Excellence in Smart Data and Services for Supporting Water Management

Deliverable D3.1

Training needs assessment

Project title:	Data4Water: Excellence in Smart Data and Services for Supporting Water Management
Contract no.:	
Deliverable No.:	D3.1
Deliverale Title:	Training needs assessment
Work Package:	3
Type:	R
Dissemination level:	CO
Due Date:	M5
Version:	2.0
Project Year:	Year 1

Abstract

Present report is part of the H2020 twinning project data4Water. During the lifetime of the project a series of training courses is expected to be carried out at Universitatea Politehnica Bucharest. These trainings are offered by three project partners: FOKIS, UNIMIB and UNESCO-IHE.
In order to identify what are the knowledge gaps that need to be covered by training a training needs assessment survey was carried out in the first 5 months of the project.

Training needs assessment was carried out using two methods:

1. Discussion of project partners

Discussions between project partners were held in Romania during the kick-off meeting of the project, on 8-10 February 2016. These structured discussions aimed to gather information on training needs of UPB, from the perspective of the project partners who have previous experience and expertise in the field. The findings from the discussions are summarized in Chapter 2.

2. Online survey

An online survey on the training needs in Hydroinformatics was carried out from March to April 2016; the results of which are presented in Chapter 3. The online survey questions are detailed in the appendix of this document.

The survey results and their analysis is presented in this deliverable. As a result of the survey three trainings to be held in the first half part of the project were selected.

Document Revision History

Date	Version	Author(s)	Summary of main changes
15 May 2016	1	I. Popescu (UNESCO-IHE) E. Apostol (UPB) C. Leordean (UPB)	Initial document
09 June 2016	2	I. Popescu (UNESCO-IHE) E. Apostol (UPB) C. Leordean (UPB)	Adding all figures from survey

Table of Contents

1. Introduction

This report presents the analysis of the survey results on training needs in the field of big data for water and hydroinformatics. The survey is part of the H2020 Data4Water project. Work package 3 of the project within which the survey is carried out, aims to address the availability of training courses at three partners in the project; FOKUS, UNIMIB and UNESCO-IHE. All training courses are designed and tailored for the needs of Universitatea Politechnica Bucharest (UPB), which is building research capacity in the field of hydroinformatics and IT applications for water resources management.

The primary objective of the analysis is to determine the researchers' actual knowledge and skills in the field of water resources management and to identify their needs for training in order to overcome the knowledge gap UPB has in the field.

In particular, the aim of the assessment was to:

- Identify which knowledge regarding water UPB researchers already have in the field;
- Determine what is the knowledge gap that need to be addressed;
- Determine the desired training content and framework according to needs expressed.

Training needs assessment was carried out using two methods:

1. Discussion of project partners

Discussions between project partners were held in Romania during the kick-off meeting of the project, on 8-10 February 2016. These structured discussions aimed to gather information on training needs of UPB, from the perspective of the project partners who have previous experience and expertise in the field. The findings from the discussions are summarized in Chapter 2.

2. Online survey

An online survey on the training needs in hydroinformatics was carried out from March to April 2016; the results of which are presented in Chapter 3. The online survey questions are detailed in the appendix of this document.

2. Project partner discussion

Project kick-off meeting took place on 8-10 February 2016 at UPB in Bucharest, Romania. One of the key points of the discussion was identification of the training needs for UPB staff. Structured discussions were held between project partners' representatives in order to identify the training needs that UPB would require in order to develop research in the field of IT in water resources management given the available courses at the other three partner institutions; FOKUS, UNIMIB and UNESCO-IHE. A series of courses have been identified as important

and decided to be included in the extended survey to be carried out at UPB. The list of these identified courses are included in section 4 of the questionnaire (see annex).

Because of the project planning, two trainings per year, the first course on Introduction to hydroinformatics was scheduled to be held on June 2016 at UPB, before the results of the training needs assessment are known. Project team assessed that this is an important course in the training plan and can be scheduled. Moreover, the first Summer school was set to be in Hydroinformatics: modelling and information technologies for water resources management, which showed the need to schedule and start the training with such a course.

3. On-line survey of training needs

3.1. Concept and implementation of survey

Training needs assessment was carried out for which a special questionnaire was developed, and used.

The overall survey contained four section, as follows:

- general information about the academic level, experience in teaching and research in general;
- experience in research in water related areas, with special focus on the area of hydroinformatics;
- enquiry on three main topics of interest in the area of hydroinformatics;
- selection of available training courses at partner institutions

The survey content is presented in the annex.

Survey has been circulated on-line to UPB academic staff, PhD students and master students. There were 35 respondents to the survey with an equal distribution over the 3 selected academic levels (figure 1). In total UPB has a Computer science department of 73 lecturing and research staff members, 26 PhD students and 490 MSc students. In Data4Water project there are 8 academic staff members who are involved in the project. Out of the 11 staff members who responded the questionnaire 4 are involved in Data4Water project.

Figure 1. Distribution of respondents based on academic level

Figure . Respondents' knowledge of water related topics

As part of the survey the background and knowledge in water was included in the on-line questionnaire. The analysis of the survey answers show that water related knowledge is almost non-existent for the respondents to the questionnaire (figure 2), which show the need for training in this topic.

3.2. Results of the survey

Results of the survey are presented and analyzed based on the respondents' answers. Graphs were generated based on the responses and are presented bellow in figures 3 figure 26.

A set of available courses at FOKUS, UNIMIB and UNESCO-IHE were made available and offered for selection to the respondents. The choices of courses importance and order in time to be delivered ranges from higher to lowest priority choice, i.e. from 1 (high priority) to 4 (low priority).

Importance of each course for UPB was ranked based on selected priority. Figure 3 shows what are the most important topics selected by the respondents. Figure 4 shows how this importance was selected for each course by Academic staff, PhD students and MSc students.

