



MINISTRY OF EDUCATION AND CULTURE



CYPRUS PEDAGOGICAL
INSTITUTE



UNIT OF EDUCATION FOR ENVIRONMENT
AND SUSTAINABLE DEVELOPMENT

Enhancing critical thinking in schools for marine pollution using innovative ICT technologies (Sea4All)

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Erasmus+ – Cooperation for innovation and the exchange of good practices



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Partners



Foundation for Research and Technology – Hellas (Coordinator)



Regional Directorate of Primary and Secondary Education of Crete



University of Cyprus



Cardiff University



Arad County School Inspectorate



Archipelagos, Institute of Marine Conservation



Cyprus Pedagogical Institute

Sea4All Objectives

- Build a strong **marine environmental awareness** and consciousness
- Enhance **pedagogical competences and skills** development for the marine environment
- Increase students **learning motivation and engagement, fostering critical thinking** for marine pollution



Diagnosis of marine education needs in the frames of the Program Sea4All (Erasmus+)

Identify the needs, differences and particularities among the participated countries through interactions with the target groups in each country.

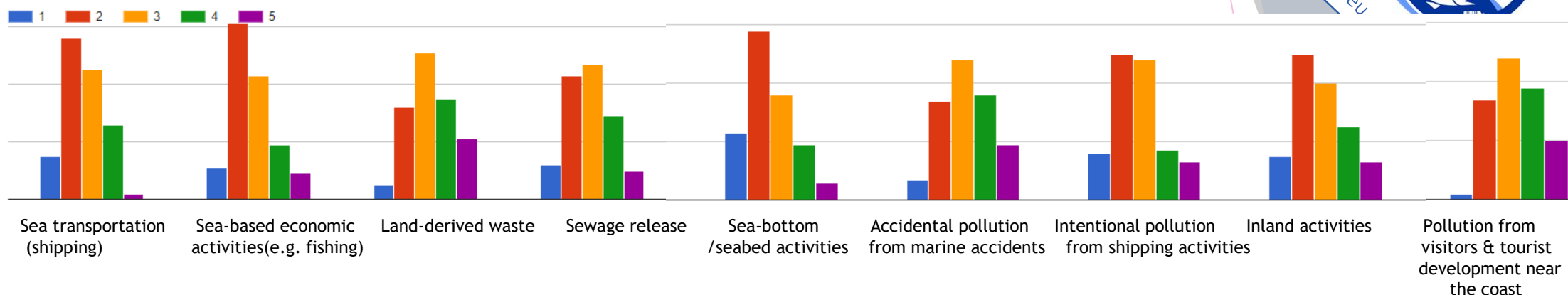
This activity was very important in order for the training curricula to be usable and meet the needs of all the partners in their national context.



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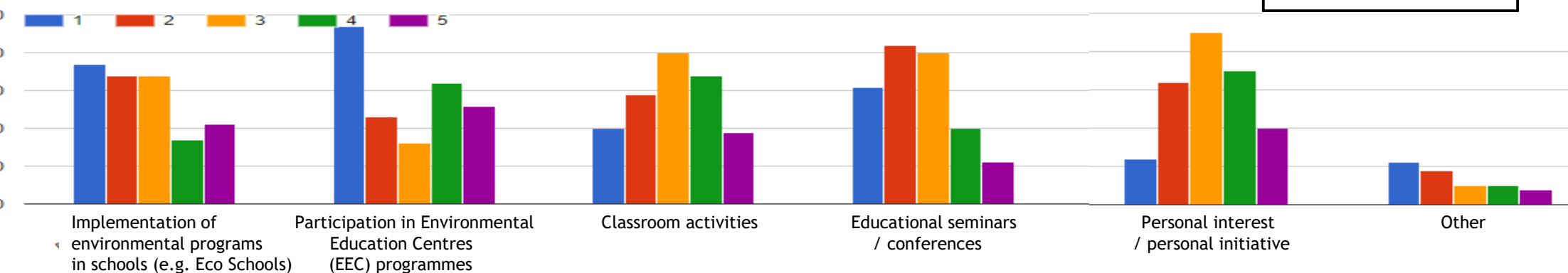


To what extent do you think **you are aware** of the following issues in marine pollution? Please use the following scale: 1= Not at all, 2=A little, 3=Moderate, 4=Very and 5= Very much

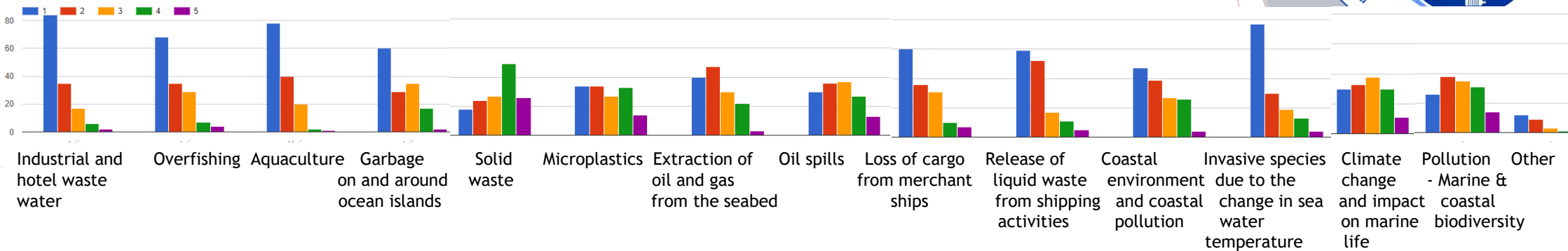


At what level have you been involved **in marine education topics/issues?** Please use the following scale: 1= Not at all, 2=A little, 3=Moderate, 4=Very and 5= Very much

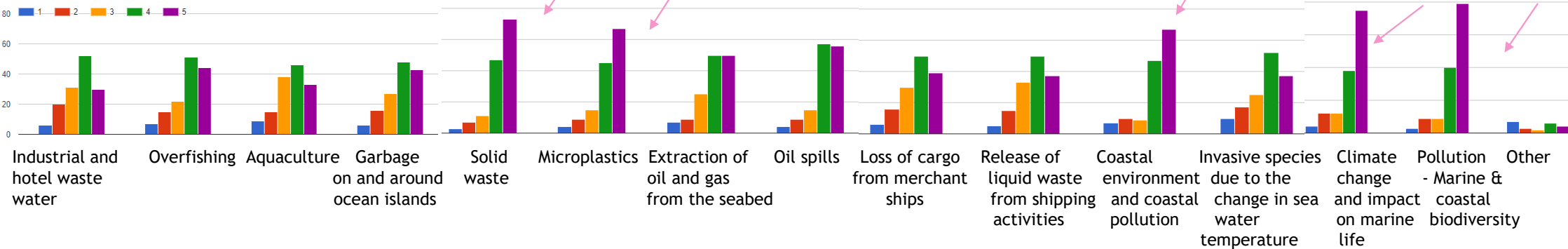
1= Not at all (blue)
 2= A little (red)
 3= Moderate (orange)
 4= Very (green)
 5= Very much (purple)



