



Quality assured content



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Project info	
Project title	Graduates for Climate Change adapted water management
Project acronym	CCWATER
Project reference number	619456-EPP-1-2020-1-NO-EPPKA2-CBHE-JP
Action type	Capacity Building in higher education
Web address	https://www.waterharmony.net/projects/ccwater/
Coordination institution	Norwegian University of Life Sciences (NMBU)
Project duration	15 January 2021 – 14 July 2024

Document control sheet	
Work package	WP2 Water & Climate change curriculum
Ref. no and title of task	T2.2.5 Evaluation and harmonisation of content
Title of deliverable	D2.2.5 Quality assured content
WP leader	THOWL
Task leader	UWM
Author(s)	Stanislawa Koronkiewicz, Xiaodong Wang, Martin Oldenburg
Date	14 July 2024
Dissemination level	Public



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1 Introduction

Teaching and learning content of 3 Courses developed in T2.2.1-2.2.3 have been evaluated internally and externally. For this purpose, partners have been organized a pool of evaluators from the resource persons inside the consortium (cross-review) and external reviewers from other curricula development projects ongoing at partner universities, experts from institutional and national quality assurance agencies, various stakeholders etc. Each reviewer received several content pieces for review (lecture presentations, textbook chapters, lab guidelines), so that each content piece was evaluated at least by 3 Reviewers. Reviewers completed an online survey about relevance and quality of the content, its matching of the current level of knowledge and technique, easiness and clearances for understanding etc. The lectures and textbooks were also evaluated by two groups of students at the Shenzhen Winter School 2024 (results in Appendix).

The reports were stored in an online database (MS Teams) and converted into blind comments to the resource persons who developed the content. Resource persons updated their content according to the reviewers' comments and returned final products to the course editors (assigned in T2.1.4). Course editors assured the quality of content improvements. They were also carry out harmonization of the content inside each course: correct repetitions, point out gaps and request additional improvements, if necessary.



2 Evaluation of Lectures

The following lectures were developed:

- **Course 1. Big Data for integrated Climate Change & Water Management**

1.1	Introduction to Big Data processing and analytics: What is Big Data, AI and machine learning, data cleaning and mining, possibilities and threats	1.1 CCWater Course Big Data-Introduction.pptx 1.1 CCWater Course Big Data-Introduction-SIAT.pptx
1.2	Big Data tools Introduction to ML, supervised, unsupervised, reinforcement learning, hypothesis (models) spaces, examples of ML applications Probability theory and concepts for ML, axioms of probability, conditional probability, Bayes theorem, maximum likelihood estimation, maximum a posteriori estimation Introduction to AI, definitions and history of AI. Intelligent Agents: Problem formulation, goals, constraints environment and actors/agents. Game theory: Selecting an optimal strategy in games using adversarial search techniques. Constraint Satisfaction Problems: Solving problems by finding acceptable solutions under constraints: Problem formulation and solving techniques.	1.2 CCWater Course Big Data tools.pptx
1.3	Big Data applications in the water sector Big Data in climate change models relevant for water sector; Process surveillance and process control with virtual sensors, forecasting effluents, process control algorithms with feed-forward/feed-back controls.	1.3 Big Data application in the water sector.pptx
1.4	Planning with Big Data Problem formulation construction of goal achieving plans: theory and practice. Planning and acting in the real world: schedules and resources, hierarchical planning, nondeterministic domains, multi-agent planning. Philosophical foundations of AI: Weak AI, strong AI, implications to dualism and consciousness	1.4 CCWater Course Big Data_Planning with Big Data.pptx
1.5	Visualization with Big Data The need and tools (examples) for visualization of Big Data based analytics; User interfaces with access limitations	1.5 CCWater Course Big Data visualization-AB_HR.pptx
1.6	Ethics and AI Integrating ethics to AI systems, accountability and interpretability of AI systems. Regulatory Framework of AI: Existing regulatory frameworks and legal issues arising from AI applications	1.6 CCWater Course Big Data_Ethics and AI.pptx

- **Course 2. Storm water management with low impact development and non-conventional water reuse**

