUB) from 14<sup>th</sup> to 28<sup>th</sup> September 2016 with this year's focus on "Groundwater and Agriculture". The aim of IGSH is to enhance the knowledge and technical capabilities of early and mid-career professionals and academics on hydrology-related environmental issues.

The International German Summer School on Hydrology focuses to train international junior scientists and early professionals from the fields of water and the environment, geo-engineering and engineering sciences (as well as from geography, hydrology, chemistry, etc.). IGSH provides a program of hydrological training courses which vary each year. In 2016, 21 participants from 17 different countries were selected out of 168 applicants (list of participants annexed). Most participants were from Africa, Asia and South America. The number of applicants are dramatically increasing year after year and participants are selected on a competitive basis. The selection criteria include; the quality of a statement of motivation, relevance of the course to the applicant's present career or research activities, and qualification of the applicants. Also age and gender aspects are taken into account.

Since the inception in 2007, the International German Summer School on Hydrology is held annually with the support of UNESCO. From 2015, IGSH has additionally been sponsored by German Academic Exchange Service (DAAD) as serial summer school on sustainable water management. The newly implemented DAAD full scholarships have increased the attractiveness of the Summer School course resulting in record numbers both in applicants and in the number of countries of origin.

The lecturers of the International German Summer School on Hydrology are from the Department of Applied Geology of Ruhr-Universität Bochum, invited high-level professionals from the industry in Germany and international and national partner universities. The lectures included theoretical as well as practical lessons with field excursions. The field excursions and locations differ from year to year depending on the type of the course under discussion. It also was supplemented by cultural trips and evening events.

The Summer School courses of the International German Summer School on Hydrology (IGSH-2016) covered the following topics:

- \_ Rural hydrogeology
- \_ Basic of hydrogeology
- \_ Nutrients in groundwater
- \_ Applications of environmental isotopes in hydrogeology
- \_ GIS applications in hydrogeology
- \_ Hydrogeochemical modelling
- \_ Heavy metals and other trace contaminants
- \_ Groundwater management
- \_ Agrochemicals
- \_ Managing groundwater heterogeneity
- \_ The rural water sector under climate change

During the course the participants were also encouraged to discuss on cases and personal experiences related to groundwater and agriculture. The following lecturers were involved this year: Prof. Dr. Stefan Wohnlich, Dr. Andre Banning, Dr. Andreas Englert, MSc. Sascha Frank (RUB, Hydrogeology); Prof. Dr. Harald Zepp (RUB, Applied Physical Geography); Prof. Dr. Thomas Himmelsbach (BGR, Germany); Prof. Dr. Frank Eulenstein (Leibniz Center for Agricultural Landscape Research, Müncheberg); PD Dr. Steffen Bender (Climate Service Center, Hamburg); Dr. Helena Banning (Umweltbundesamt, Dessau, Germany); Prof. Dr. Seifu Kebede (Addis Ababa University, Ethiopia); Dr. Faye Seynabou Cissé (University of Cheikh Anta Diop, Dakar, Senegal), Dr. Ali Mahdavi (Imam Khomeini International University, Qazvin, Iran); Mr. Thomas Dietz, Mr. Roland Schindler (NEW Niederrhein Wasser GmbH, Germany); Mr. Rahimjon Nazirzoda (Tajikistan).

Besides other field trips, IGSH 2016 participants visited the lignite mine Garzweiler, NRW region of Germany. Participants had the opportunity to observe, appreciate and discuss on technical and environmental issues of large scale surface mining.

