



Erasmus+



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

Sonja Schreurs, Bram Mast, Wouter Schroeyers, Isabelle Gerardy

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

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- ▶ Introduction
  - ▶ Erasmus+ project ‘Blended learning in radiation protection and radioecology’
  - ▶ MaRaWas training school
  - ▶ Critical reflection and conclusions

# INTRODUCTION

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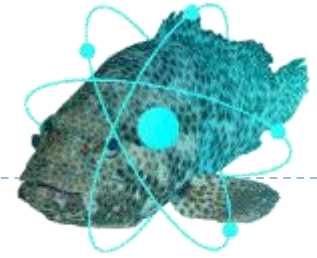
## Development of a waste management training : a challenge!

- ▶ **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

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- ▶ **CHERNE** (<http://www.cherne.ntua.gr/> )
  - ▶ Open European academic network for cooperation in higher education on radiological and nuclear engineering
  - ▶ since 2005
    - 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”

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## 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 of training schools : master students of each partner :  
Different background in knowledge and practical skills

# ERASMUS+ STRATEGIC PARTNERSHIP

“Blended learning in radiation protection and radioecology”

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## 6 ‘distance’ learning modules 2ECTS/module

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

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

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# 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

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- ▶ 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
    - ▶ In group of 4 students : paper
    - ▶ Submitted and reviewed by 2 experts in advance



# MARAWAS TRAINING SCHOOL

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## ▶ Training activities

### ▶ Practical exercises (3 half days) in groups of 4 students

- Decontamination and waste management in the radiochemistry lab : LSC
- Portal monitoring and intervention training
- From residues to building materials : Alkali activation



# MARAWAS TRAINING SCHOOL

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## ► 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

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## 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

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- ▶ 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><b>21-25 NOVEMBER 2016</b></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 managment 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

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## 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

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## 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

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## Trainer perspective : Competences achieved

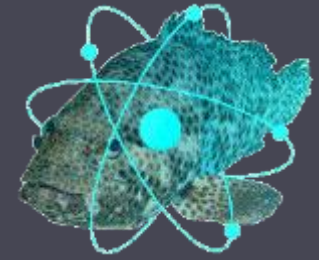
- Enlarge their knowledge and skills in nuclear waste management in different aspects
- Team work : collaboration before and during the course
- Improve English communication
- Elaborate network
- Appreciating each other qualities (differences in nuclear background training between partners)

**Mission accomplished !**

**New edition : timing Fall 2017 ?**

**Will be announced at the Cherne website !**





Thank you for your attention !

Acknowledgements :

All external experts during the technical visits, round table.

All students and professors of the partnership

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