



Erasmus+



DEVELOPMENT OF THE ERASMUS+ BLENDED
LEARNING TRAINING MODULE
'MARAWAS: MANAGEMENT OF RADIOACTIVE WASTE'

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Blended learning in radiation protection and radioecology
(e-learning modules)

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 - ▶ MaRaWas training school
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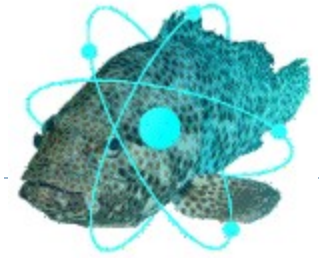
INTRODUCTION

Development of a waste management training : a challenge!

- ▶ **In practice : waste management => very different contexts**
 - ▶ From minimization, classification and quantification during operation
 - ▶ To local short term storage
 - ▶ Preparation for transport to a waste treatment facility
 - ▶ Waste conditioning and final disposal
- ▶ **Radioactive waste : divers**
 - ▶ Different treatments
 - ▶ Different exposure routes
 - ▶ Different national legislations,.....

=> **Development** of training school MARAWAS :
a **first attempt** in the framework of a **Erasmus+ strategic partnership**
for **master students** from different European partners of **CHERNE network**

INTRODUCTION



- ▶ **CHERNE** (<http://www.cherne.ntua.gr/>)
 - ▶ Open European academic network for cooperation in higher education on radiological and nuclear engineering
 - ▶ since 2004
 - 16 IP organized mostly with European grants
 - > 300 students participated in teaching activities
 - ▶ Annual Cherne workshop (Covilha 22-26/5/2017)

- ▶ **Erasmus + Strategic Partnership**
 - ‘Blended learning in radioecology and radiation protection’**
 - 01-09-2015 until 31-08-2017**

ERASMUS + STRATEGIC PARTNERSHIP

“Blended learning in radiation protection and radioecology”

8 Academic Partners (from the CHERNE network)

- ▶ HE2B-ISIB– **BELGIUM**
- ▶ UNIVERSITEIT HASSELT (UHasselt)- **BELGIUM**
- ▶ FACHHOCHSCHULE AACHEN (FH Aachen) - **GERMANY**
- ▶ UNIVERSITA DI BOLOGNA(UNIBO) - **ITALY**
- ▶ UNIVERSIDADE DE COIMBRA - **PORTUGAL**
- ▶ CZECH TECHNICAL UNIVERSITY IN PRAGUE(CUT) – **CZECH REPUBLIC**
- ▶ NATIONAL TECHNICAL UNIVERSITY OF ATHENS(NTUA) - **GREECE**
- ▶ UNIVERSITAT POLITECNICA DE VALENCIA (UPV)- **SPAIN**

2 Non-academic partners

- ▶ a research institute: THE NATIONAL RADIATION PROTECTION INSTITUTE (SURO) – **CZECH REPUBLIC**
- ▶ a regulatory body: GREEK ATOMIC ENERGY COMMISSION - **GREECE**

Target group for training schools : master students of each partner :
Different background in knowledge and practical skills

ERASMUS+ STRATEGIC PARTNERSHIP

“Blended learning in radiation protection and radioecology”

6 ‘distance’ learning modules 2ECTS/module

Basics nuclear and radiation physics	Basics of measurement and dosimetry	Radiation protection
General safety principles	Basics radiochemistry	Medical applications

Via **E-learning module platform** supervised by
Greek Atomic Energy Commission (EEAE) <http://edu.eeae.gr>

Support for face to face learning activities in the training schools (one week)

Extra modules specially related to training schools can be added :
practical information on the training activities and organisational aspects

6 Training schools (2 ECTS/week)

	Probability Risk Assessment PRA	Measurements of Environmental radioactivity in Belgium (MERiBel)	Safe industrial applications of radiation and radionuclides SARA
where	UPV – Valencia	ISIB HE2B - Brussels	CTU - Prague
when	Feb 2017	April 2017	Dec 2016
Students	20	20	20

	Radiochemistry MARC	Practical radiation protection in medical field MANTRA	Management of radioactive waste MARAWAS
where	FHAachen – HE2B Jülich	Unibo – Bologna	UHasselt – Diepenbeek
when	Sept 2016	March 2017	Nov 2016
students	20	20	20

