1

Enhancing critical thinking in schools for marine pollution using innovative ICT <u>techno</u>logies

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## Contents

About Sea4All1
Interview on Key Aspects of Sea4All2
Sea4All - Scientific aspects of marine pollution 3
SeaTeaching at Sea4all: A Handbook for Teachers4
Webinars6
Multiplier Events6
Final Project Conference6
Contact information6
Project Coordinator6
Social Media6
Partners
Disclaimer6

The project "Enhancing critical thinking in schools for marine pollution using innovative ICT technologies (Sea4AII)" is funded in the framework of the Erasmus+ 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.

Innovative educational material, school games and portal an educational for environmental consciousness raising and especially for marine **pollution** issues are some of the tools to be developed for addressing the goals of the project. They will be used for educational purposes in schools as part of a special educational curriculum for enhancing environmental awareness in schools. This endeavour is only possible as a result of the collective work of experienced teachers, marine scientists and computer scientists. We aim for these tools to result in innovative educational material, based on the combination of real environmental data with recognised interactive pedagogical practices, assisted by electronic tools.

Leader in this project is the Foundation for Research and Technology-Hellas, in Crete (Greece) in collaboration with six other organization from four different countries: The Regional Directorate of Primary and Secondary Education of Crete, the Archipelagos Institute of Marine Conservation in Greece, the Cardiff University (United Kingdom), the Inspectoratul Scolar Judetean in Romania, the University of Cyprus and the Ministry of Education and Culture in Cyprus in collaboration with local schools in Greece, Cyprus, Romania and United Kingdom. FEB 2020

NO 2 :

## **Interview on Key Aspects of Sea4All**

Aravella Zachariou, Coordinator of Environmental Education and Sustainable Development Department, Chair of the UNECE ESD Steering Committee

# What is Ocean/Marine Literacy and how it relates to Education for Sustainable Development?

Ocean/Marine literacy is the change of our frame of mind aiming to make us understand how our day to day actions affect the health and sustainability of the oceans and seas, in order to recognize how the health of the oceans and seas affect our daily lives and to realize the economic, social, environmental, political and culture importance in humanity. Ocean/marine literacy cannot be stand-alone but is part of the wider environmental literacy which aims to create environmental literate citizens who need not only to acquire knowledge for the environment, but also learn, understand, know, feel, develop skills and attitudes that will help them to act and react actively for creating more sustainable societies based on ensuring the triple environment-society-economy. Based on the above, Ocean/marine literacy is an intrinsic part of the Education for Sustainable Development as a means for confronting the global challenges, as they were very clearly synthesized in the United Nations Global Agenda 2030 on Sustainable Development Goals. Taking in consideration that SDG14 "Life below water", aims to the conservation and sustainable use of the oceans, seas and marine resources", Ocean/Sea Education as part of Education for Sustainable Development is the vehicle for the creation of Ocean/Marine Literacy from the early childhood, incorporating life long, formal, non-formal and informal education.

## Through what processes can marine education be promoted?

Marine education, as part of Education for Sustainable Development (ESD), can be integrated into formal, non-formal and in-formal education, within all levels of education and in society. Marine education topics can be integrated, interdisciplinarily, into all the subjects of the curriculum. Issues such as marine pollution, marine life, accidents at sea, tourism development and marine pollution, impacts of climate change on marine life etc. can be considered either in the form of cross-curricular projects, or as modules within a course with the application of various teaching techniques related to ESD such as roleplaying games, simulations, conceptual maps, learning scenarios, etc. At the same time, however, maritime education can be an intrinsic part of non-formal and informal education, either through outdoors education settings such as Environmental Education Centers, or through organized marine education programs in various marine areas, such as coasts. The SEA4all program seeks to fill a major gap in marine education issues by providing organized learning scenarios, integrated work plans and a variety of educational activities enabling teachers and pupils to approach marine pollution issues in an integrated way (indoors and outdoors).



How can marine education be integrated into teachers' professional development programs?

Successful integration of marine education into the education process requires teachers who are competent to approach marine/sea pollution issues effectively. This involves designing and offering integrated marine professional development programs that, in addition to knowledge, will focus on competences that will enhance teachers to organize teaching in maritime pollution issues their experientially and practically. In this context, the novelty of the Sea4All program focuses on the fact that all teaching material is supported by a comprehensive teacher education and training program. This professional development program, based on ESD teachers' competences in relation with marine pollution issues, is designed to develop them interactively at formal and non-formal education level. It is very important that the particular training program took into account the diagnosis teachers needs analysis on marine issues, conducted in the context of the program, in order to trace and bridge the gap of inadequate education and training at all levels of maritime education.