2.1	Urban stormwater and impacts Hydrologic processes in urban catchments, Stormwater quantity and quality, impacts of urban stormwater -causes of the impacts, Changes under the climate change.	2.1.1 Hydrologic processes in urban catchments.pptx 2.1.2 Stormwater quantity and quality.pptx
2.2	Overview of urban stormwater management Urban stormwater management, Stormwater control index system, Water sensitive urban design, Measurements for urban stormwater management, Conventional water reuse. Sustainable urban drainage (SuDS, blue green infrastructure etc- added by Harsha).	2.2 Urban Stormwater Management.pptx
2.3	Introduction of low impact development for urban stormwater control Concept of Low Impact Development (LID), Types and impacts of LID in urban stormwater management, Deployment of LID in urban water systems, Relationship between LID and non-conventional reuse.	2.3.1 Concept of Low Impact Development.pptx 2.3.2 Types and impacts of LID in USWM.pptx
2.4	Applications of big data and software in LID of urban stormwater control Big data and IT tools, Case study applications, Stormwater Management Models (E.g. SWMM of US-EPA), Model for urban stormwater improvement conceptualization (E.g. MUSIC of eWater -Australia).	2.4.1_1 Big data for urban storm water management.pptx 2.4.1_2 Software tools for urban storm water management.pptx
2.5	Integrated management strategies Risk assessment of urban stormwater, Technical standards on sustainable stormwater management, Regulations on stormwater management, planning, case studies.	2.5 Integrated Management Strategies.pptx



Evaluation of Lectures

- Course 3. Integrated Water Resources Management under Climate Change

3.1 Water resources and consumptive use Hydrological cycle, Assessment of water availability, water quality, Value of water, Water utilization and sectoral demands. Socio-economic and environmental dimensions of water resources, Recycling and reuse	C3_S1.1 Hydrological cycle.pptx C3_S1.2 Assessment of water availability.pptx C3_S1.3 Water quality.pptx C3_S1.4 Value of water NN+HR.pptx C3_S1.5 Water utilization and sectoral demands.pptx C3_S1.6 Recycling and reuse of water.pptx C3_S1.7 Socio-economic and environmental dimensions of water resources.pptx
3.2 Impact of climate change on water resources Climate variability and climate change, CC drivers and CC projections, CC mitigation and adaptation, Impact of climate change and adaptation in water sector, designs under stationary and non-stationary hydrological series	C3_S2.1 Climate system.pptx C3_S2.2 Observed climate changes and climate variability.pptx C3_S2.3 CC drivers and CC projections.pptx C3_S2.4 Impacts of CC in water sector.pptx C3_S2.5 CC mitigation and adaptation.pptx C3_S2.6 Designs under stationary and non-stationary hydrological series.pptx
3.3 IWRM challenges under climate change IWRM concepts, Supply and demand management, Management of shared water resources, Impact of climate change and adaptation in water sector, Climate resilience, Catchment management, Gender in IWRM, Sustainable solutions at regional/local levels	C3_S3.1_1 IWRM concepts.pptx C3_S3.1_2 Supply and demand management.pptx C3_S3.2_1 Gender in IWRM.pptx C3_S3.2_2 Management shared water resources.pptx C3_S3.3 Climate resilience.pptx C3_S3.4 Catchment management.pptx C3_S3.5_Solutions at regional and local levels to IWRM challenges.pptx
3.4 Water governance Water policy and national goals, Legislation and regulations, Legislations and their implementation, Institutions, Public participation	C3_S4.1 Good water governance.pptx C3_S4.2 Water resource policies & national goals.pptx C3_S4.3 Water governance legislation, regulations and implementation.pptx C3_S4.4 Water governance – Institutions.pptx C3_S4.5 Public participation.pptx

2.1 Methodology

- Each lecture developed in T2.2.1 was assessed by 3 independent reviewers.
- Additionally, the lecture materials were evaluated by the group of students participated at the Shenzhen Winter School. For this purpose a short survey was distributed to group of 93 students.

The assessment details related to lectures for Course 1-3 are presented in Appendix 1 and summarized in Table 1.

2.2 Results and Conclusions

The results of Reviewers evaluation indicated a high degree of completeness of the developed materials in relation to the adopted assumptions. The lectures contained a satisfactory amount of source materials (references, assignments, etc.). The coverage of current scientific/technical level of knowledge, according to the reviewers, was high or at least medium. There was some medium overlap between lectures in course 2 (lectures 2.1. and 2.2).