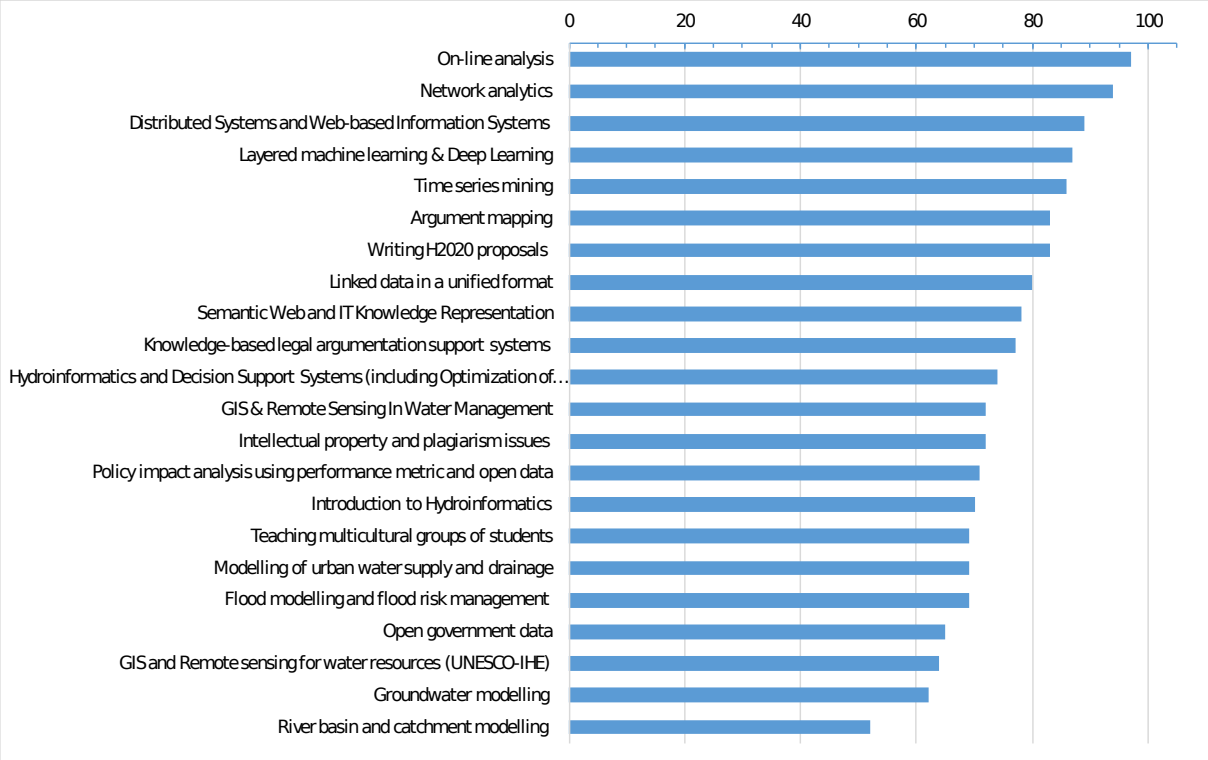


Figure 2. Ranking of topics based on respondents' priority selection

Ranking of topics show that most of the topics are in similar range, between 70 and 95 points, out of the maximum 105 points possible. However, all water related topics are ranked in the lower half of the list.

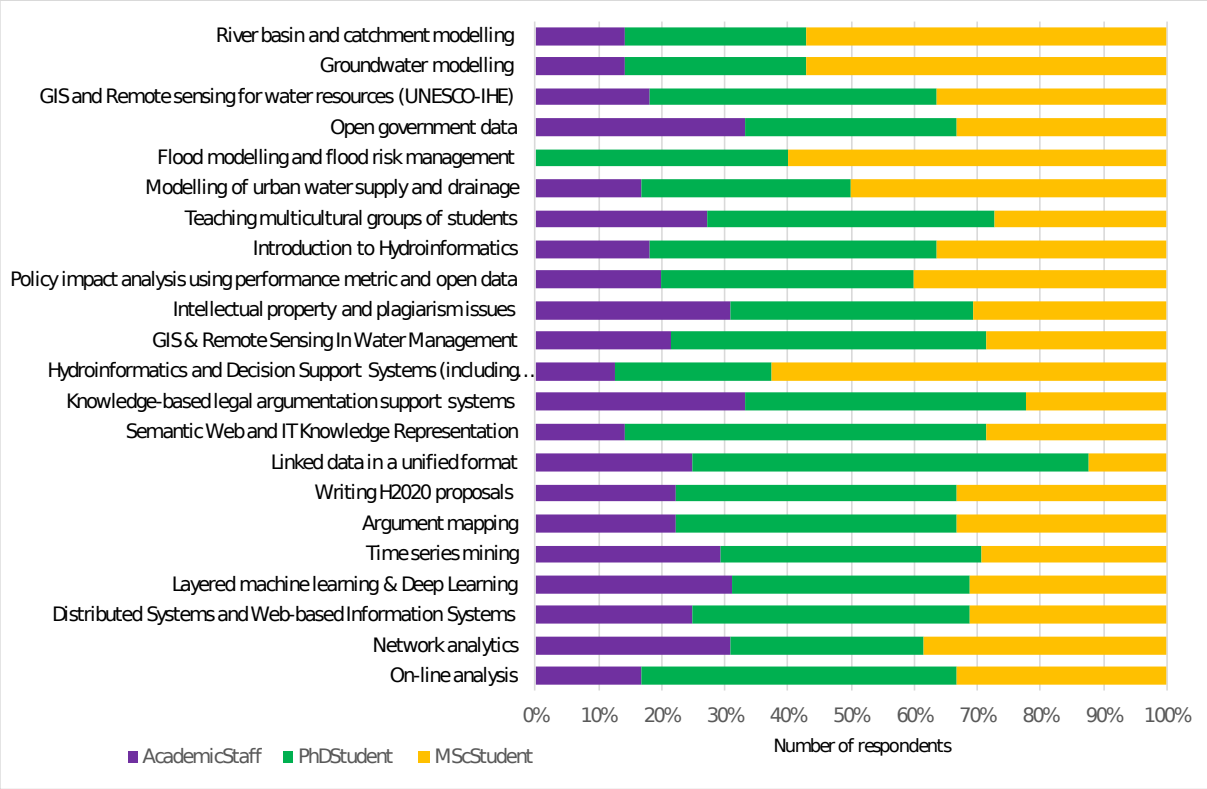


Figure 3.Priority topics per respondent academic level as % of total respondents

Figure 4 shows that interest in most of the topics is from PhD and MSc students rather than academic staff. Moreover, topics where the interest of academic staff is high are related to computer science related topics.

