



Ocean Literacy for All

Curriculum analysis

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CONTENTS

CONTENTS	1
INTRODUCTION	2
METHODOLOGY	3
SELECTION OF COUNTRIES	3
COLLECTION OF LATEST CURRICULA INFORMATION	3
PRIMARY & SECONDARY EDUCATION AGE RANGES PER COUNTRY	6
SUBJECTS OF INTEREST IN PRIMARY AND SECONDARY EDUCATION	7
PROCESS	9
FIRST PHASE	9
SECOND PHASE	10
PRIMARY EDUCATION CURRICULUM ANALYSIS	11
EDUCATION SYSTEMS & OCEAN LITERACY ENTRY POINTS	11
BELGIUM (FLEMISH COMMUNITY)	11
CROATIA	11
FINLAND	12
FRANCE	13
GERMANY	13
GREECE	14
PORTUGAL	15
ROMANIA	17
UNITED KINGDOM (ENGLAND)	17
COLLECTIVE RESULTS – PRIMARY EDUCATION	18
SECONDARY EDUCATION CURRICULUM ANALYSIS	21
EDUCATION SYSTEMS & OCEAN LITERACY ENTRY POINTS	21
BELGIUM (FLEMISH COMMUNITY)	21
CROATIA	22
FINLAND	23
FRANCE	24
GERMANY	25
GREECE	25
PORTUGAL	26
ROMANIA	29
UNITED KINGDOM (ENGLAND)	29
COLLECTIVE RESULTS – SECONDARY EDUCATION	31
CONCLUSIONS	36
ANNEX	37

INTRODUCTION

Although the ocean covers the vast majority of our planet, most of us live on land and have a low awareness of the importance of oceans in our lives. Europe's territory exhibits large peninsulas and indented coastlines stretching from the Arctic to the Atlantic, including the Baltic Sea, the Mediterranean Sea and the Black Sea.

According to the World Economic Forum (WEForum)¹ oceans are responsible for producing more than 50% of the oxygen of the Earth. In addition, and by absorbing huge amounts of heat from the sun, oceans are helping our planet regulate its climate. Even today, the number and type of species that call the ocean their home is unclear while fish is on the menus of billions of people around the globe. Finally and according to OECD², by 2030 ocean-based industries will employ more than 40 million people worldwide. The biggest share of those jobs is likely to be in the fisheries sector, followed by tourism. Taking all the above into account, oceans and seas should be seen as a cornerstone of social and economic development, but unfortunately this is far from being the case.

European school curricula reflect the general "ocean blindness" of society. By analysing existing curricula to find blue entry points, we aim to support schools and teachers who wish to make ocean literacy more present in their classrooms.

The curricula analysed corresponded to primary and compulsory secondary education level, which in most cases covered the ages from 5-6 to 18-19 years old. Particular effort has been made in presenting and taking into account the particularities of each country and the curriculum developments on national level, aiming to provide as accurate and up to date information as possible.

In the first section, focus is given to the methodology that has been put together in order to run this exercise, along with information related to the sources of information that have been used, the age ranges that the curriculum analysis focused on and the analytical process that has been followed.

In the sections that follow, we present a short summary of the educational systems per country, including the subjects that were of interest to the curriculum analysis, and we identify the entry points for ocean literacy topics.

Finally, the Annex presents extensive information on the curriculum analysis subjects that have been used for the respective country and level of education offering insights and details on the topics of common interest.

¹ <https://www.weforum.org/agenda/2019/08/here-are-5-reasons-why-the-ocean-is-so-important/>

² https://read.oecd-ilibrary.org/economics/the-ocean-economy-in-2030_9789264251724-en#page205

METHODOLOGY

SELECTION OF COUNTRIES

A comprehensive curriculum analysis has been performed from a representative sample of nine (9) countries that included:

1. Belgium (Flanders)
2. Croatia
3. Finland
4. France
5. Germany
6. Greece
7. Portugal
8. Romania
9. United Kingdom (England)

The sample of countries was chosen based on the two factors that are explained below:

- The **countries of provenance for the consortium**: Preference was given to countries that the consortium deemed important. The main reason behind the selection of the above listed nine countries was to represent all important sea-basins in Europe. This choice facilitated the collection of the most recent curricula information of the respective countries and the validation of the curriculum analysis results when needed.
- The **case of Germany**: With the highest population among the EU member states (16,25 % of the EU27 population, Eurostat 2013) the integration possibilities of ocean literacy topics into the national curriculum, is of great importance. However, as Germany is composed by 16 states (Länder) each one deciding its own educational policies, diverse curricula can be found across the country. In this report, North Rhine-Westphalia, the largest state in terms of population, serves as an example in cases where the specificity of particular topics makes it impossible to give a universal description for all states, given the federated nature of educational policy and practice in Germany. The North-Rhine-Westphalia state curriculum is also the same to the ones of three more Länder and is considered quite representative³ of all 16 Länder. When it comes to secondary education focus will be placed on *Gymnasium* (one of the six available types of school options), the secondary school which prepares students to access higher education.