During the course, the participants also worked in small groups on questions relevant to their own projects with the help of the methods learned during IGSH. At the end of the course, the participants were given the opportunity to evaluate and comment on the different aspects of the Summer School course (such as their expectations from the course, scientific competence of the lecturers and the organization of the course). We consider a suchlike quality control very important for successive optimization of the IGSH goals. Those who demanded to gain Credit Points were evaluated by means of a successful final examination and a well-graded presentations of the group projects. Numerous participants were able to obtain recognition from the IGSH with 4 CP in their study programs and doctoral programs. Finally, participants were awarded with a certificate of attendance by Prof. Dr. Siegfried Demuth (Director of the German UNESCO IHP/HWRP Secretariat) and Prof. Dr. Stefan Wohnlich from Department of Applied Geology in Ruhr-Universität Bochum.

The course was held in a very friendly, cooperative and productive atmosphere, which allowed the participants to establish close contact among themselves and to the lecturers as well. This opened an opportunity for future collaboration to establish scientific cooperation, social networks, and extend the IGSH scientific community. Generally, the Summer School course provides the opportunity for knowledge transfer and exchange on hydro(geo)logical processes and agricultural management.

The IGSH organizers would like to thank the DAAD and the German IHP/HWRP National Committee of UNESCO for the financial and intellectual support of IGSH. The next IGSH "Groundwater and Energy" will take place from 6<sup>th</sup> to 20<sup>th</sup> September, 2017.

**Lecturers, field-work directors and field assistants:**

Prof. Dr. Stefan Wohnlich

Ruhr University of Bochum, Applied Geology, Hydrogeologist

Prof. Dr. Harald Zepp

Ruhr University of Bochum, Applied Physical Geography

Dr. Andreas Englert

Ruhr University of Bochum, Applied Geology, Groundwater Modeller

PD Dr. Steffen Bender

Climate Service Center, Natural Resources Department, Science officer, Hamburg

Dr. Andre Banning

Ruhr University of Bochum, Applied Geology, Hydrochemist

Dr. Helena Banning

Umweltbundesamt, Dessau, Germany

Prof. Dr. Seifu Kebede

Addis Ababa University, Earth Sciences, Hydrogeologist

Dr. Seynabou Cisse Faye

University Cheikh Anta Diop (UCAD), Dakar University, Senegal

MSc.-Geol. Sascha Frank

Ruhr University of Bochum, Applied Geology, Hydrogeologist

Dr. Ali Mahdavi Mazdeh

Imam Khomeini International University, Qazvin, Iran

Mr. Thomas Dietz,

NEW NiederrheinWasser GmbH

Mr. Roland Schindler

NEW NiederrheinWasser GmbH

Dr. Andrea Niedermayr

Ruhr University of Bochum, Applied Geology, Hydrogeochemist

Mr. Rahimjon Nazirzoda, Tajikistan

**Annexes:**

1. Course Program
2. List of Participants
3. Statistics of Participants
4. Participants' comment collection sheet (Open questionnaire)
5. Statistical evaluation of Questionnaire
6. Photos

### Annex-1: IGSH 2016 Course Program - Groundwater and Agriculture: September 14 – 28, 2016

Date	Time	Activities	Speakers/Lead
Wednesday, 14-09-2016		Arrival of Participants	
	18:00	Campus Tour and Welcome Dinner	Prof. Dr. Stefan Wohnlich, Applied Geology, RUB
Thursday, 15-09-2016	08:30 – 09:30	Brief introduction to the course, organizational affairs and introduction of the Ruhr Area	Prof. Dr. Stefan Wohnlich, Applied Geology, RUB
	09:30 – 10:15	The multiple transformations of the urban landscape Ruhr - Introducing its physical environment, economy and demography	Prof. Dr. Harald Zepp, Applied Physical Geography, RUB
	10:30 – 12:00	Workshop: Introduction of participants and short presentations by participants	All participants and lecturers
	13:15 - 16:45	Workshop: Introduction of participants and short presentations by participants	All participants and lecturers
	17:00	City tour: Visit to the city of Bochum	Prof. Dr. Stefan Wohnlich, Applied Geology, RUB
Friday, 16-09-2016	08:30 – 10:00	Lecture: Introduction to Rural Hydrogeology	Prof. Dr. Stefan Wohnlich, Applied Geology, RUB
	10:30 – 12:00	Lecture/Exercise: Basics of Hydrogeology I	
	13:15 – 14:45	Lecture/Exercise: Basics of Hydrogeology II	
	15:00 – 16:45	Case study: Senegal	Dr. Seynabou Cisse, Dakar University, Senegal
	17:00	Workshop: Group forming and project discussion	All participants and lecturers
Saturday, 17-09-2016	9:00 – 14:00	Cultural field excursion: History, architecture and medieval handicraft: LWL Freilichtmuseum (Open Air Museum) Hagen	Prof. Dr. Stefan Wohnlich, Dr. Andrea Niedermayr Applied Geology, RUB
	Afternoon/ Evening	Free	
Sunday, 18-09-2016		Free day	
Monday, 19-09-2016	08:30 – 12:00	Lecture/Exercise: Nutrients in Groundwater	Prof. Dr. Frank Eulenstein, Leibniz-Zentrum für Agrar- landschaftsforschung, Müncheberg