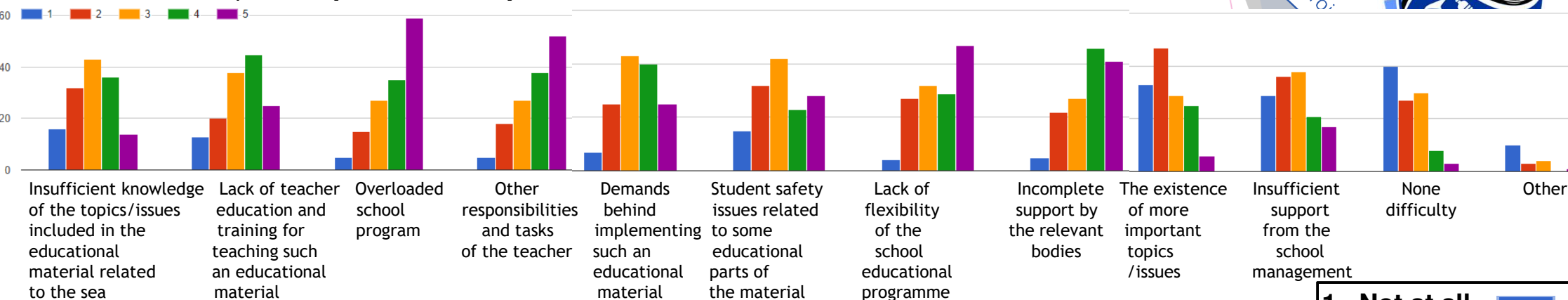
To what extent have **you taught**, or divulged, the following topics in schools? Please use the following scale: 1= Not at all, 2=A little, 3=Moderate, 4=Very and 5= Very much



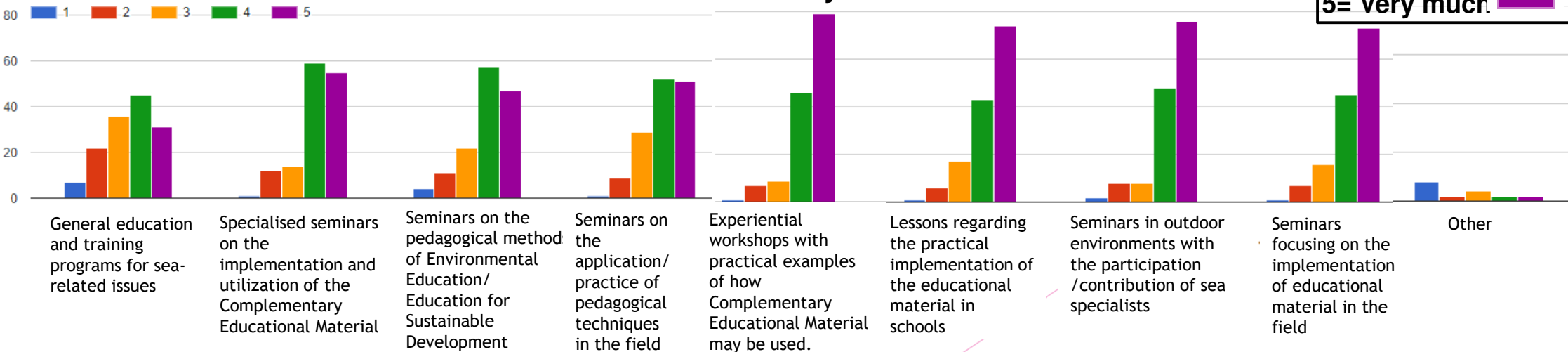
Which of the following themes do you consider **most important for Complementary Educational Material on Marine Issues**? Please use the following scale: 1= Not at all, 2=A little, 3=Moderate, 4=Very and 5= Very much



To what extent do you think the following items are obstacles for working with marine educational tool? Please use the following scale: 1= Not at all, 2=A little, 3=Moderate, 4=Very and 5= Very much

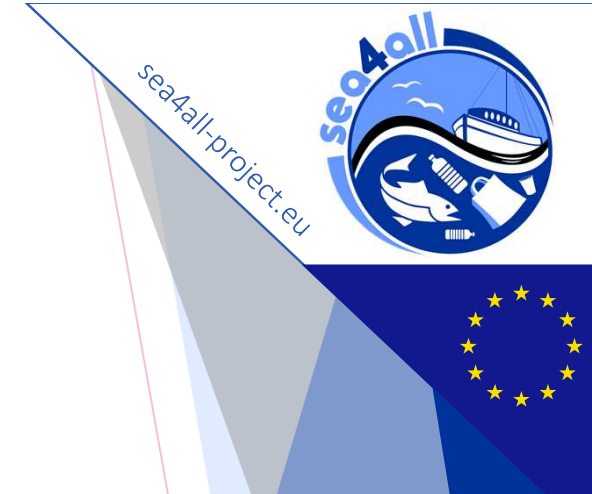


To what extent do you think the following items will assist you in implementing the educational material for marine education? Please use the following scale: 1= Not at all. 2=A little. 3=Moderate. 4=Very and 5= Very much