3







**Cardiff University** was founded in 1883, and is established as one of Britain's leading research universities. The research expertise and facilities at the University are used by industry and commercial partners, government bodies and other organisations internationally. Under the Sea4All project, Cardiff University's 3D Seismic Lab has helped understanding the impact of marine pollution, including microplastics, in 47 different areas of Europe. Cardiff University is also liaising with several educational partners in South Wales to divulge the project to schools, and local authorities. Cardiff University is one of

twelve universities from across the UK who have been funded by Research Councils UK (RCUK) as part of their School-University Partnerships Initiative (SUPI). The SUPI aims to create structured and strategic mechanisms for Higher Education Institutes (HEIs) to work in partnership with secondary schools and FE colleges. This partnership working supports researchers' direct engagement with students and bring contemporary and inspirational research contexts into formal and informal learning to enhance and enrich the curriculum of Welsh Universities.

## Sea4All - Scientific aspects of marine pollution

Article by Eleni Kokkinou, Associate Professor, FORTH

The aim of the Sea4all project is to promote new technologies, innovative methods and develop novel learning materials and tools in the field of "fighting marine pollution". These materials and tools will enhance the potential of learning, the acquisition of knowledge and skills-development in education.

Scientific based scenarios concerning the integrated treatment of small oil spills and floating plastic debris contribute strongly to the training and education of young people and teachers, as they become better informed using a simplified estimation on small-scale oil spills and harmful floating debris with special emphasis on coastal ecosystems and the marine trophic chains. Specifically, the development of scientific based scenarios was focused on the following topics:





The **Oceanography Center** (OC-UCY) is a Research Unit in the School of Sciences, University of Cyprus (UCY). It plays a key role in the marine research of the Eastern Mediterranean Levantine Basin and its scope of activities includes numerical models (flow, oil spill and general pollutant dispersion, and sea state predictions), operational and biological oceanography, satellite

remote sensing, remote in-situ monitoring, hydrography, data and metadata management, and operational oceanography. OC-UCY has participated in many EU-funded and national projects. OC-UCY has developed and operates the Cyprus Coastal Ocean Forecasting and Observing System, which provides operationally, forecasts for sea currents, temperature and slicks detection and predictions Marine biological research at OC-UCY focuses on the investigation of marine biodiversity and abundance in the Levantine, and on the mapping of coastal areas in Cyprus. OC-UCY also carries out environmental impact assessments and performs water analyses for nutrient concentrations. In particular, OC-UCY actively contributes to the enhancement of knowledge concerning marine life which is essential to the determination of the legislation regarding the adaptation to climate change. OC-UCY also assesses the effects of climate change through the study of biodiversity by monitoring physical parameters and recording invasive species.

- How do oil spills and floating debris reach our seas?
- Which factors affect the dispersion of the oil spill and floating debris?
- What happens to oil and floating debris on the ocean's surface?
- How do oil and floating debris act in water?
- What is the oil behaviour on various beach sediments and rocks?
- What is the rate of breakdown of the various types of marine debris?
- What are the ways of its incorporation into marine food chain (leading also to humans)?
- Who takes care of the problem of oil spills and floating debris and what are the best techniques to manage these problems?
- How can each of us develop or be part of initiatives and actions that combat marine pollution and raise awareness about this increasing problem?

The above mentioned topics have been analysed for the Mediterranean, Black Sea and Atlantic-UK waters using bathymetric, geomorphological, meteorological and oceanographic data, together with marine ecology issues. The data have been fused in geospatial (GIS) domain to develop 40+ pollution scenarios in the context of the Sea4All project.

## SeaTeaching at Sea4all: A Handbook for Teachers

Article by Androniki Spatharaki, Educational Project Coordinator, PE 70, PE, KES PDI Crete

Within the framework of the Sea4all program, a guidebook for teachers has been created, based on ten thematic axes on maritime pollution issues, developing equal number of 'lessons'.

In order to highlight the interrelationship between environment-society-economy as well the crucial role of education in achieving sustainable literacy, we made use of various training schemes / challenges such as:

- comprehensive learning, with an emphasis on cultivating positive attitudes and values,
- interdisciplinary approaches for comprehensive presentation and understanding of critical social issues;
- cultivation of critical thinking for transformational learning and understanding of culture and perceptions,
- teamwork teaching, make use of experiential education and new technologies, inspiring lessons based on real life that stimulate and motivate individual and collective action, as well as build active citizens who know, reflect, act and reflect.