A small number of respondents from academic staff, maximum 4 in most of the topics have selected the offered topics as priority.

Topic Flood modelling and flood risk management is one of the topics of no interest to academic staff.

Difference in academic staff choices and PhD and MSc choices can be explained due to their interest in future career. UPB staff is already at the peak of their career, or on a clear determine academic track, which makes the field of water not interesting enough, while PhD students and MSc students are trying to prepare themselves better for the potential job opportunities on the market.

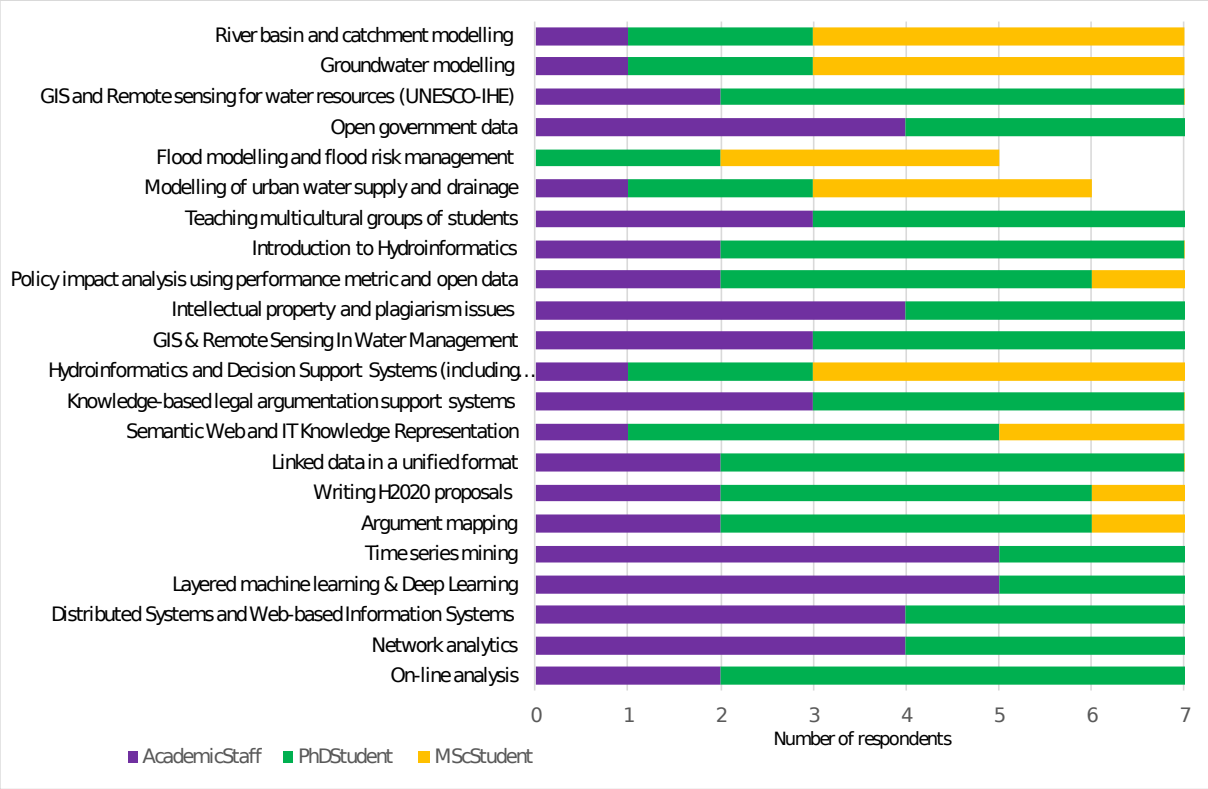


Figure 4. Number of respondents per academic level

Details on each course selection and offering is given bellow in figures 6 to 27.

Each selected rank is presented on the vertical axis and number of respondents on the horizontal axis. Number of respondents per category choice, as well as percentage from the total number of respondents is presented in the legend of each graph.

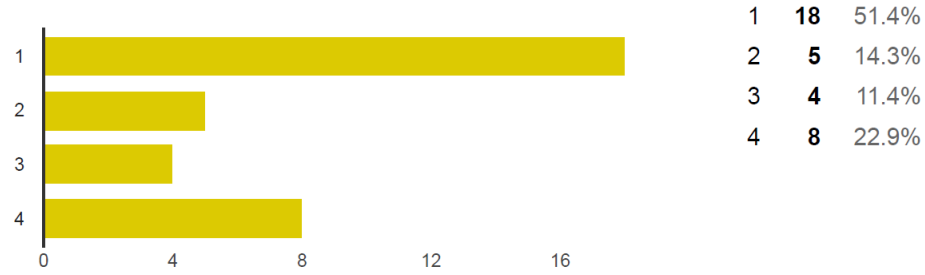


Figure 5. . Time series mining (1 day course)

Time series mining is offered by Bicocca University and it is of high importance for 18 of the respondents, out of which