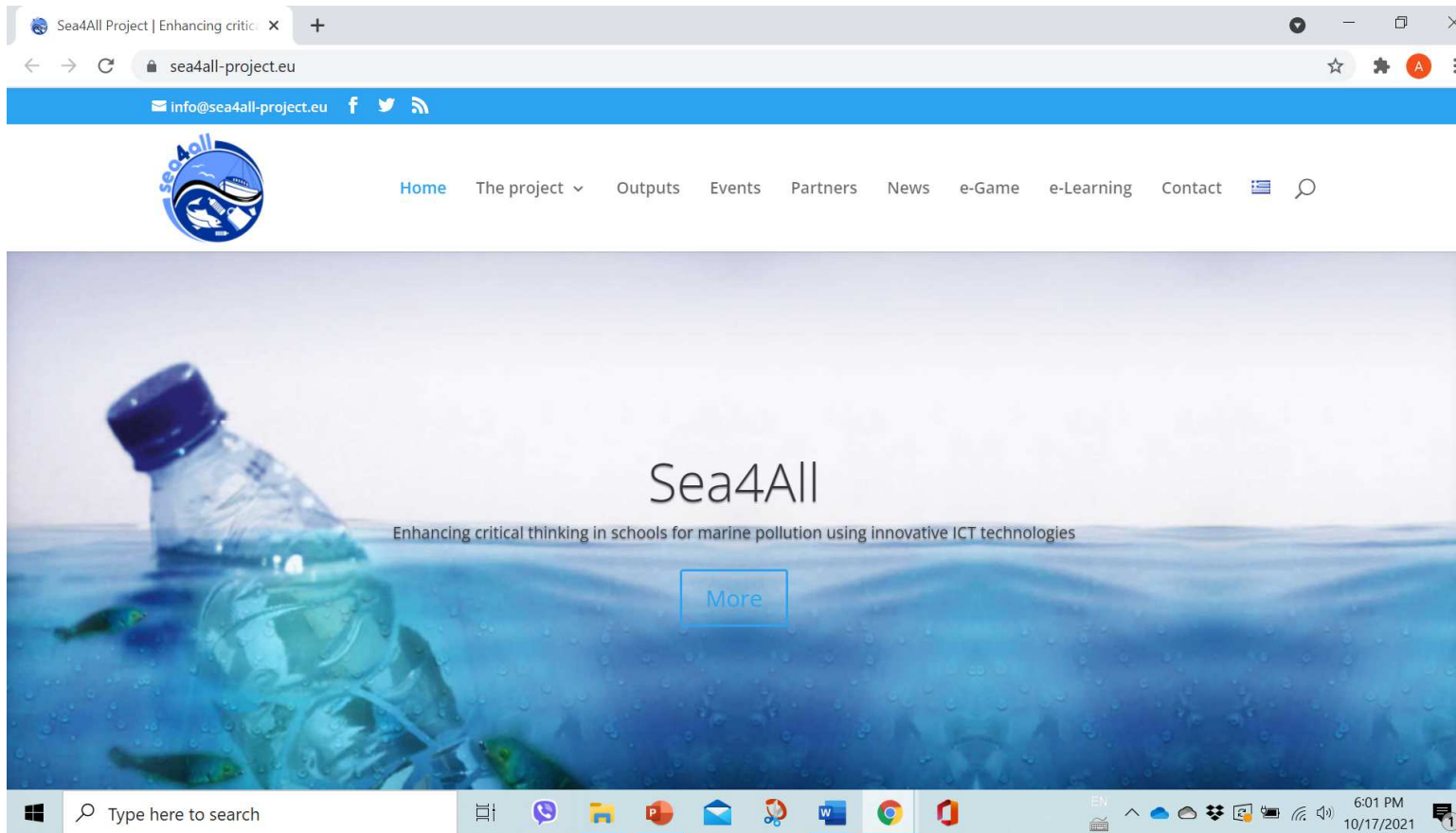
Intellectual Outputs

- 01. Training Curriculum
- 02. Technological Developments In Marine Pollution
- 03. Creation Of An E-Learning Platform
- 04. ICT Based Learning Game
- 05. Pedagogical Handbook



Sea4All website

<https://www.sea4all-project.eu>



01. Training Curriculum

CONTENTS

- Module 1:** Teaching Competences
- Module 2:** Teaching Methods
- Module 3:** Scientific Content Knowledge
- Module 4:** Marine Pollution: Theoretical framework
- Module 5:** Thematic Examples

Example – Role play game

“Building a New Desalination Plant in town”

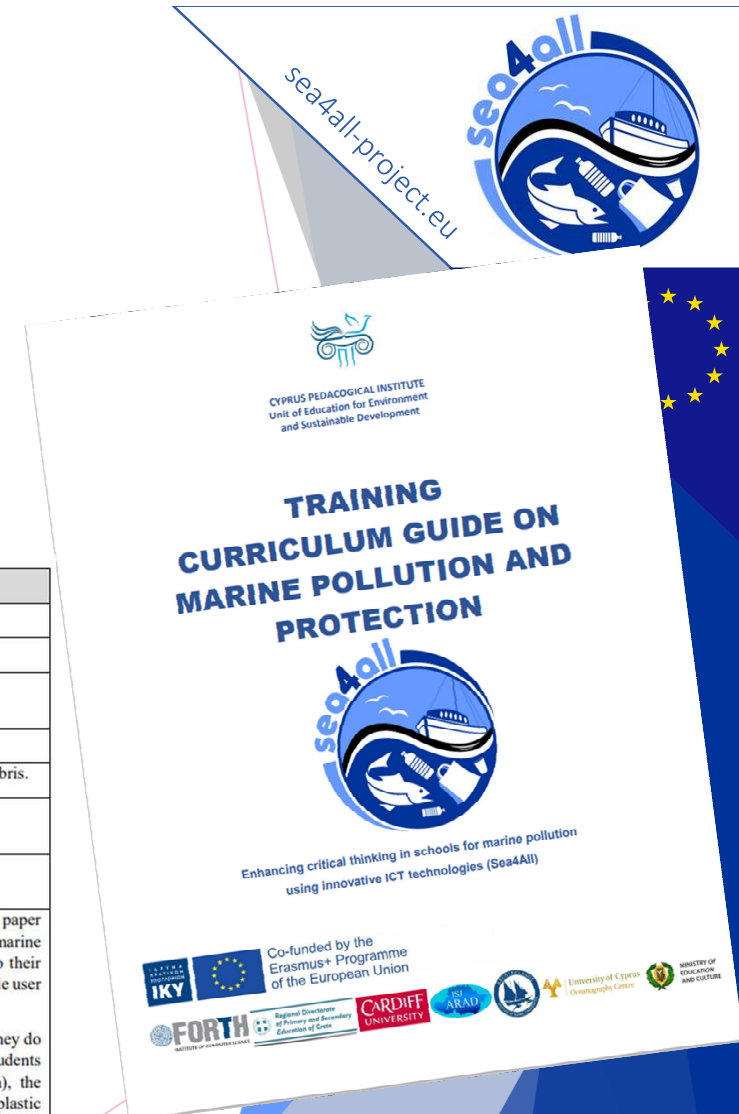
This activity is based on the discussion of different opinions relating to a new desalination plant that's going to be built in town.
The students discuss and argue, undertaking the following roles:

- Water Development Department representatives
- Farmers
- Green Party representatives
- Mechanical Engineers
- Ministry of Finance representatives
- Community Board representatives
- Mass Media
- Environmental Department representatives

Module 2: Teaching Methods

Example Activities	
Title	Plastic nightmare (Activity 1)
Suggested duration	15 mins
Technique used (e.g. simulation, debate)	Brainstorm, discussion.
Materials required	Flipchart paper and pens
Aim of activity	To help the students to identify the possible sources of plastic marine debris.
Underpinning components	UC 1.1a: Identify the destination of the waste that people generate.
Connection with competences	Systems Competence , Attentiveness Competence
Short description	<p>Divide the students into small groups and provide them with a flipchart paper and pens. In the middle of their sheets they write “Sources of plastic marine debris” and they brainstorm writing on their sheets things that come to their mind. Students try to describe the possible origin of the debris, the possible user group or industry and how it ended up in the sea.</p> <p>Groups can swap sheets, compare with other student’s ideas, discuss if they do not agree or if they want to add something else. In plenary, discuss students comments. Refer to the scenario (No 12- Romania plastic pollution), the geographical characteristics of the area and the possible sources of the plastic marine debris that polluted the sea off Constanta.</p>

Module 5: Thematic Examples



02. Technological Developments In Marine Pollution

- Scientific data (meteorological, oceanographic, geomorphological, geological and marine ecological data) were combined to predict and to communicate, the impact of oil spills and floating debris.
- This material was included in the rest of the intellectual outputs as part of the modern environmental techniques to face the problem of marine pollution.