	13:15 – 16:30	Case studies: Groundwater quality protection in German waterworks	Thomas Dietz, Roland Schindler, NEW NiederrheinWasser GmbH, Mönchengladbach
	17:00	Barbecue around Lake Kemnade, Bochum	All participants and lecturers
Tuesday, 20-09-2016	08:30 – 12:00	Lecture/Exercise: Applications of environmental isotopes in hydrogeology	Prof. Dr. Seifu Kebede, Addis Ababa University, Ethiopia
	13:15 – 17:00	Lecture/Exercise: GIS applications in Hydrogeology	M.Sc. Sascha Frank, Applied Geology, RUB
Wednesday, 21-09-2016	08:30 – 12:00	Lecture/Exercise: Hydrogeochemical modelling I	Dr. Andre Banning, Applied Geology, RUB
	13:15 – 15:00	Lecture/Exercise: Hydrogeochemical modelling II	
	15:00 – 17:00	Case study: agricultural systems and water related problems in Central Asia	M.Sc. Rahimjon Nazirzoda, Tajikistan
	17:15	Workshop: Discussions in working groups and evaluation of first results	All participants and lecturers
Thursday, 22-09-2016	08:30 – 10:15	Lecture/Exercise: Heavy metals and other trace contaminants	Dr. Andre Banning, Applied Geology, RUB
	10:30 – 12:00	Case study: Groundwater and Agriculture in Qazvin and its Challenges	Dr. Ali Mahdavi Mazdeh, Imam Khomeini International University, Qazvin, Iran
	13:15 – 17:00	Lecture/Exercise: Groundwater Management	Prof. Dr. Thomas Himmelsbach, BGR
Friday, 23-09-2016	08:30 – 12:00	Lecture/Exercise: Agrochemicals	Dr. Helena Banning, Umweltbundesamt, Dessau
	13:15 – 17:00	Lecture/Exercise: Managing Groundwater Heterogeneity	Dr. Andreas Englert, Applied Geology, RUB
	17:15	Field trip: Hydrological and cultural visit to Cologne city center	
Saturday, 24-09-2016	09:30 – 12:00	Field trip: Deutsches Bergbaumuseum Bochum	Guided tour in national museum of mining, Applied Geology, RUB
	Afternoon/ evening	Free	