MARAWAS TRAINING SCHOOL

- ▶ 20 students from 6 different partners : 5 groups of at least 3 different nationalities
- ▶ 2 ECTS => 60 h study load
- ▶ 5 full days training activities (38 h)
- ▶ Pre-training activities via extra module on module platform
 - ▶ Study guide : instructions
 - ▶ Study background documents
 - ▶ Formulate questions
 - ▶ Prepare lab exercises : lab text, manuals and videos
 - ▶ Round table topic concerning waste management in different European countries
 - ▶ per group : paper submitted and reviewed by 2 experts in advance

MARAWAS TRAINING SCHOOL

- ▶ Training activities during 1 week
 - ▶ Practical exercises (3 half days)
 - a. Decontamination and waste management in the radiochemistry lab : LSC
 - b. Portal monitoring and intervention training
 - c. From residues to building materials : Alkali activation



MARAWAS TRAINING SCHOOL



► Technical visits (3 half days)

- a. Waste management and conditioning , short term storage :
Belgoprocess, Dessel
- b. Decontamination techniques : Tecnubel, Dessel
- c. Long term waste management :
Underground laboratory Hades and exhibition center
Euridice, Mol
- d. Portal systems : indoor and outdoor monitoring and intervention
procedures
hospital
steel production plant

MARAWAS TRAINING SCHOOL

Invited lecture

Guest speaker Christian Cosemans (NIRAS)

“A Short Introduction to Radioactive Waste Management in Belgium”



Round table

Panel experts

Christian Cosemans

Herwig Janssens



5 topics (1/group)

- “Stakeholders in the medium and long term storage of radioactive waste”
- “On site waste management and monitoring in hospitals”
- “Waste management in university labs (on site) across Europe”
- “Transport procedures of radioactive waste to a treatment facility”
- “Approaches for the management of NORM waste in EU”

EVALUATION

- ▶ Friday : presentation of the results of a practical session/group
- ▶ Final mark :
 - ▶ Evaluation of the paper
 - ▶ Round table participation
 - ▶ Presentation and performance in the practical sessions

PROGRAM MARAWAS TRAINING SCHOOL

Nov 2016

Monday	Tuesday	Wednesday	Thursday	Friday
<p>Arrival in Diepenbeek Welcome</p> <p>Answers to questions</p> <p>Phd short presentations</p>	<p>practical exercises a, b, c</p>	<p>Technical visit : Belgoprocess : waste management Tecnubel : lecture - demo decontamination techniques</p>	<p>Technical visit: portal systems in several industrial settings (medical/ waste/scrap/...)</p>	<p>Preparing reports and oral presentations</p>
<p>21-25 NOVEMBER 2016</p>				
<p>practical exercises a. Decontamination lab b. Detection portal c. NORM2geo- polymers</p>	<p>practical exercises a, b, c</p>	<p>Technical visit : Euridice - Long term waste management</p> <p>Exhibition and underground laboratory Hades</p>	<p>Lecture of Niras Presentations and discussion of topic in round table : Waste management in different EU countries</p> <p>Social event</p>	<p>oral presentations and Evaluation practical exercices : Erasmus + members</p> <p>Farewell drink</p>

CRITICAL REFLECTION

Pre-training organisation

- ▶ Lot of administration to access the technical visits and organisation of training activities
- ▶ Early registration even before start of academic year
- ▶ Development of extra module on Moodle platform

Intensive guidance during training activities

- ▶ Different practical skills : supervision by many colleagues during practical exercises
- ▶ External experts and partner professors

Financial support

- ▶ Erasmus and Hasselt university covered all training activities, social event, hosting, travel expenses
- ▶ Future fee ?

CRITICAL REFLECTION

Student perspective :

- Highly appreciated program:
practical exercises, technical visits, expert lecture,
social event and hosting
- Helpful background documents and study guide
- One week intensive training
- Preparation of the round table topic
instructions should be more elaborated
students didn't know each other yet
- Mixed group of students : beneficial for other skills
- Most of them decided to attend future training modules

CRITICAL REFLECTION : OVERALL CONCLUSION

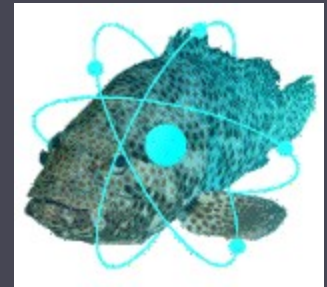
Trainer perspective : Competences achieved

- Enlarge their knowledge and skills in nuclear waste management in different aspects
- Team work : collaboration before and during the course
- Improve English communication
- Elaborate network
- Appreciate each other qualities (differences in nuclear background training between partners)

Mission accomplished !

New edition : timing Fall 2017 ?

Will be announced at the Cherne website !



Thank you for your attention !

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All external experts during the technical visits, round table.

All students and professors of the partnership

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