Tab. 1: Lecture review results

Course 1						
Indicators	Lectures and numbers of answers					
	1.1	1.2	1.3	1.4	1.5	1.6
Presence of all required topics and modules						
High	3	3	3	3	3	3
Medium						
Low						
Inclusion of relevant resources (references, assignments, etc.)						

Evaluation of Lectures






High	3				1	3
Medium		3	3	3	2	
Low						
Adequate depth of coverage for topic						
High	3	3	3	1	3	3
Medium				2		
Low						
Rate of overlapping with other lectures of the course						
High						
Medium						
Low	3	3	3	3	3	3
Course 2						
Indicators	Lectures and numbers of answers					
	2.1	2.2	2.3	2.4	2.5	
Presence of all required topics and modules						
High	3	3	3	3	3	
Medium						
Low						
Inclusion of relevant resources (references, assignments, etc.)						
High			1	3	3	
Medium	3	3	2			
Low						
Adequate depth of coverage for topic						
High	1	3	3	1	3	
Medium	2			2		
Low						
Rate of overlapping with other lectures of the course						
High	1	1				
Medium	2	2				
Low			3	3	3	
Course 3						
Indicators	Lectures and numbers of answers					
	3.1	3.2	3.3	3.4		
Presence of all required topics and modules						
High	3	3	3	3		
Medium						
Low						
Inclusion of relevant resources (references, assignments, etc.)						
High		3	2	1	1	
Medium	3		1		2	
Low						
Adequate depth of coverage for topic						
High	3	3	3	3	3	
Medium						
Low						
Rate of overlapping with other lectures of the course						
High						
Medium						
Low	3	3	3	3	3	



The survey included the following questions and student responses:






How would you rate the overall quality of this lecture?

Antall svar: 400

Svar	Antall	% av svar	
Excellent	203	50.7%	 50.7%
Very good	151	37.8%	 37.8%
Good	45	11.3%	 11.3%
Fair	1	0.3%	 0.3%
Poor	0	0%	 0%

How would you rate the relevance of the lecture content to climate change adapted water management?

Antall svar: 400

Svar	Antall	% av svar	
Excellent	198	49.5%	 49.5%
Very good	153	38.3%	 38.3%
Good	48	12%	 12%
Fair	1	0.3%	 0.3%
Poor	0	0%	 0%








Evaluation of Lectures

Evaluating the quality of the learning experience






Please rate the effectiveness of the teaching methods used in this course (lectures, group discussions, case studies, practical exercises, etc.).

Antall svar: 400

Svar	Antall	% av svar	
Very Effective	170	42.5%	 42.5%
Effective	183	45.8%	 45.8%
Neutral	44	11%	 11%
Ineffective	3	0.8%	 0.8%
Very Ineffective	0	0%	 0%

How satisfied were you with the interactive digital learning in this lecture based on your expectations and needs?

Antall svar: 400

Svar	Antall	% av svar	
Very Satisfied	169	42.3%	 42.3%
Satisfied	190	47.5%	 47.5%
Neutral	38	9.5%	 9.5%
Dissatisfied	2	0.5%	 0.5%
Very Dissatisfied	1	0.3%	 0.3%

General comments and student suggestions concerning the aspects of the lectures which could be improved:

- Maybe the one who made the presentation could take some notes for the slides with only pictures so the one who is presenting knows what to say and what it is about.
- For the further use maybe also use example of the country the lecture is hold in (in comparison to Norway)
- Ask some questions during lectures
- I really like the lecture! We could follow really easily and it was a great introduction to the modeling program!
- Maybe show a few videos next time about the impacts on Water treatment plants
- Very good presentation slides and teaching
- Better to add photos, tables, graphs in the presentation. It gives more clearer idea. Better to add regulations on stormwater management, available standards and design of stormwater management system.

Suggestions for additional topics or activities that could enhance the lecture:

- Better to add some real world examples
- Big data is a very important topic, and the basics from this lecture were clear to me. Therefore I was glad about some classes with more information about this topic followed. Still, I would make this topic a bigger part.