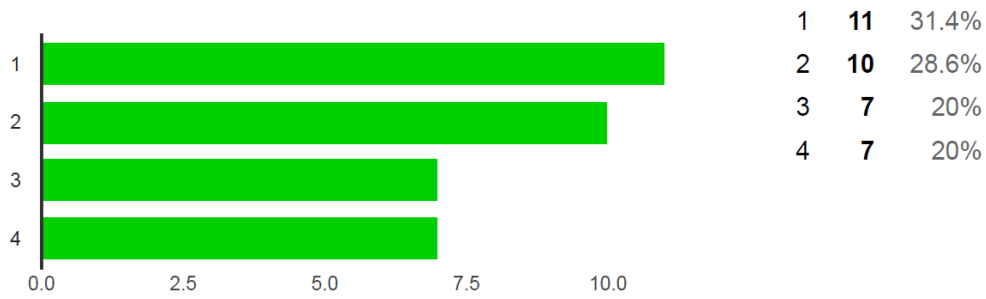


Figure 6. Network analytics (1.5 day course)

Time series and network analytics is offered by Bicocca University

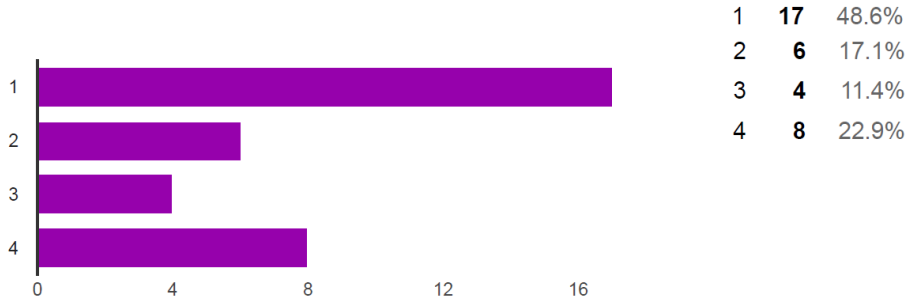


Figure 7. Layered machine and Deep Learning (1.5 day course)

Layered machine and Deep Learning (1.5 day course) is offered by Bicocca University and it is of high importance for 17 of the respondents.

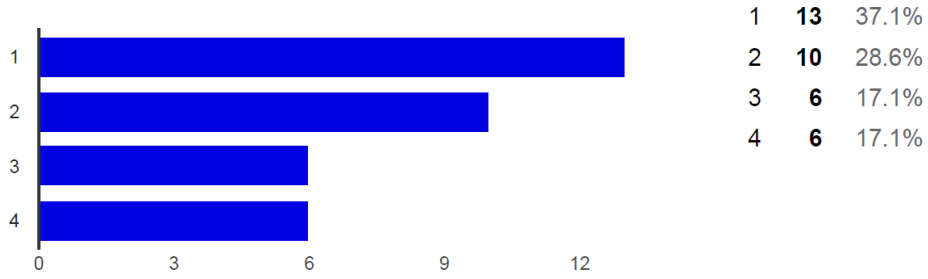


Figure 8. Online analysis (1.5 day course)

Online analysis (1.5 day course) is offered by Bicocca University

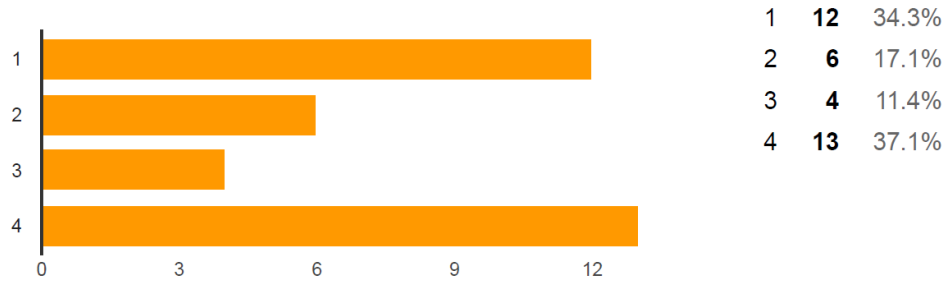


Figure 9. GIS and Remote sensing in Water management (3 day course)

GIS and Remote sensing in Water management (3-day course) is offered by FOKUS.

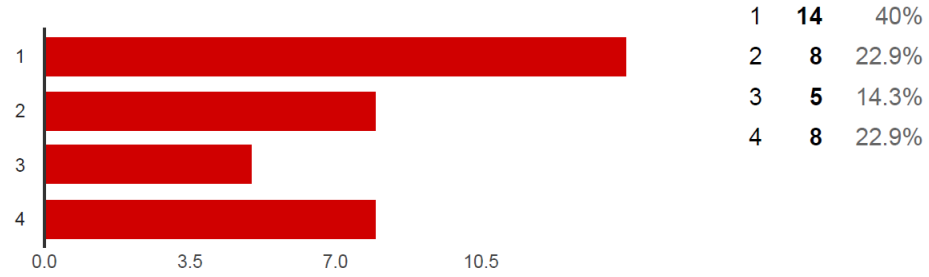


Figure 10. Distributed systems and web-based information systems (2-3 day course)

Distributed systems and web-based information systems (2-3 day course) is offered by FOKUS

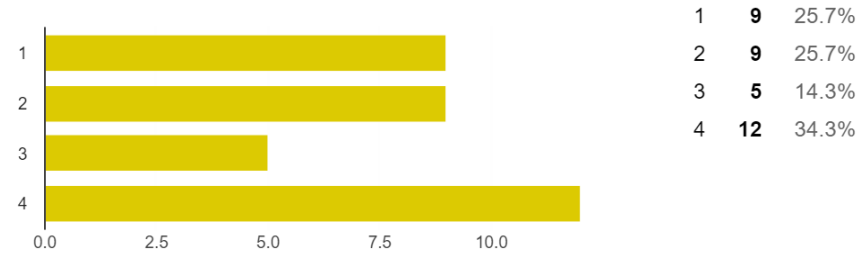


Figure 11. Semantic web and IT knowledge representation (1-3 day course)