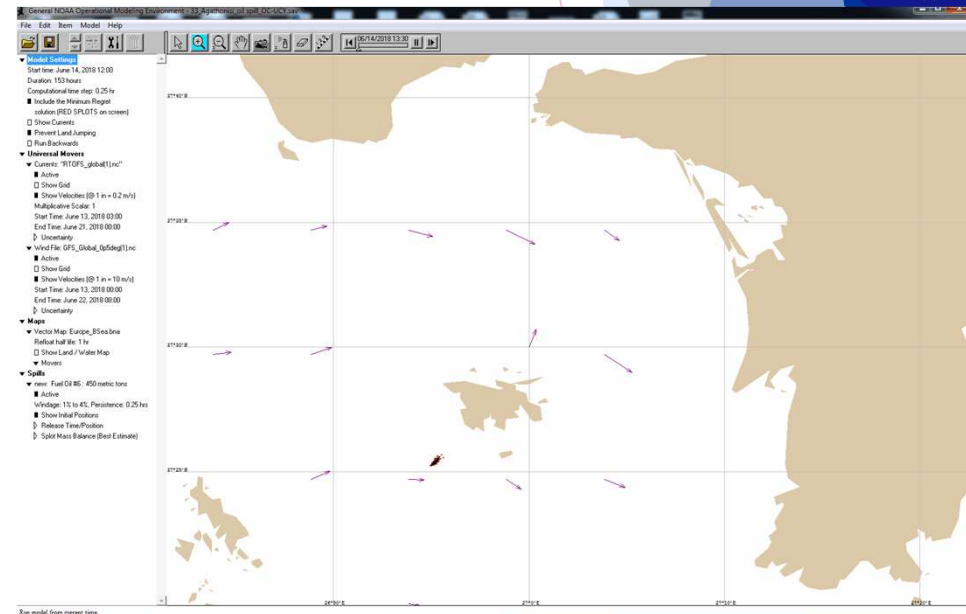
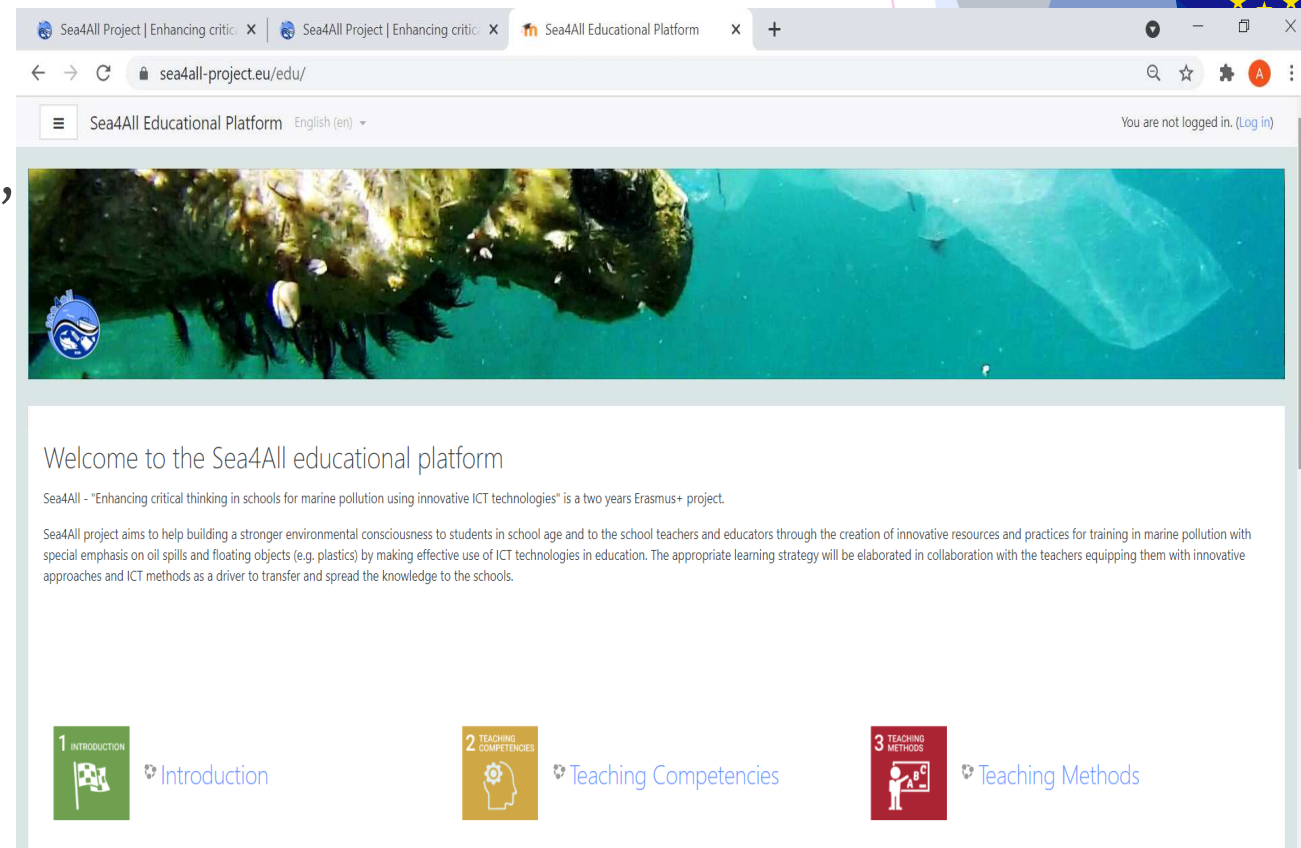


Fig: Initial conditions of a model used to simulate the spreading of an oil spill near the island of Agathonisi, Aegean Sea

03. Creation Of An E-Learning Platform

- The e-learning platform can be accessed from almost everywhere and supports multilingual environment.
- It includes activities, resources and packages allowing to share, reuse and expand context.
- It offers synchronous and asynchronous access.



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Sea4All Educational Platform English (en) You are not logged in. (Log in)

Welcome to the Sea4All educational platform

Sea4All - "Enhancing critical thinking in schools for marine pollution using innovative ICT technologies" is a two years Erasmus+ project.