3 Evaluation of Textbooks

Three Textbooks were developed in task T2.2.2, one for each of the 3 Courses:

- CCWater - WP2 - T2.2.2 - Big Data-Textbook Course 1 final
- CCWater - WP2 - T2.2.2 - Textbook of Course 2 final
- CCWater - WP2 - T2.2.2 - Textbook of Course 3 final

3.1 Methodology

- Each textbook developed was assessed by 3 independent Reviewers.
- Additionally, Textbooks were evaluated by the group of students participated at the Shenzhen Winter School (survey for group of 93 students).

3.2 Results and Conclusions

As a result of the evaluation, the Reviewers noticed the lack of developed chapters 1.2 and 1.4 for Course 1. In the final version of the textbook, they were supplemented and assessed positively by the Reviewers. The assessment details related to textbooks for Course 1-3 are presented in Appendix 2 and summarized in Table 2.

Tab. 2: Textbook chapters review results

Course 1						
Indicators	Chapters and numbers of answers					
	1.1	1.2	1.3	1.4	1.5	1.6
Presence of all required topics and modules						
High	3		3		3	3
Medium						
Low		3		3		
Inclusion of relevant resources (references, assignments, etc.)						
High	3		3		3	3
Medium						
Low						
Adequate depth of coverage for topic						
High	3		3		3	3
Medium						
Low						
Rate of overlapping with other lectures of the course						
High						
Medium						
Low	3		3		3	3
Course 2						
Indicators	Lectures and numbers of answers					
	2.1	2.2	2.3	2.4	2.5	
Presence of all required topics and modules						
High	3	3	3	3	3	
Medium						
Low						
Inclusion of relevant resources (references, assignments, etc.)						
High	3	3	3	3	3	
Medium						
Low						







Evaluation of Textbooks

Adequate depth of coverage for topic					
High	3	3	3	3	3
Medium					
Low					
Rate of overlapping with other lectures of the course					
High					
Medium	3	3	3	3	3
Low					
Course 3					
Indicators	Lectures and numbers of answers				
	3.1	3.2	3.3	3.4	
Presence of all required topics and modules					
High	3	3	3	3	3
Medium					
Low					
Inclusion of relevant resources (references, assignments, etc.)					
High	3	3	3	3	3
Medium					
Low					
Adequate depth of coverage for topic					
High	3	3	3	3	3
Medium					
Low					
Rate of overlapping with other lectures of the course					
High					
Medium	3	3	3	3	3
Low					

Students assessed the usefulness of the textbook for learning. Results of survey are presented below:

Are the textbook chapter/reference materials relevant and handy for your learning?

Antall svar: 400

Svar	Antall	% av svar	
Strongly Agree	134	33.5%	 33.5%
Agree	146	36.5%	 36.5%
Neutral	78	19.5%	 19.5%
Disagree	2	0.5%	 0.5%
Strongly Disagree	0	0%	 0%
Not used	40	10%	 10%





4 Evaluation of Practical (laboratory) exercises

4.1 Methodology

To evaluate the Practical (laboratory) exercises, a short survey was distributed to the partners. 121 people participated in the survey, both teaching staff and non-academic professional in the sector:

Number of submissions: 121

Submissions	Count	% of submissions	Chart
Teaching staff	110	90.9%	 90.9%
Student	0	0%	0%
Non-academic professional in the sector	11	9.1%	 9.1%

4.2 Results and Conclusions

The assessment details related to Practical (laboratory) exercises for Course 1-3 are presented in Appendix 3. Table 3 summarizes the evaluation the quality of the content of the practice (laboratory) exercise materials. The content was rated as excellent, very good or good.

Tab. 3: Evaluation of the Practical (laboratory) exercises content

How would you rate the content?

Submissions	Excellent	Very good	Good	Fair	Poor	Chart
How would you rate the overall quality of this lecture	53	57	12	0	0	
How would you rate the relevance of the exercises to climate change adapted water management	60	43	20	0	0	
How would you rate the usefulness of the acquired skills from the exercises	55	48	18	0	0	
Were the timelines or schedule fitful to the education program?	56	43	22	0	0	
Please rate the effectiveness of the exercises enhancing the teaching activity related to climate change adapted water management	58	46	17	0	0	