Semantic web and IT knowledge representation (1-3 day course) is offered by FOKUS

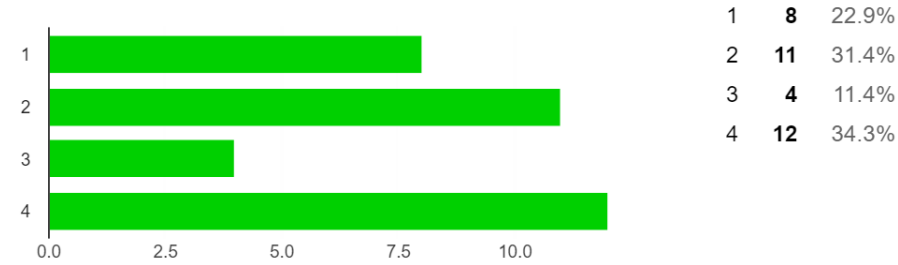


Figure 12. Linked data in a unified format (1 day course)

Linked data in a unified format is offered by FOKUS

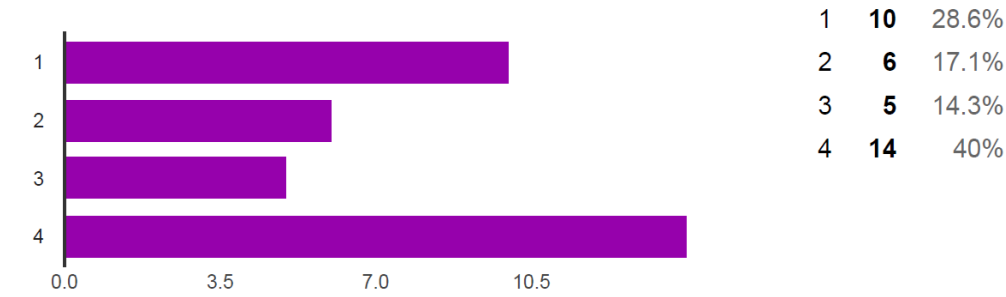


Figure 13. Teaching multicultural groups of students (1 day course)

Teaching multicultural groups of students (1-day course) is offered by FOKUS

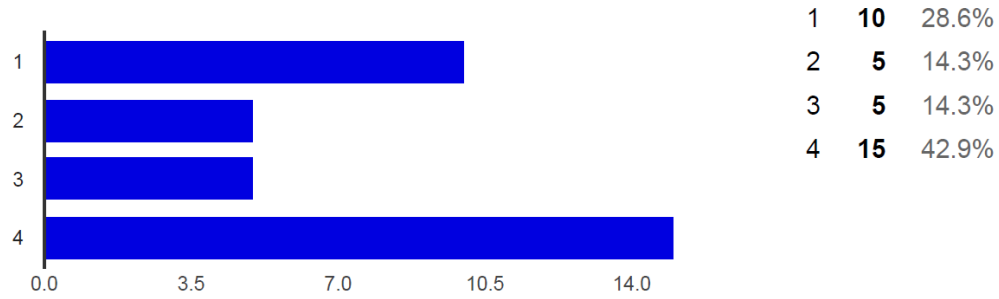


Figure 14. Open government data (1 day course)

Open government data (1 day course) is offered by FOKUS

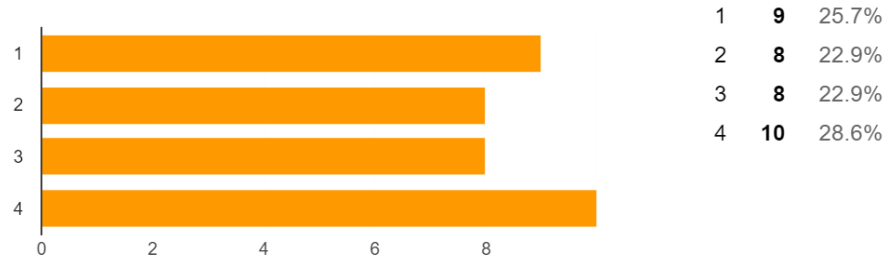


Figure 15. Argument mapping (1 day course)

Argument mapping (1-day course) is offered by FOKUS

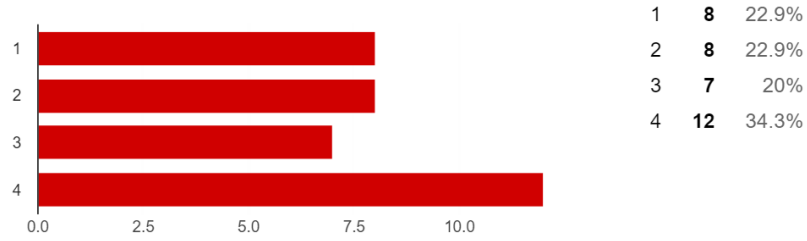


Figure 16. Knowledge based legal argumentation support systems (1 day course)

Knowledge based legal argumentation support systems (1 day course)is offered by FOKUS

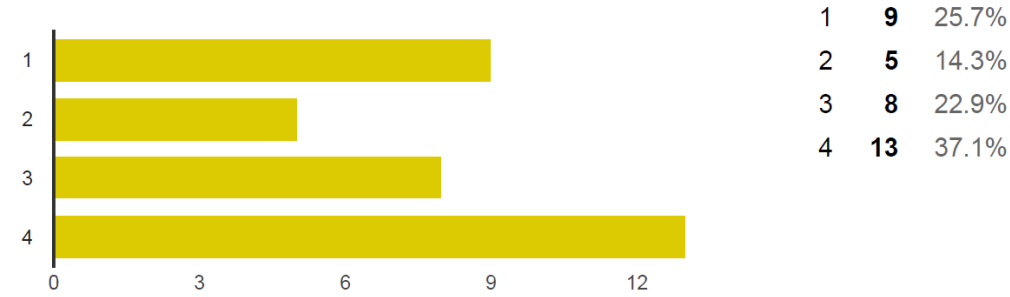


Figure 17. Policy impact analysis using performance metric and open data (1 day course)