Sea4All project aims to help building a stronger environmental consciousness to students in school age and to the school teachers and educators through the creation of innovative resources and practices for training in marine pollution with special emphasis on oil spills and floating objects (e.g. plastics) by making effective use of ICT technologies in education. The appropriate learning strategy will be elaborated in collaboration with the teachers equipping them with innovative approaches and ICT methods as a driver to transfer and spread the knowledge to the schools.

1 INTRODUCTION Introduction

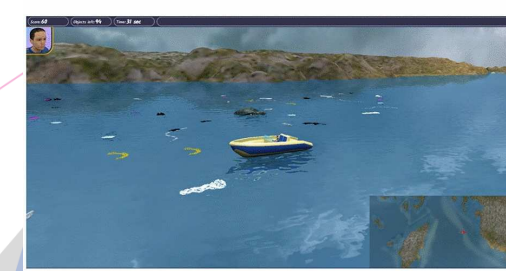
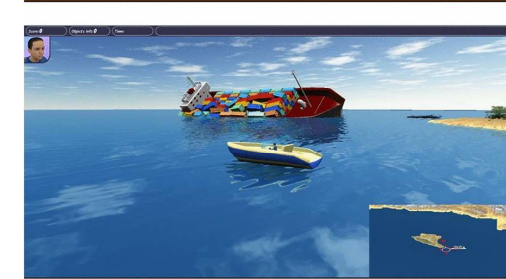
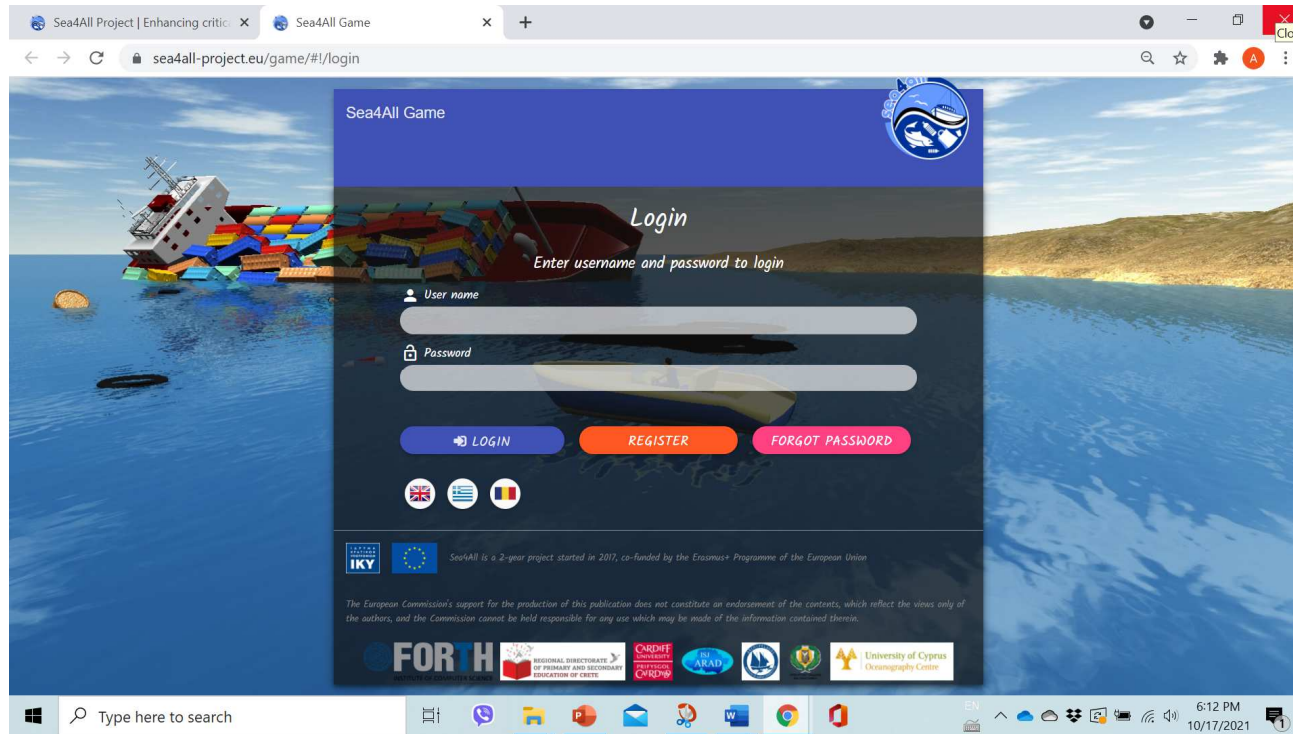
2 TEACHING COMPETENCIES Teaching Competencies

3 TEACHING METHODS Teaching Methods



04. ICT Based Learning Game

- An innovative ICT based on-line learning game was developed, to advance skills, promote and motivate in a playful manner the learners for responsible behaviors, achieving the greatest positive impact, through the use of ICT.



05. Pedagogical Handbook

- Provides in depth information, basic concepts, definitions and innovative methodological approaches on marine pollution in School Education.
- It was developed on the basis of the theoretical framework and competencies identified within the Curriculum and the Technological Developments in Marine Pollution.



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Output 1- Training Curriculum

The aim of this output was to create a training curriculum that could be used for the teachers' professional development in the issues of marine protection and conservation.



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Output 1- Training Curriculum

Taking in consideration:

- a) that the issues of marine environment are critical,
- b) that the teachers feel incompetent to work with them because of the nature of those issues, their particularities and their complexity,
- c) the absence of a comprehensive training curricula that will focus to the teachers competencies in that issues.



Output 1- Training Curriculum

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CONTENTS

- **Module 1:** Teaching Competences
- **Module 2:** Teaching Methods
- **Module 3:** Scientific Content Knowledge
- **Module 4:** Marine Pollution: Theoretical framework
- **Module 5:** Thematic Examples



Module 1: Teaching Competences

- Effective promotion of ESD requires teachers who have the appropriate knowledge and competences to be able to integrate it:
 - 1) to the analytical program
 - 2) in all aspects of school life
 - 3) organically in educational policy
 - 4) in all forms of education (formal, non-formal and informal)

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A Rounder Sense of Purpose II: Integrating ESD (Education for Sustainable Development) educator competences

<i>Understanding connections</i>	<i>Making change positive</i>	<i>Making change happen</i>
<i>Integration:</i>		
Systems... I understand and help learners to see that everything is connected, that in some way, everything we do has a result somewhere, which in turn has an impact for how we live together.	Futures... I can describe, and can help learners imagine, different possibilities for the future; I help learners to describe the consequences of these futures for different people.	Participate... I collaborate with others in my work to improve opportunities for people to live and learn together in different ways; I encourage learners to do likewise.
<i>Involvement:</i>		
Awareness... I can discuss and encourage learners to research real life issues that affect us all and discover ways in which they can be improved; I share the importance of the need for such improvements.	Empathy... I can see situations as others see them and can help learners to put themselves 'in other people's shoes'; I understand that learning is affected by our emotion and share this understanding with others.	Engaged... I work from 'who I am, as an authentic person' and recognise my values; I encourage others to do the same and recognise the values held by others.
<i>Practice:</i>		
Together... I work together with people from different backgrounds and walks of life to help us learn to live together and I encourage learners to do the same.	Change... I consider new ideas carefully while learning from the past and I help learners to do the same when considering ways of improving their society, the environment and the economy.	Action... I am, and help learners to be, active in society; I help learners to learn and grow in confidence by getting involved in meaningful, real world issues in our community.
<i>Reflection:</i>		
Check... I think critically and encourage learners to do the same, to ask why things are as they are, to check sources, statements etc. and recognise that there is more than one side to every story.	Responsible... I work in a way that everybody can see and understand what I am doing; I feel personally responsible for my work and help learners to be the same.	Decisive... I act and encourage learners to act decisively and in good time, even when faced with dilemmas or other situations of uncertainty.