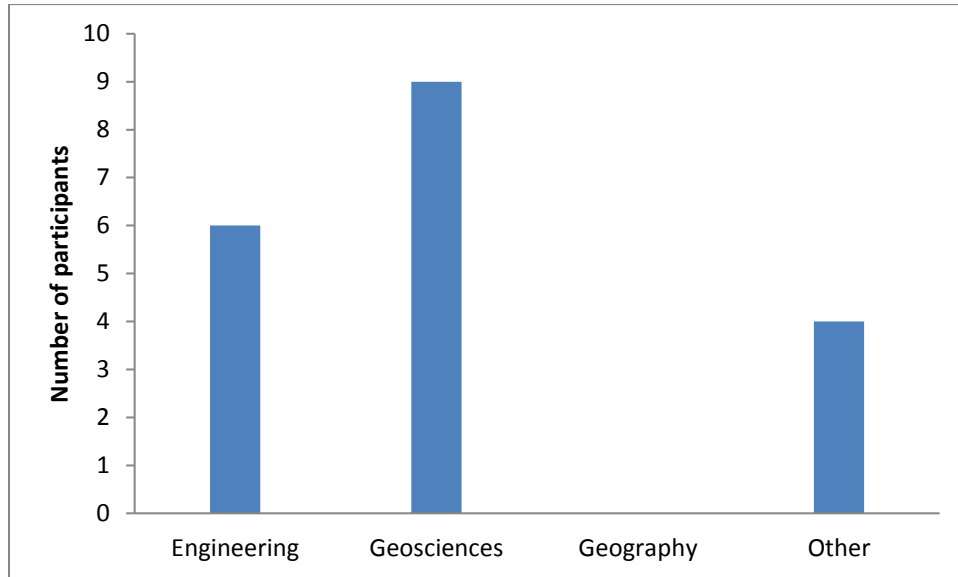
Sunday, 25-09-2016	11:00 – 17:00	Field trip: Hydrogeology and drinking water production in the Lower Rhine area	Dr. Andre Banning, Applied Geology, RUB
Monday, 26-09-2016	08:30 – 12:00	Lecture/Exercise: The rural water sector under climate change I	PD Dr. Steffen Bender, Climate Service Center, Hamburg
	13:15 – 14:45	Lecture/Exercise: The rural water sector under climate change II	
	15:00	Workshop: Discussion in working groups: open questions and presentation of concepts	All participants and lecturers
Tuesday, 27-09-2016	08:30 – 12:30	Written examination (8.30-9.30); Participants present their group project (10-12), final discussion, Course evaluation by participants (-12.30);	All participants and lecturers
	13:00 – 15:00	Award of certificates, Departure ceremony – Farewell lunch	
Wednesday, 28-09-2016		Departure of participants	



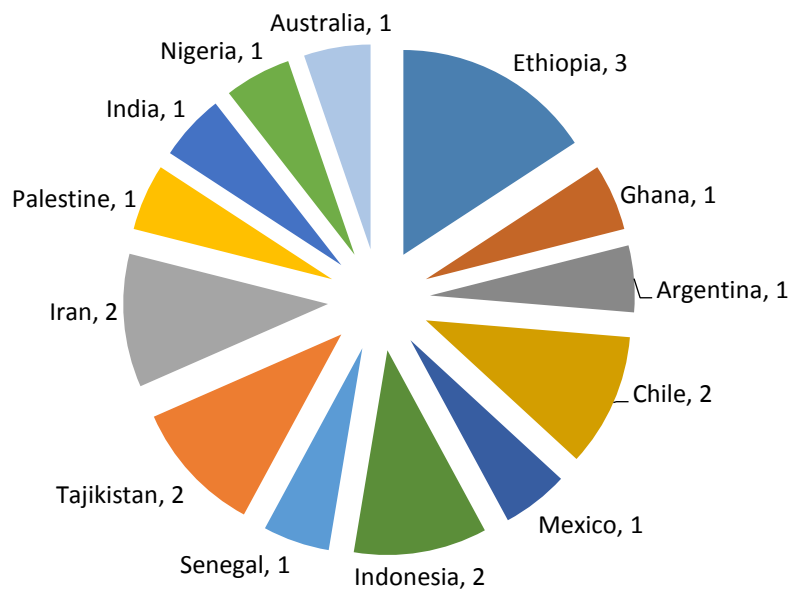
**Annex-2: IGSB 2016 Participants List**