Policy impact analysis using performance metric and open data (1-day course) is offered by FOKUS

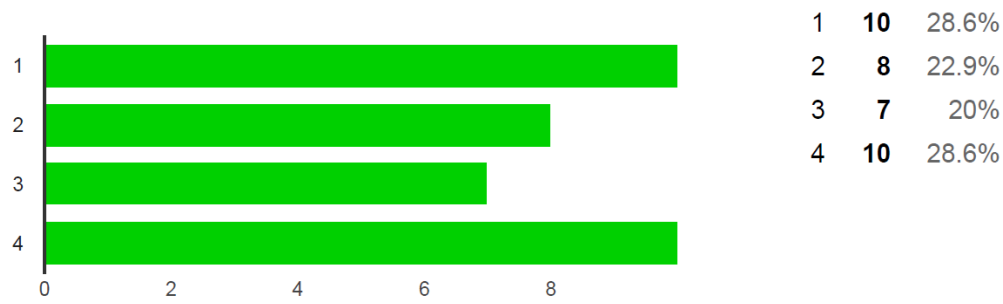


Figure 18. Writing H2020 proposals (1 day course)

Writing H2020 proposals (1-day course) is offered by FOKUS

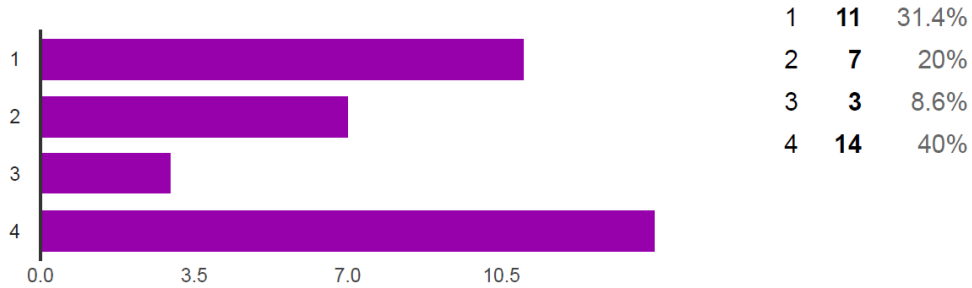


Figure 19. Introduction to Hydroinformatics (3 days course)

Introduction to Hydroinformatics (3 days course) is offered by UNESCO-IHE

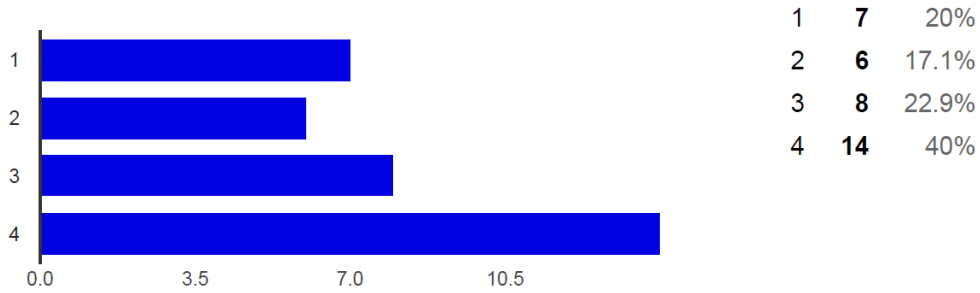


Figure 20. Modelling of urban water supply and drainage (2 day course)

Modelling of urban water supply and drainage (2-day course) is offered by UNESCO-IHE

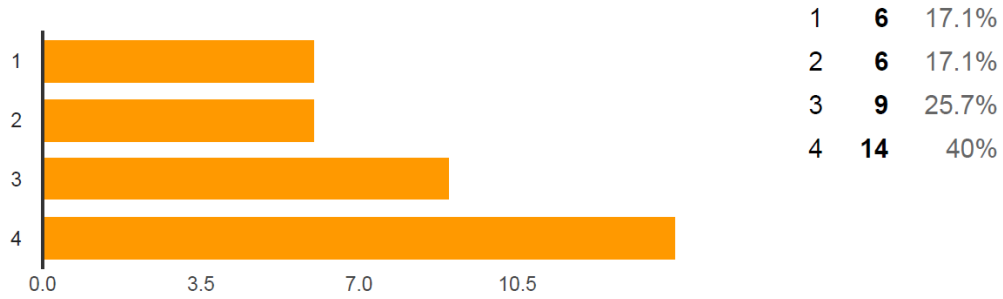


Figure 21. Flood modelling (3 day course)

Flood modelling (3 day course) is offered by UNESCO-IHE

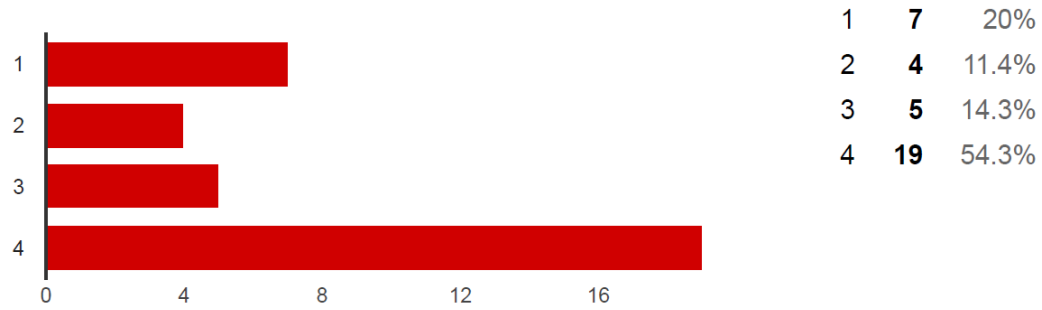


Figure 22. River basin and catchment modelling (3-4 day course)