COLLECTION OF LATEST CURRICULA INFORMATION

In the last years, curricula reforms have taken place in many European countries. Consequently, and before proceeding with the actual analysis, it was essential to ensure that access to the most current and up to date information was available. The TIMMS

³ http://www.schulentwicklung.nrw.de/lehrplaene/upload/klp_gs/LP_GS_2008.pdf

report 2015⁴ on students' science achievement has also been used as an additional source of information.

The main sources of information that have been used regarding the national curricula can be found in **Table 1** below:

Table 1: National curricula sources for primary and secondary education in the observed countries

Country	Primary education	Secondary education
Belgium (Flanders)	https://onderwijsdoelen.be/resultaten?intro=basisonderwijs&filters=onderwijsniveau%255B0%255D%255Bid%255D%3Df7dc9e9c97a653c7dba05896ef57a333480b%26onderwijsniveau%255B0%255D%255Btitel%255D%3DBasisonderwijs%26onderwijsniveau%255B0%255D%255Bwaarde%255D%3DBasisonderwijs	https://onderwijsdoelen.be/resultaten?intro=secundaironderwijs&filters=onderwijsniveau%255B0%255D%255Bid%255D%3D0767c5a44ffdc8a05697bbe5b2021167fb49cf6e%26onderwijsniveau%255B0%255D%255Btitel%255D%3DSecundair%2520onderwijs%26onderwijsniveau%255B0%255D%255Bwaarde%255D%3DSecundair%2520onderwijs
Croatia	http://www.kurikulum.hr/dokumenti/ https://narodne-novine.nn.hr/clanci/sluzbeni/2006_09_10_2_2319.html	http://www.kurikulum.hr/dokumenti/ Secondary vocational: https://mzo.gov.hr/UserDocsImages//sliske/Vijesti/07-18/19-07-18//Nacionalni%20kurikulum%20za%20stakovno%20obrazovanje%20%289.%20srpnja%202018.%29.pdf Biology, elementary school and gymnasium: https://narodne-novine.nn.hr/clanci/sluzbeni/2019_01_7_149.html Physics, elementary school and gymnasium: https://narodne-novine.nn.hr/clanci/sluzbeni/2019_01_10_210.html Geography, elementary and gymnasium: https://narodne-novine.nn.hr/clanci/sluzbeni/2019_01_7_145.html Informatics, elementary and gymnasium: https://narodne-novine.nn.hr/clanci/sluzbeni/2018_03_2_436.html Chemistry, elementary and gymnasium:

⁴ <http://timss2015.org/timss-2015/science/student-achievement/>

Country	Primary education	Secondary education
		https://narodne-novine.nn.hr/clanci/sluzbeni/2019_01_10_208.html Mathematics, elementary and gymnasium: https://narodne-novine.nn.hr/clanci/sluzbeni/2019_01_7_146.html Science and society, elementary school: https://narodne-novine.nn.hr/clanci/sluzbeni/2019_01_7_147.html Science, elementary: https://narodne-novine.nn.hr/clanci/sluzbeni/2019_01_7_148.html
France	http://www.education.gouv.fr/pid24307/les-programmes-de-l-ecole-elementaire.html https://cache.media.education.gouv.fr/file/MEN_SPE_11/67/3/2015_programme_s_cycles234_4_12_ok_508673.pdf	http://www.education.gouv.fr/pid24239/les-programmes-du-lycee.html https://www.education.gouv.fr/les-programmes-du-college-3203
Finland	Finnish National Board of Education Publications: NATIONAL CORE CURRICULUM FOR BASIC EDUCATION, 2014 http://www.allianceforchildhood.eu/files/Improving_the_quality_of_Childhood_Vol_7/QOC%20V7%20CH06%20DEF%20WEB.pdf	http://www.allianceforchildhood.eu/files/Improving_the_quality_of_Childhood_Vol_7/QOC%20V7%20CH06%20DEF%20WEB.pdf
Germany	http://timssandpirls.bc.edu/timss2015/encyclopedia/countries/germany/the-science-curriculum-in-primary-and-lower-secondary-grades/ https://www.schulentwicklung.nrw.de/lehrlaene/upload/klp_gs/LP_GS_2008.pdf	http://timssandpirls.bc.edu/timss2015/encyclopedia/countries/germany/the-science-curriculum-in-primary-and-lower-secondary-grades/ (lower secondary)
Greece	http://dipe-v-thess.thess.sch.gr/images/docs2019/DidYliFysiki2019_22_08_2019.pdf	http://digitalschool.minedu.gov.gr/new/ https://www.curriculumonline.ie/Senior-cycle/
Portugal	1st cycle (1st - 4th grade), 2nd Cycle (5th - 6th grade) and 3rd cycle (7th to 9th grade): https://www.dge.mec.pt/aprendizagens-essenciais-ensino-basico	https://www.dge.mec.pt/aprendizagens-essenciais-ensino-secundario