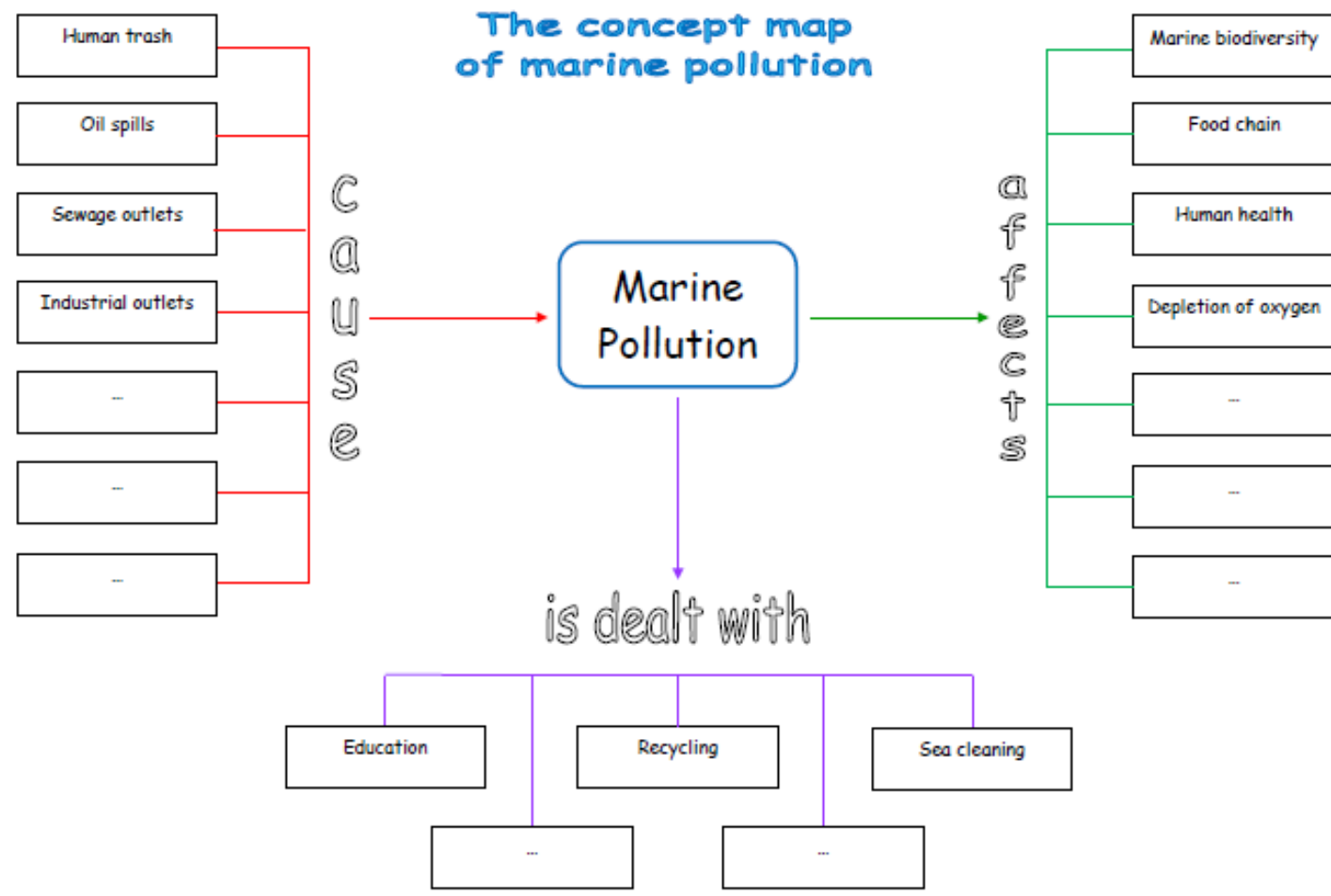
Fig. 2: RSP Competences: Simplified version



Module 2: Environmental Education techniques



- 1. Brainstorming
- 2. Concept map
- 3. Debate
- 4. Role-playing games
- 5. Ethical dilemma
- 6. Field study
- 7. Modeling
- 8. Web Quest
- 9. Bibliographic research



Examples:

- **Brainstorming:** Marine pollution
- **Debate:** Sea Food Safety
- **Role play:** “Building a New Desalination Plant in town”
- **Ethical dilemma:** Mr John’s dilemma about redirecting his hotel’s sewage into the sea
- **Field study:** Study of microplastics on a beach
- **Modeling:** Small-Scale Modeling of Oil Spill clean-up methods
- **Web Quest:** Example regarding ocean / sea pollution
- **Bibliographic research:** Oil spill pollution in the Mediterranean



Module 3: Marine Pollution: Theoretical framework

It focuses on:

- a) Mitigation of marine pollution
- b) Bathymetry (What is bathymetry and its contribution in marine/ocean sciences and marine pollution issues)
- c) Oceanographic and meteorological data
- d) Modelling
- e) Shoreline susceptibility
- f) Ecological data



Module 4: Scientific Content Knowledge

- Focuses on the environmental, ecological, economic and social impact of marine pollution by oil and floating debris to coastal populations all over the world.
- The main sources of marine pollution are discussed focusing on floating objects and oil spills and three examples regarding the importance of these sources are presented, as generating plastic pollution around the world.