River basin and catchment modelling (3-4 day course) is offered by UNESCO-IHE

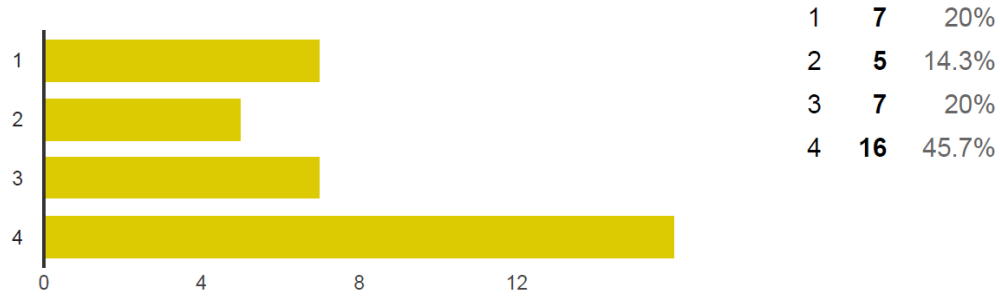


Figure 23. . Groundwater modelling (1.5 day course)

Groundwater modelling (1.5 day course) is offered by UNESCO-IHE

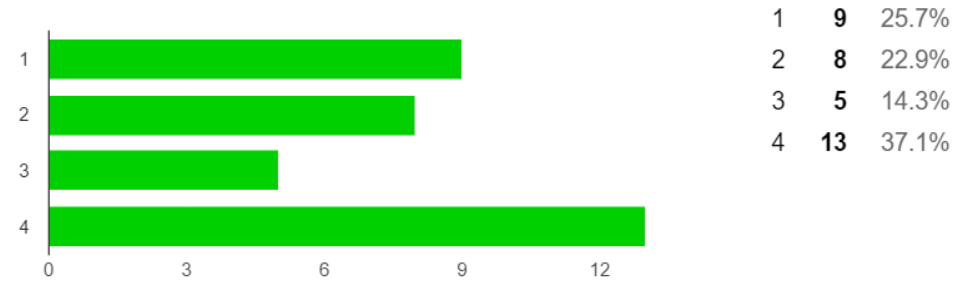


Figure 24. Hydroinformatics and decision support systems (2 day course)

Hydroinformatics and decision support systems (2-day course) is offered by UNESCO-IHE

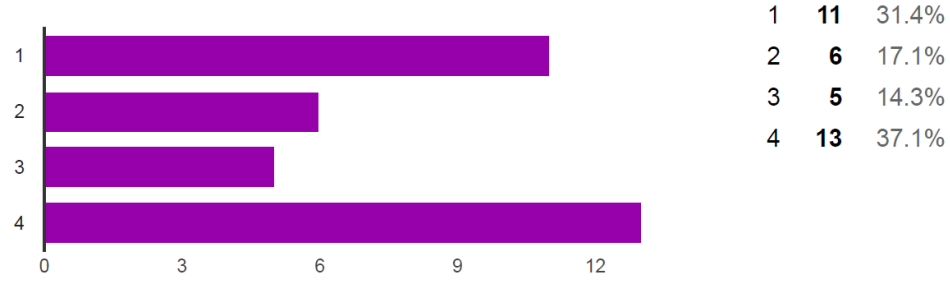
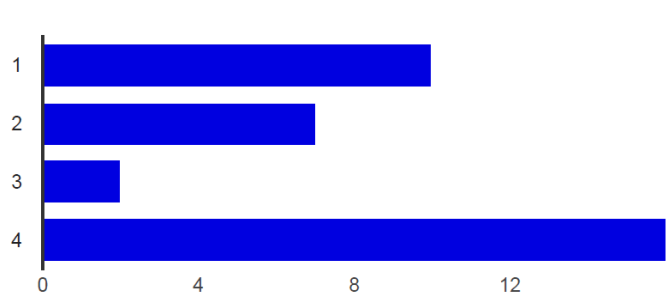


Figure 25. Intellectual property (0.5 day course)

Intellectual property (0.5 day course) is offered by UNESCO-IHE



1	**10**	28.6%
2	**7**	20%
3	**2**	5.7%
4	**16**	45.7%

Figure 26. GIS and remote sensing (2 day course)

GIS and remote sensing (2-day course) is offered by UNESCO-IHE

Apart from courses on offer respondents were asked to give three free choices of courses they are interested in. The overview of such input is presented in table 1 bellow.

Table 1. Open- choice course selection

Academic Staff	
Data analytics, Dealing with data uncertainty, Machine Learning, Data Cleaning	
Data analytics, Dealing with data uncertainty, ML techniques	
Data analytics, Modelling, Statistics	
Data Analytics, Statistics, Big Data	
Distributed Processing, Data Analytics, Timeseries Analysis	
Distributed Systems and Real-time Data Processing, Data analytics, Modelling	
GIS networks, Data Analyses, Sensors for water monitoring	
Optimisation (for water related problems), Data analytics for water management, Distributed Systems and Real-time Data Processing in water management	
prediction of water pollution; Big Data in Water Quality; MapReduce for Water Quality	
Virtual Reality, Software Engineering, Software Modeling	
Water remote monitoring systems, Water quality, Water data analytics	
MSc Student	
Artificial intelligence, machine learning, data science	
Data Analytics	
Distributed Processing, Data Analytics	
Distributed Processing, Data Analytics, Semantic Web	
Distributed Systems, Data Analytics,	
Distributed systems, Parallelism, Cloud systems	
GIS-app water management, flood simulation, pipeline models	
Modelling theory and Optimisation for water related problems, Distributed Systems and Real-time Data Processing	
Modelling theory; Optimization ; Distributed Systems and Real-time Data Processing in water management.	
Sensors used in water management Specific industrial networks used in water management Size and scalability needs in water management	
Virtualization, ARM embedded programming, Linux distribution process	
(blank)	
PhD Student	
Big data analytics tools, Fault Tolerance in distributed systems, Real-time Data Processing	
Data Analysis for water systems, Data Aggregation, Fault tolerant Measuring Systems	
Data Analytics, Distributed Processes	
Data analytics, Machine learning, GIS	
Distributed Processing, Data Analytics	
Distributed Processing, Data Analytics, Data management	
Distributed Systems and Real-time Data Processing in water management; Knowledge representation/interchange formats for water management (e.g. XML markup languages, Semantic Web formats); Data analytics for water management.	
Modelling theory (for water related problems), Uncertainty analysis, Data analytics for water management	
Modelling, Optimisation, Data Analytics	
Pipe Hydraulics, Distributed Systems and Real-time Data Processing in water management, Modelling theory (for water related problems)	
security, computer networks, operating systems	