FEB 2020

NO 2 :



Under this light, the ten developed lessons of the guide, are innovative authentic educational proposals that are also integrated with the other outputs of the Sea4all project (electronic platform and game, etc.), in order to inform, sensibilitize, creatively engage and motivate tomorrow's student-citizens in transformational learning for social change. The ten lessons are entitled: A Sea full of Culture, A map full of ... Words, Treasure emits SOS, Learning about the dangers that threaten the sea, Learning about the trash floating in the sea, Balance of Sea Ecosystems, Food Safety coming from the Sea, Coastal Pollution, Recycling - Re-use - Consumption Reduction, Sea and Sustainable Development,.

At the same time, the guidebook enriches the teaching culture of teachers, with accessible methodological pathways of teaching and personal meaning, and ultimate goal to leave an imprint in students' real lives. Thus, the 'boundaries' of

knowledge recede under the power of the holistic approach that interdisciplinarity imposes as a contemporary trend of understanding a complex learning universe.

The guidebook and each lesson consists of Immediately applicable ideas for making use of authentic material, experiments, conceptual maps, digital resources, experiential activities with possibilities of adaptation, while adding pedagogical value to its use in teaching practice. These tutorials, in the form of teaching modules, are developed in common building blocks, such as: Objectives -Introductory Text - Involved Knowledge - Materials - Suggested Activities - Adaptation Activities -Bibliography Links. The material can be used by each teacher both as a whole, in the proposed order as a complete work plan for marine pollution from floating objects and oil spills, with the possibility of increasing or decreasing difficulty, or as a single lesson intervention for discussion.

Expectation of the writing team and the project partners is the constant future enrichment of the guidebook with new creative and original ideas coming from trainees and educators who apply them in the educational practice.



Page from the lesson of the "Recycle - Reuse -<br/>Reduce consumption" guide.Page from the lesson of the "Sea and Sustainable<br/>Development" guide.

### **Events**

#### Webinars

'Live' web-based lessons to teach teachers on Scientific and Educational Issues on Maritime Pollution:

March 21<sup>st</sup>: Introduction to the Sea4All project and the educational framework

April 18<sup>th</sup>: Teaching methods and ESD Competences: Applications on marine pollution

May 16<sup>th</sup>: Technical and physical aspects of marine pollution, with emphasis on oil spills and floating objects

May 26<sup>th</sup>: Threats to marine life – How can we all help to protect our seas?

#### **Multiplier Events**

Workshops for teachers were held in each country participating in the project, to maximize the dissemination of project results. The Workshops were as follows:

Cyprus: September 4, 2019 in Akrotiri and September 5, 2019 in Cavo Greco

United Kingdom: 23 and 27 September 2019 in Cardiff

Romania: October 3, 2019 in Arad

Greece: 9 October 2019 in Heraklion and 19 October (Field Study) in lerapetra

#### **Final Project Conference**

The final Conference on the Sea4All project took place in Heraklion on Thursday 21 November 2019. The purpose of the Conference / Conference was to present the final results of the project but also to inform the participants on marine pollution issues, not only for Greece but also for the whole of Greece. Europe. At the same time, after the end of the workshop, special Training Workshops for Teachers were held that were interested in integrating the new tools created by the Sea4All project into the classroom. The conference was attended by more than 70 educators and scientists. Relevant material is available on the online learning platform.

## **Contact information**

#### **Project Coordinator**

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### **Social Media**



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Follow us on Twitter https://twitter.com/Sea4All



School Education Gateway https://www.schooleducationgateway.eu/



eTwinningLive https://live.etwinning.net/

### **Partners**



Foundation for Research and Technology – Hellas web: www.ics.forth.gr | Greece

Regional Directorate Of Primary And Secondary Education Of Crete web: <u>kritis.pde.sch.gr</u> | Greece



CARDIFF University web: <u>www.cardiff.ac.uk</u> | United Kingdom



Arad County School Inspectorate web: <u>www.isjarad.ro</u> | Romania



Archipelagos web: <u>www.archipelago.gr</u> | Greece



Cyprus Pedagogical Institute web: <u>www.moec.gov.cy</u> | Cyprus



University Of Cyprus web: <u>www.ucy.ac.cy</u> | Cyprus

## Disclaimer

The Sea4All project is co-funded by the Erasmus+ Programme of the European Union.

The content of this newsletter cannot be considered as the European commission's official position and neither the European Commission nor any person acting on behalf of the European Commission is responsible for the use which might be made of it; its content is the sole responsibility of the Sea4All project partners.

FEB 2020

NO 2 :