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Module 5:

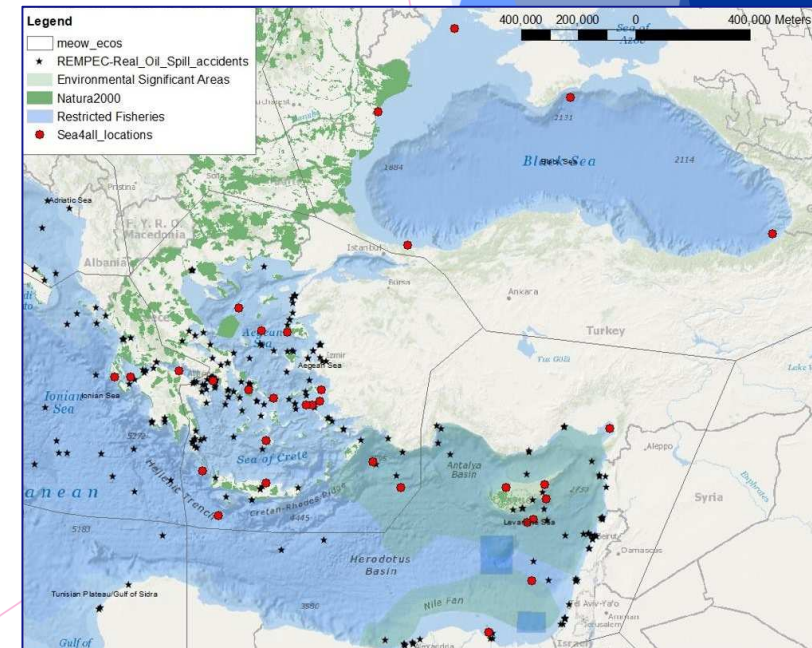
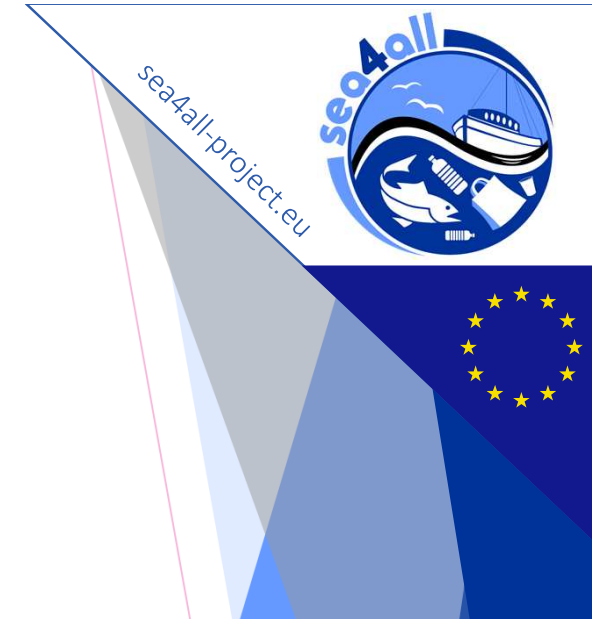
Thematic Examples Scenarios

- Romania Plastic Pollution
- Shetland Islands Spill (UK)
- Oil spill pollution in Cape Greko (Cyprus)
- Large volumes of litter released on Samos due to migration (Greece)
- Ghost nets in the Thermaic Gulf (Greece)

Activity	
Title	
Suggested duration	
Technique used (e.g. simulation, debate)	
Materials required	
Aim of activity	
Underpinning components	
Connection with competences	
Short description	
References	

Scenario: Romania Plastic Pollution

- Hypothetical accumulation of plastic on the sea floor of Constanta, in Romania, at the start of the tourist season
- Simulation of a case-study to plastic pollution for 48h
- Close proximity of the accident to Danube Delta and to “2 Mai Marine Reserve
- Marine animals can get entangled and injured by litter or they can ingest it, mistaking it for food.
- Important species:
 - the zebra mussel (*Dreissena polymorpha*)
 - the common carp (*Cyprinus carpio*)
 - the round goby (*Neogobius melanostomus*)
 - the common dolphin (*Delphinus delphis*)
 - the bottlenose dolphin (*Tursiops truncatus*)
 - the harbor porpoise (*Phocoena phocoena*)
 - the Mediterranean monk seal (*M. monachus*)
 - the Beluga whale (*Delphinapterus leucas*)
 - the grey seal (*Halichoerus grypus*)



Learning Objectives

The educator helps learners to ...

- 1.1 Understand the world as an interconnected whole and examine the consequences of their actions.
- 1.2 Pay attention to unsustainable aspects of our society and presents the urgent need for change.
- 1.3 Develop their self-awareness through the emotional impact of learning.
- 1.4 Envision possible futures and their sustainability aspects and examine the changes that have to be done in order to achieve a sustainable future.
- 1.5 Develop their critical thinking and communication skills.



Underpinning Components

In order to achieve the above Learning objectives the educator should be able to:

UC 1.1a Identify the sources of the waste that people generate.

UC 1.1b Realize the impact of marine debris on the marine and coastal ecosystem.

UC 1.2 Identify consumption habits and their impacts on the environment, specifically plastics.

UC 1.3a Help the students to experience the negative effects that marine litter and especially, plastic debris have on the health of marine animals.

UC 1.3b Differentiate compassion from empathy.

UC 1.4 Imagine future scenarios related with marine pollution, specifically plastic debris, and consider if these scenarios are sustainable or not.

UC 1.5a Think creatively about a sustainable future.

UC 1.5b Share and debate ideas.



Activities

“Plastic nightmare”

- Brainstorm, discussion.
- To help the students to identify the possible sources of plastic marine debris.

“What can be done?”

- Role play, discussion.
- Students take different roles and collaborate to create a plan to prevent and reduce the impact of marine debris.

“Escaping”

- Simulation, discussion
- To help students develop empathy for marine wildlife.

“Sea dream”

- Simulation, discussion.
- To help students imagine positive alternative sustainable futures with no plastic debris, and to realize the steps that have to be done towards that direction.

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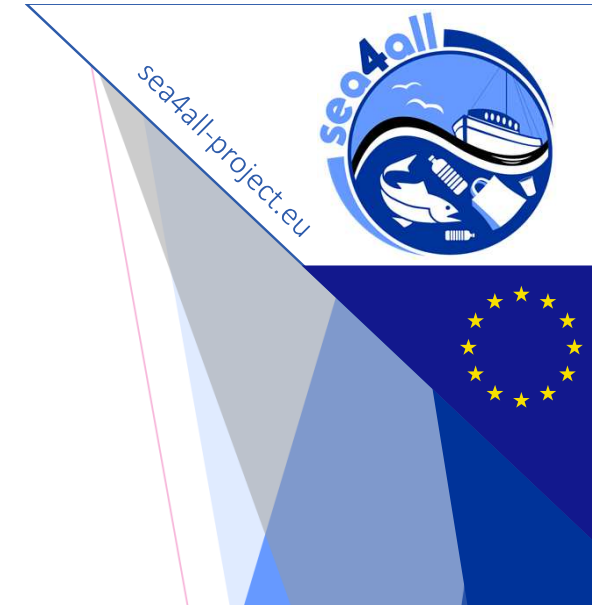


Scenario: Oil spill pollution in Cape Greko (Cyprus)