No	Family Name	First Name	Sex	Country
1	Berehanu	Behailu	M	Ethiopia
2	Aziz	Fati	F	Ghana
3	Lauro	Carolina	F	Argentina
4	Zegu	Hindeya Gebru	M	Ethiopia
5	Garcia Piña	Ayon	M	Chile
6	Rocha Escalante	Hermann	M	Mexico
7	Rinaldi	Aris	M	Indonesia
8	Asri	Firdani	F	Indonesia
9	DIAW	Mor Talla	M	Senegal
10	Ruzmatova	Zarina	F	Tajikistan
11	Dowlatabadi	Narges Khatoon	F	Iran
12	Thaher	Dalal	F	Palestine
13	Gandla	Shailaja	F	India
14	Dioha	Emmanuel Chukwuka	M	Nigeria
15	Esmaelian	Anahita	F	Iran
16	Leonardo	Christopher	M	Chile
17	Walton	Craig	M	Australia
18	Komilov	Umedjon	M	Tajikistan
19	Nasemann	Anreas	M	Germany
20	Nasemann	Daniel	M	Germany
21	Mebrahtu	Tesfay Kiros	M	Ethiopia

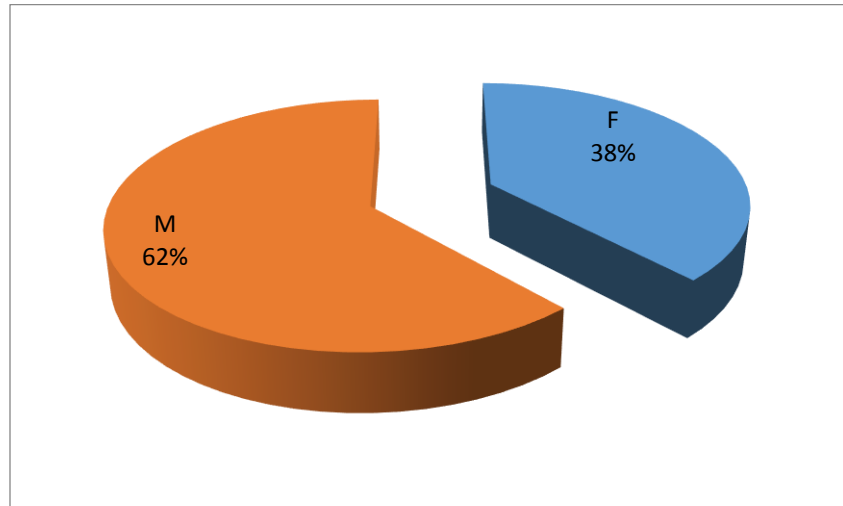
### Annex-3: Statistics of Participants



### Country



## Gender Distribution



## Selection of participants

### Priority applications

- 1 – Self sponsored applicants (with some relevance of academic background to the course to be given, and submission of complete application documents)
  - 2 – Course scholarship applicants (with a relevant background and complete application document)
  - 3 – Partial scholarship applicants with relevant background, motivation letter, experience
  - 4 – Full scholarship applicants with very relevant background and experience, very strong motivation letter, mainly from Sub-Saharan Africa and Asian countries
- One from each country (no two applicants from the same country is given a full scholarship unless special cases are considered)

### Excluded applications

- 1 - Professors and Doctors with over 12 years experience
- 2 - Applicants with over 20 years of experience
- 3 - Applicants older than 50 and younger than 23
- 4 - Applicants with BSc and very limited experience (ex. Less than 3y experience)
- 5 - Applicants with farthest academic and industry background from the course
- 6 - Applicants who participated in the same course in the previous years organized by IGSH
- 7 - Applicants who participated three or more times in the past may not be given a chance to take part in this course
- 8 - Applicants who failed to submit their CV and addresses of their referees (incomplete application) should not be considered

9 - No two persons from the same country are allowed to take part in the course unless special conditions govern the situation