4. Conclusion and recommendations

The detailed analysis of the training needs survey is an important basis for further project activities in order to maximize the impact of the Data4Water activities and in particular for the planned training sessions. The training planning in the project is based on the present analysis and represents a response to the expressed needs and demands. The main aim of the trainings is to ensure that they can provide valuable support for bringing UPB research into the water research domain.

4.1. Course selection

A ranking of training courses importance based on selection of responses is presented in figure 3. It can be seen that the most important training wishes of UPB focus on topics related to Computer science rather than water, which are ranked last in the list.

On a first look at the selection of priorities for training, from the list of courses on offer, it seems like little interest towards the water area, however an analysis of respondents based on academic level shows that majority of academic staff respondents selected water related subjects, while students are less interested. This is expected, because students are still in their early stages of developing skills in computer sciences area.

The analysis of open-choices for courses show the same trend as for the courses in offer.

4.2. Planning of trainings

Based on the analysis of survey results 3 courses are selected and plan initially in the first 15 months of the project. After three training courses, a quick survey for the remaining three training will be carried out.

The three selected training courses are:

1. *Introduction to Hydroinformatics* on June 21-23, 2016
2. *Open government data*, on November 2016
3. *Time series and data analytics*, on June 2017

Two of the planned Trainings (1 and 3, respectively) will be held back to back with a summer school.

Annex

The Survey questionnaire

The present training needs assessment questionnaire is carried out in the framework of Data4Water EU H2020 project.

The questionnaire is filled up by academic staff, PhD and MSc students of Universitatea Politehnica Bucuresti (UPB), in view of providing trainings in the field of hydroinformatics and water related topics.

There are several sections of this questionnaire. Please complete all of them.

A General information

1. Personal information	
Name (title, initials, name), first name, M/F?	
Department, Organisational Unit	
Academic level	( ) academic staff ( ) PhD student ( ) MSc student
If you are an academic staff and/or a PhD student please complete the two questions on the right	
	( ) Teaching load (hours (per year), excl. preparation)
	Please list the Main programme(s)/topic(s) taught (maximum 3) topics _____ _____ _____

2. Teaching/Research Experience (Complete this point only if you are an academic staff)	
Number of years of teaching and research experience with UPB	
Number of years of research experience outside of UPB	
Remarks (if any):	

B Experience with water related topic

Please indicate your answers in the checklist by placing an 'X' in the corresponding column. In case of selecting Extensive experience please add in brackets the number of months or years of experience.

3. Experience with water related topics	Little/none	Average	Extensive
Do you have experience in research in the following water areas:			
(1) Hydrology and catchment processes			
(2) Hydraulics and hydrodynamics of rivers			
(3) Pipe Hydraulics (water supply networks)			
(4) Drainage flow			
(5) Groundwater flow			
(6) Flood modelling and flood management			
(7) Water quality			
(8) Modelling theory (for water related problems)			
(9) Reservoirs			
(10) Optimisation (for water related problems)			
(11) Uncertainty analysis			
(12) Data analytics for water management			
(13) Geographical Information Systems (GIS) for water-related problems			
(14) Web-based applications for water problems			
(15) Mobile phone apps for water problems			
Other (please specify) …….			

4. Experience type, (just related to water topics)	Little/none	Average	Extensive
EU research projects			
Consultancy projects			
Teaching water related topics (please specify what)			
Laboratory work			
Other (please specify):……			

C. Training interests

5. List three main subject you would be interested to be trained in
1.
2.
3.

D. Available Training

Remark: Give an indication on the trainings that you would like to follow (1 to 4, as order in time) in the checklist bellow by placing an 'X' in the corresponding column.

6. D4W Training topics provided by project partners	*Duration (days)*	*1*	*2*	*3*	*4*
1. Time series mining (Bicocca University)					
2. Network analytics (Bicocca University)					
3. Layered machine learning (Bicocca University)					
4. On-line analysis (Bicocca University)					
5. Open government data (FOKUS)					
6. Linked data-a unified data format (FOKUS)					
7. Streaming analytics and complex event processing (FOKUS)					
8. Linked data management (FOKUS)					
9. Smart data analytics and mining (FOKUS)					
10. Teaching multicultural groups of students (FOKUS)					
11. Semantic web (FOKUS)					
12. Argument mapping (FOKUS)					
13. Knowledge-based legal argumentation support systems (FOKUS)					
14. Policy impact analysis using performance metric and open data (FOKUS)					
15. Writing H2020 proposals (FOKUS)					
16. Introduction to Hydroinformatics (UNESCO-IHE)	3-4 days				
17. Modelling of urban water supply and drainage (UNESCO-IHE)	2 days				
18. Flood modelling and flood risk management (UNESCO-IHE)	3 days				
19. River basin and catchment modelling (UNESCO-IHE)	3-4 days				
20. Groundwater modelling (UNESCO-IHE)	1.5 days				
21. Hydroinformatics and Decision Support Systems (including Optimization of water systems) (UNESCO-IHE) 22. Intellectual property and plagiarism issues (UNESCO-IHE)	2 days 0.5 days				
23. GIS and Remote sensing in water management					