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INOW ASIA

WP2 Implementation I:
Modular Curriculum Development &
Teaching Capacitation

The INOWASIA Consortium

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Université Toulouse III - Paul Sabatier (UT3)	France
Hanoi University of Science – Vietnam National University (HUS)	Vietnam
Can Tho University (CTU)	Vietnam
National University of Laos (NUOL)	Laos
Souphanouvong University (SU)	Laos
Institute of Technology of Cambodia (ITC)	Cambodia
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Abstract

This deliverable summarises the list of courses that will be developed and implemented, based on the knowledge and skills/competences that are required to train the future young water professionals from Southeast Asia. The information was mainly obtained through the Research and Analysis Plan (WP1 questionnaires) and worked with the partners during the Scientific Committee meetings.

The project already suggested a hybrid methodology, combining 1) e learning courses to acquire and reinforce basic knowledge in the field of water resources and 2) face-to-face classes to acquire advanced knowledge. The basic knowledge will be offered through an open e learning platform with free self-paced courses, not only available for INOWASIA students but also to any student, academic, researcher and professional from the water resources sector, while advanced knowledge courses will be developed using problem-based learning methodology and implemented in existing or new subjects in the MSc programs from our SEA universities. Additional advanced knowledge and PBL methodology training is offered to teachers (and students) with virtual and face-to-face sessions during the consortium trips to Europe and Southeast Asia, and with specific missions from some European partners to Cambodia, Laos and Vietnam.

Document History

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V0.1	11-10-2022	First draft
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Contents

Acronyms

PBL	Problem-Based Learning
SEA	South-East Asia
MSc	Master of Science
WP	Work Package
WASH	WAter Sanitation and Hygiene
NGO	Non-Governmental Organizations
APC	Academic and Professional Committee

Basic knowledge training

Based on the conclusions of Research and Analysis Plan conducted in WP1, the basic learning objectives identified for the future young water professionals were:

- To understand in detail main water processes and mechanisms, at municipal and industrial scale.
- To have a global view of the water sector challenges, including specific water challenges faced in Cambodia, Laos, and Vietnam.
- To build/reinforce a strong background in sustainable water management.
- To have an interdisciplinary knowledge linking chemistry, biology, engineering, biotechnology, hydrogeology, economy, law, agriculture, automation, etc.

When the existing courses in the SEA universities were studied in detail, it was found that most of these basic competences were already included in the syllabus of their degrees (both at Bachelor and MSc level). It was decided to generate a list of basic knowledge courses that could be developed for a free e-learning platform, with teaching material based on the existing expertise of INOWASIA partners and complemented with the inputs/feed-back of the stakeholders from our Academic and Professional Committee (APC). The material will be adapted to be followed on-line in a self-paced format (without supervision). It will be available in the INOWASIA training platform (developed by WUSMED), where the students must create a profile for registration, with a wide target audience:

- Students from any science/engineering field
- Researchers and teachers from universities, research centres, or R+D departments in water companies.
- Water technicians in companies from different sectors and in the public administration.
- Water consultants.
- Managers of natural protected areas.
- Technicians in charge of carrying out and following up environmental audits and water impact studies.
- Industrial sector professionals working on water issues.
- Tourism sector professionals working on water issues.
- Agricultural sector professionals working on water issues
- Water process engineers.
- Coordinators or technicians of WASH programs in NGOs or International Institutions.

The skills that will be acquired by the students who are enrolled to a self-paced on-line course are the following:

- Digital skills.
- Time management.
- Autonomy.

- Responsibility.
- Confidence in their technical abilities.
- Self-motivation and personal drive.

Most of the courses will be developed in English, but the option of leaving it in other languages of INOWASIA partners is maintained to increase the audience in local markets. The material includes:

- Title of the course
- Goal of the course
- Learning objectives
- Keywords (between 3 and 6)
- Author/s and affiliation/s
- Estimated time effort for the student (recommended between 5 and 15 hours)
- Short video (optional)
- Compilation of the slides in a ppt or pdf file
- Basic literature
- Supplementary reading
- Final evaluation (multichoice exercise)

Each partner of INOWASIA will lead the development of the material of at least one on-line course. The final list of the courses done is the following:

Course title	Leading partner	Task force	Language(s)
Introduction to aquatic ecology	NUBB (Ratha Chea)	UT3, UdG	English
Chemistry for environmental engineering	ITC (Khy Eam)	SU	English
Natural services, ecological engineering and biodiversity conservation	UT3 (Magalí Gerino)	NUBB, IRD	English French
Basic hydrology	IRD (Didier Orange)	ITC	English
Basic eco-hydrology	IRD (Didier Orange)	UT3	English
Municipal wastewater treatment	UdG (I Rodriguez-Roda)	Ramboll	English Spanish
Drinking water treatment	UdG (Laura Ferrandez)	Ramboll, FSUB	English

			Spanish
Material applied in water and wastewater treatment	VNU-HUS (Trinh Tran)	UdG, Ramboll	English
Chemistry environment and management	SU (Anousith Vannaphon)	ITC	English Laosian
Watershed management	CTU (NVC Ngân)	NUBB	English
Biological approach for water quality monitoring	NUOL (Chanda Vongsombath)	ITC	English Laosian

The draft material will be revised by at least two partners of the consortium (including APC stakeholders), who will give their feedback with respect to the level and quality of the contents, in an iterative process. Once approved, the courses will be implemented in the INOWASIA training platform, where they will be tested by local students to identify gaps and coding errors. Once all the details are solved, the course will be available to any audience.