10 - Full scholarships for applicants from Europe, USA, Brazil and Argentina should not be given unless special condition govern the situation

11 - Applicants who failed to meet the application deadline (applications may be considered based on the type of scholarship they are applying for and their academic background)

**Annex-4: IGSH 2016 Participants' comment collection sheet**

<b>Your reason(s) of attendance?</b>	
General interest in the topic	
Special professional needs	
Practical application	
Knowledge renewal	
Other	

<b>What is your professional background?</b>	
Engineering (please specify)	
Geosciences (please specify)	
Geography	
Other (Please specify)	

<b>Are your expectations fulfilled by the course with respect to:</b>					
	Fully	Yes	Neutral	No	No idea
Quality of contents					
Compressibility					
Practical applicability					
Time for discussions					
Number of examples and exercises					
Quality of exercises					

Field trips					
Duration of the course					
Quality of the course					

<b>Scientific competence</b>	Very good	Good	Average	No idea
Prof. Dr. Stefan Wohnlich				
Prof. Dr. Thomas Himmelsbach				
Dr. Andreas Englert				
Dr. Andre Banning				
Dr. Helena Banning				
Prof. Dr. Seifu Kebede				
Dr. Seynabou Cissé				
PD Dr. Stefan Bender				
Dr. Ali Mahdavi				
Prof. Dr. Frank Eulenstein				
Prof. Dr. Harald Zepp				
Mr. Sascha Frank				
Mr. Roland Schindler				
Mr. Thomas Dietz				
Mr. Rahimjon Nazirzoda				

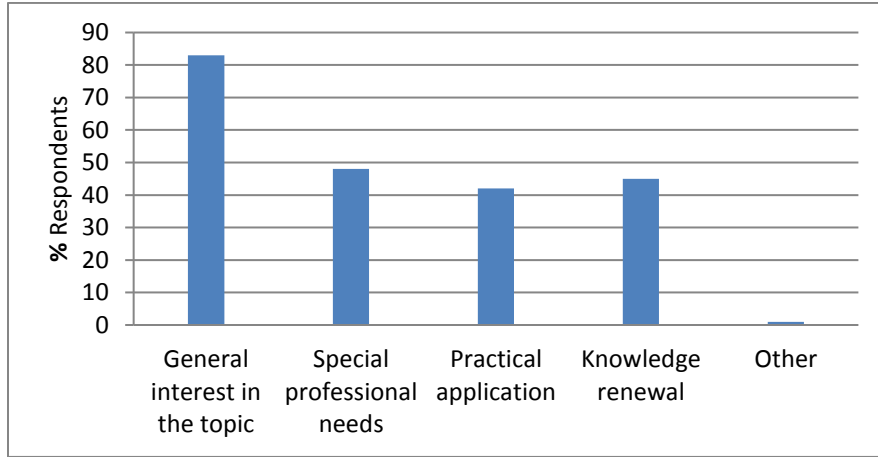
	Yes	Neutral	No
Have you got enough time for questions/discussions?			
Have your questions been satisfactorily discussed?			

<b>Have you been satisfied with the organization of the course?</b>	Very much	Yes	Neutral	No	No idea