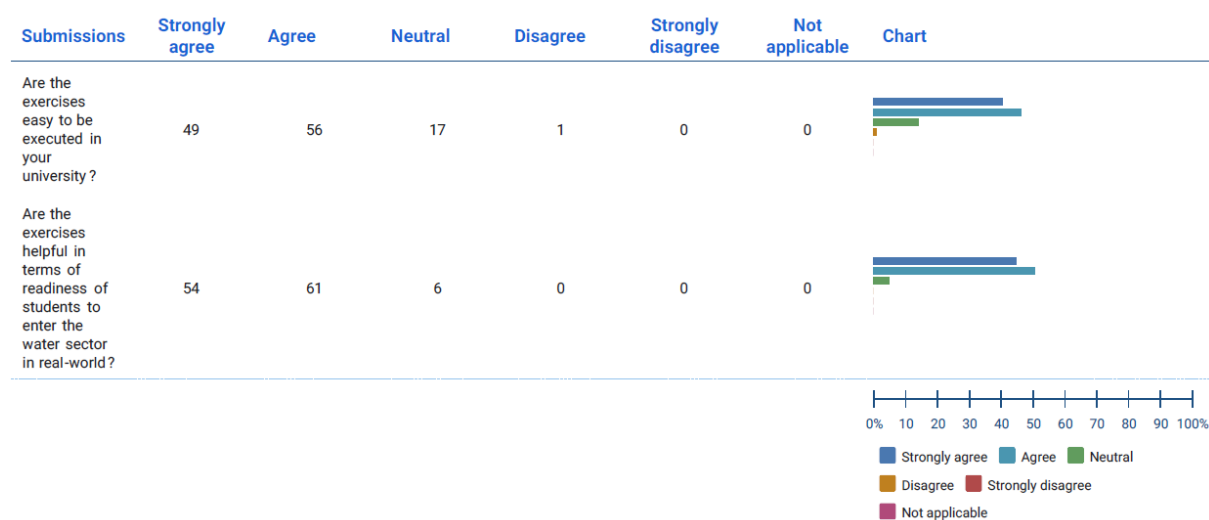


The second part of the survey concerned practical usefulness and implementability of the exercises, which is presented in Table 4.

- For the question: “Are the exercises easy to be executed in your university?” 40 % of Evaluators responded “Strongly agree”, 45 % - “Agree” 14 % - “Neutral” and below 1 % - “Disagree”.
- For the question: “Are the exercises helpful in terms of readiness of students to enter the water sector in real-world?” 45 % of Evaluators responded “Strongly agree”, 50 % - “Agree” and 5 % - was “Neutral”.

Tab. 4: Evaluation of the Practical (laboratory) exercises content

Practical usefulness and implementability



There were several general comments and suggestions which are listed below:

- In addition to the experiments listed in the course, if there are new instruments, they can also be added to the course materials.
- One could consider conducting measurement experiments on certain buildings within the school. While students from different countries may have varying living environments, schools often have consistent structures such as gymnasiums and libraries. These buildings can be used as standardized environments for rainwater collection experiments.
- In question 2c, the situations in other countries differ from that in Sri Lanka. It would be beneficial to include scenarios from other typical regions, such as Northern Europe, Western Europe, and East Asia, in the standard answer.
- In question 2, the comparison focuses on policies of the country in one's own region. Another question could be added to compare countries selected from those with significant differences in natural environment and social development levels, and to contrast their regulatory frameworks. This type of comparison would help students better understand the diverse policies adopted by different countries under varying resource and economic conditions.
- It would be better to discuss other techniques for stormwater management besides rainwater harvesting.
- Second task in the exercise limits to two country. It could be useful to consider at least two country and for the answer, students are encouraged to use more information from research articles and best practices from those countries.
- Need more adapted or selected exercises
- The discussion section could be extended more into innovation and usefulness of the harvesting.
- Could we extend exercise with some other parameters such as heavy metals, nutrients, pesticides or herbicides.

Appendix 1

Evaluations of Lectures

File	Location
T2.2.5-evaluation-lectures-completed (xlsx)	Uploaded
Appendix-students evaluations(1) (PDF)	Uploaded

Appendix 2

Evaluations of Textbooks

File	Location
T2.2.5-evaluation-textbook-completed (xlsx)	Uploaded

Appendix 3

Evaluations of practical (laboratory) exercises

File	Location
report-ccwlabs.pdf	Uploaded