Advanced knowledge training

Based again on the conclusions of Research and Analysis Plan conducted in WP1, where global/local water challenges and education gaps were identified, and after carefully reviewing the contents and syllabus of the existing MSc in the SEA universities of INOWASIA in the field of water resources, several topics were selected.

As mentioned before, the teaching methodology selected is problem-based learning (PBL), to train our students with key 21st century personal skills. PBL is a semi-autonomous cooperative learning process in small groups where (real) complex situations are discussed in groups instead of lecture-based classes. PBL places the student at the forefront of the learning process by transforming the teacher into a coach who probes and challenges students towards constructing knowledge. Students formulate and pursue their own learning objectives by researching a situation, developing appropriate questions, and producing their own solution to an open problem. They learn concepts instead of just absorbing facts. These enquiry-based teaching methods engage students in creating, questioning, and revising knowledge, while developing their skills in critical thinking, collaboration, communication, reasoning, synthesis and resilience.

The tentative list of the subjects to be developed in PBL and implemented in the existing MSc in the field of water resources is the following.

SEA partner	Master's program	Subject title	Implemen-tation	Estimated time	Leading partner	Task force
NUBB	Sustainable Ecosystem Management MSc	Ecosystem's services (benefits to people valuation and payment for ecosystem services)	Existing subject (minor modifications of syllabus)	45 h (1 or 2 PBL)	NUBB (Ratha)	UT3, IRD
NUBB	Sustainable agriculture MSc Sustainable Ecosystem Management MSc	Water quality management	New subject	45 h (2 PBL PILOT + 1 conventional credit)	NUBB (Sochreat)	SU UT3 UdG
NUOL	Environmental pollution and prevention MSc	Apply biological indicators for water quality assessment	Existing subject	30 h (2 PBL)	NUOL (Chanda)	UT3, FSUB
SU	Agriculture and forest management	Experimental Design in agriculture and Forest Environment.	Existing	32 ho (2 PBL)	SU (Bonpasith)	
ITC (maybe)	Water and environmental engineering MSc Engineering MSc	Resource recovery	New subject (elective)	32 h (2 PBL)	UdG and ITC (Theng Vouchley)	FSUB
ITC	Water and environmental engineering MSc M2 October 2023	Management of water supply and sanitation	Existing	32 h (2 PBL)	UdG and ITC (Heu Rina)	VNU
CTU	Water engineering MSc	Hydrological modelling	Existing	32 h (2 PBL),	CTU (Dr. Nam)	IRD
HUS-VNU	Environmental chemistry MSc Environmental Engineering MSc	Wastewater treatment design	Existing	15 h (1 PBL)	VNU UdG	FSUB UT3
HUS-VNU	Environmental chemistry MSc Environmental Engineering MSc	Water and smart cities sustainable water management. Green cities	Existing	15 h (1 PBL)	VNU	IRD UT3

There are some additional subjects that will be developed in PBL, and the material saved in the project website available for the partners who want to implement the subject in the future.

- Advanced wastewater treatment: membranes and oxidation (UT3, UdG)
- Drinking water treatment (UdG)
- Ecosystem services in the mangroves with ICT and IRD
- …

As established for the online courses, PBL material will be reviewed by INOWASIA partners before its implementation in the existing MSc.

As mentioned above, and to reinforce 21st century skills acquisition, PBL teaching methodology was chosen. Training about the methodology was necessary for all the partners and teachers from their faculties/departments/universities (see deliverable 2.3).

To complement the courses developed in PBL, and train the teachers about the advanced knowledge, three actions have been defined:

- Face-to-face training sessions have been added to the consortium trips to Europe and Southeast Asia, biannual steering committees through seminars, master classes and visit to facilities. It has been done in the consortium trips to Spain, to France, and to Vietnam.
- A week of virtual training with master classes given by experts in the field (from inowasia and from our international network) on all the topics chosen for the development of the subjects that will be implemented in PBL. It is scheduled for late 2022 or beginning of 2023, and it will be open so that any student, teacher or professional in the field can connect and attend the master classes. The material used for theses master classes will be saved in our web page to leave it available for the teachers who must implement the subjects in their SEA universities.
- Specific missions to target countries to train on specific topics. A first mission was done to Cambodia with master classes about membranes for water treatment and WASH. A second specific mission is planned for December/January in Cambodia and Laos with master classes about wastewater natural treatment, nature-based solutions, resource recovery, and membranes for water treatment. Further work is being done to define new missions on Eco&Sols Biofunctools, Membrane Bioreactors, Drip Irrigation / agriculture, and biomimicry.