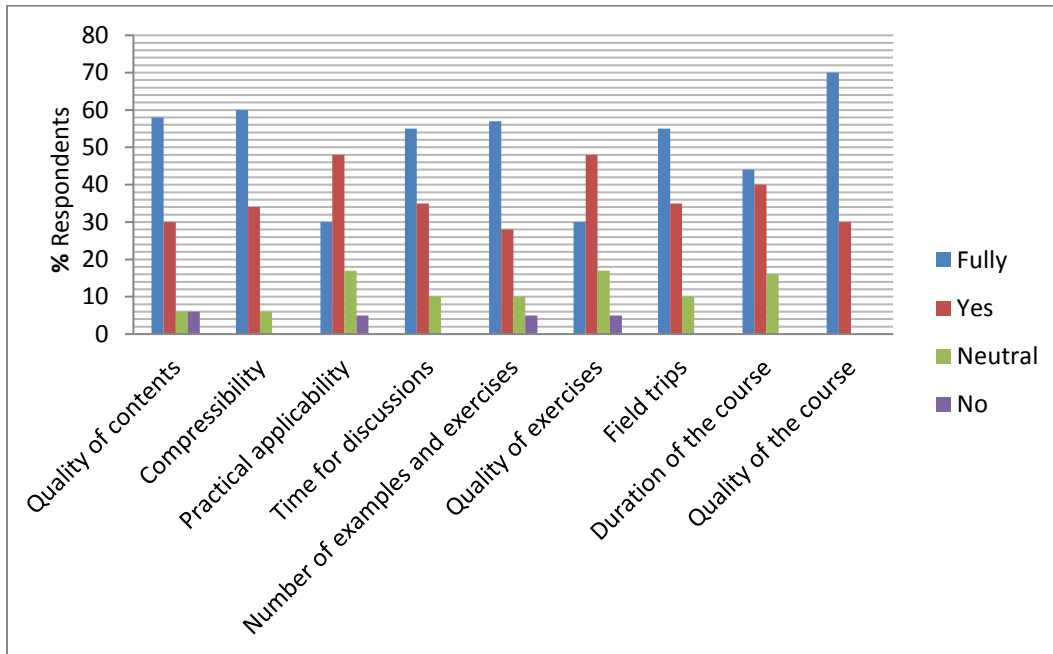


## Annex-5 Statistical Evaluation of Questionnaire

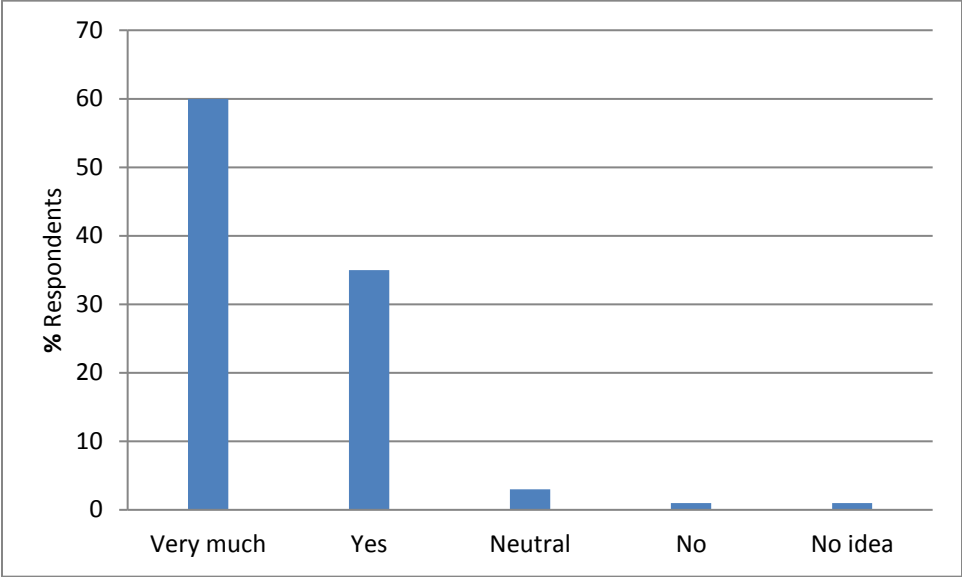
### A - Reason(s) of attendance



### B – Quality of content of the course, Practical Applicability and Quality of Exercises



**C – Comments on Accommodation (Hotel and Hostel)**



**Annex-6: Photos**



**Field excursion photos**





**Photos during Lectures**



**Certificate award**



**Visits to hydraulic lab at RUB GMG laboratory**





**Participants at the University canteen (RUB Mensa)**









**Social events and city tours**