- Oil spill leakage from recreation vessel in Cape Greco - Cyprus
- Cape Greko peninsula - Natura 2000 site
- Important area for marine biodiversity

Important species:

- the green turtle (*Chelonia mydas*)
- the Mediterranean monk seal (*Monachus monachus*)
- loggerhead (*Caretta caretta*)
- bottlenosed dolphin (*Tursiops truncatus*)
- the ghost crab (*Ocypode cursor*)
- *Posidonia oceanica*, protected as habitat



Activity

“Small-Scale Modeling of Oil Spill dispersion”

- Modeling_Hands-on Activity
- Practicing student’s skills on hands-on modelling

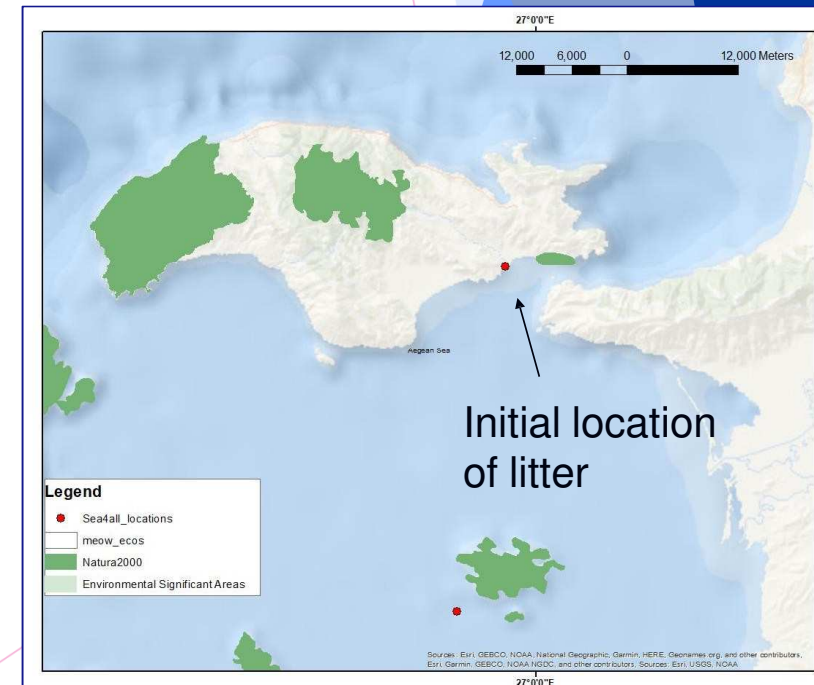


Scenario: Large volumes of litter released on Samos due to incoming refugees (Greece)

- Accumulation of marine litter in Samos, Greece
- High environmental significance area and tourist activity.
- Point of the accident: very close to the coast
- Litter identity : rope fragments, plastic and other litter, plastic cups, pens, food wraps, bottle stoppers, lighters, undefined plastic

Important species:

- the green turtle (*Chelonia mydas*)
- the fin whale (*Balaenoptera physalus*)
- the dolphins *Stenella coeruleoalba*, *Tursiops truncatus* and *Delphinus delphis*
- the Mediterranean monk seal (*Monachus monachus*)
- the sperm whale (*Physeter microcephalus*)
- the harbour porpoise (*Phocoena phocoena*)
- the plant *Posidonia oceanica*



Activities

“The Mediterranean and migration”

- Understand how incoming refugees could contribute to the littering of the Mediterranean Sea.
- Comprehend the consequences of littering of the Mediterranean Sea locally, nationally and in a regional level.

Example Activity	
Title	The Mediterranean and migration
Suggested duration	1 hour
Technique used (e.g. simulation, debate)	Brainstorming, Discussion, Concept Map
Materials required	Map, Articles, Photos
Aim of activity	Students to: <ul style="list-style-type: none"> - understand how incoming refugees could contribute to the littering of the Mediterranean Sea. - comprehend the consequences of littering of the Mediterranean Sea locally, nationally and in a regional level.
Underpinning components	UC 4.1.a Understand and apply systems thinking UC 4.1.b Understand and apply boundaries and frames to systems, look for interconnections and emergence and recognize feedback UC 4.2.a Analyze issues and contexts from different perspectives and from different levels of detail UC 4.2.b Use different forms of thinking and logic to aid analysis UC 4.3.a Recognize varying degrees of participation and different ways in which people can participate UC 4.4.a Think creatively about possibilities for the future and critique suggestions UC 4.4.b Share and debate ideas, suggestions and worldviews
Connection with other competences	Systems Competence , Attentiveness Competence, Empathy competence
Short description	<p>Divide the students into small groups and provide them with a flipchart paper and pens. In the middle of the paper the phrase “Incoming refugees could contribute to the littering of the Mediterranean Sea.” The students brainstorm and write down their ideas. Students try to describe the possible contribution of incoming refugees to the littering of the Mediterranean Sea. Groups can swap sheets, compare with other student’s ideas, discuss and enrich their brainstorming.</p> <p>Following brainstorming, the teacher gives the scenario (Scenario 27-Samos: Large volumes of litter released on Samos due to incoming refugees), including the geographical characteristics of the area and the possible sources of the litter that polluted the sea of Samos.</p> <p>Additionally, the following article</p> <p>https://www.pri.org/stories/2018-11-27/greeces-refugee-crisis-creates-strain-already-fragile-ecosystem</p> <p>and photos are given to the groups of students to enable them discuss in their groups and reach to results. Based on the material given to them, the students in their groups, complete the following concept map:</p>

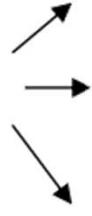


Littering of the Mediterranean Sea by incoming refugees

Causes



Consequences



Measures



Personal level

Collective Level



Scenario: Ghost nets in the Thermaic Gulf (North Greece)

- Large drifting fishing nets near Thessaloniki, in the Thermaic Gulf
- Affected population: 1.5 million people live around the Thermaic Gulf
- The location of the accident is near to environmentally protected sites
- **Important species:**
 - Green Turtle (*Chelonia mydas*)
 - Fin whale (*Balaenoptera physalus*)
 - Striped dolphin (*Stenella coeruleoalba*)
 - Bottlenose dolphin (*Tursiops truncatus*)
 - Monk seal (*M. monachus*)
 - Sperm whale (*Physeter macrocephalus*)
 - Common dolphin (*Delphinus delphis*)
 - Harbour porpoise (*Phocoena phocoena*)

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Activities

“An invisible threat”

- Modeling, discussion
- This activity allows students to understand what are the ghost nets and through simulation to realise their impacts on sea organisms.

“The Ghost nets problem”

- Bibliographic research, webquest, discussion
- To help students realise that ghost nets is a universal, multifactorial problem

“Ghost busters”

- Brainstorm, Discussion
- To help students develop empathy for trapped sea animals and think of ways to eliminate the problem.

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Thank you for your attention!



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