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

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Introduction
Erasmus+ project ‘Blended learning in radiation protection and radioecology’
MaRaWas training school
Critical reflection and conclusions
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/](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 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”

6 ‘distance’ learning modules 2ECTS/module

<table>
<thead>
<tr>
<th>Basics nuclear and radiation physics</th>
<th>Basics of measurement and dosimetry</th>
<th>Radiation protection</th>
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<tr>
<td>General safety principles</td>
<td>Basics radiochemistry</td>
<td>Medical applications</td>
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Via E-learning module platform supervised by Greek Atomic Energy Commission (EEAE) [http://edu.eeae.gr](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
<table>
<thead>
<tr>
<th>Training schools (2 ECTS/week)</th>
<th>Probability Risk Assessment PRA</th>
<th>Measurements of Environmental radioactivity in Belgium (MERiBel)</th>
<th>Safe industrial applications of radiation and radionuclides SARA</th>
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</thead>
<tbody>
<tr>
<td>where</td>
<td>UPV – Valencia</td>
<td>ISIB HE2B - Brussels</td>
<td>CTU - Prague</td>
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<td>when</td>
<td>Feb 2017</td>
<td>April 2017</td>
<td>Dec 2016</td>
</tr>
<tr>
<td>Students</td>
<td>20</td>
<td>20</td>
<td>20</td>
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<tr>
<td>Radiochemistry MARC</td>
<td>Practical radiation protection in medical field MANTRA</td>
<td>Management of radioactive waste MARAWAS</td>
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<tr>
<td>where</td>
<td>FHAachen – HE2B Jülich</td>
<td>Unibo – Bologna</td>
<td>UHasselt – Diepenbeek</td>
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<td>when</td>
<td>Sept 2016</td>
<td>March 2017</td>
<td>Nov 2016</td>
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<tr>
<td>students</td>
<td>20</td>
<td>20</td>
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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
    - In group of 4 students: paper
    - Submitted and reviewed by 2 experts in advance
MARAWAS TRAINING SCHOOL

Training activities

- Practical exercises (3 half days) in groups of 4 students
  a. Decontamination and waste management in the radiochemistry lab: LSC
  b. Portal monitoring and intervention training
  c. From residues to building materials: Alkali activation
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
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
# MARAWAS Training School

**November 2016**

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
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<tbody>
<tr>
<td>Arrival in Diepenbeek</td>
<td>Welcome</td>
<td>Technical visit: Belgoprocess: waste management Tecnubel: lecture - demo decontamination techniques</td>
<td>Technical visit: portal systems in several industrial settings (medical/ waste/scrap/...)</td>
<td>Preparing reports and oral presentations</td>
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<td>Answers to questions</td>
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<tr>
<td>Phd short presentations</td>
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21-25 November 2016

| practical exercises a, b, c                  | practical exercises a, b, c      | Technical visit: Euridice - Long term waste management Exhibition and underground laboratory Hades | Lecture of Niras Presentations and discussion of topic in round table: Waste management in different EU countries Social event | oral presentations and Evaluation practical exercises: Erasmus + members Farewell drink |

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*Erasmus+*
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
➢ 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
Financial support Erasmus+ and Uhasselt