Country	Primary education	Secondary education
Romania	https://eacea.ec.europa.eu/national-policies/eurydice/content/teaching-and-learning-primary-education-38_en https://www.edu.ro/invatamant-primar http://programe.ise.ro/Actuale/Gimnaziu-2017.aspx	http://programe.ise.ro/Actuale/Gimnaziu-2017.aspx https://www.edu.ro/invatamant-liceal
United Kingdom (England)	https://www.gov.uk/government/publications/national-curriculum-in-england-primary-curriculum	https://www.gov.uk/government/publications/national-curriculum-in-england-secondary-curriculum

PRIMARY & SECONDARY EDUCATION AGE RANGES PER COUNTRY

One of the aspects that contribute to the complexity of the curriculum analysis exercise is the differences in schooling ages that are visible all-around Europe. With this in mind and before proceeding to the actual analysis of the curricula for each one of the selected countries and subjects, it is important to take into account how the different educational systems are organised and how the ages of pupils attending primary and secondary education vary.

The information provided in “**The Structure of the European Education Systems 2016/17: Schematic diagrams**”⁵ report published by Eurydice provides us with a clear view of the situation per country. In **Table 2** below, we present primary and secondary education and the corresponding ages of students in the nine observed countries.

5

https://webgate.ec.europa.eu/fpfis/mwikis/eurydice/images/9/9d/Structure_of_education_systems_2016_17.pdf

Table 2: Table of educational level and corresponding ages of students per country

Country (source Eurydice)	Primary ages	Secondary ages
Belgium (Flemish community)	6-12	12-18
Croatia	7-15	15-19
Finland	7-16	16-19
France	6-11	11-18
Germany	6-10	10-19
Greece	6-12	12-19
Portugal	6-15	15-18
Romania	6-11	11-19
United Kingdom (England)	5-11	11-18

A close look at these diagrams reveals that in most of the countries the entry point to compulsory **primary education** is between **5-6 years**. The only exception is that of Finland and Croatia where pupils are starting primary education a bit later, at the age of 7 years.

In **secondary education**, the age of **10-12 years** is shared, as entry point, among the majority of countries. The only exceptions in this case are again in Finland and Croatia where compulsory education is organised in a single structure. This means that education in these countries is provided from the beginning to the end of compulsory schooling, with no transition between primary and lower secondary education and with general education provided in common for all pupils. In these two countries, the entry point to secondary education is at **15-16 years**.

SUBJECTS OF INTEREST IN PRIMARY AND SECONDARY EDUCATION

Looking across the primary and secondary curricula of the respective countries and taking into account the relation of ocean literacy subjects to the Natural Sciences, we have determined the main set of subjects that are of interest to the project.

In primary education, most of the countries have a version of integrated Science classes: England (except for Geography, which is studied separately), Portugal (where the two focal subjects are called "Environment Study" and "Natural Sciences"), Croatia (where the subjects are separated the following way: "Science and society", "Natural Sciences and Mathematics" and "Environmental education"), Flanders (Belgium) ("World orientation"), France (where the subjects are separated the following way: "Questioning the world of living things, matter and objects", "Science and Technology", "Life and Earth Sciences", "History and Geography", "Mathematics" and Art History"),

Germany (where the subjects of focus are “Space, environment and mobility”, “Nature and life” and “Technology and the world of work”) and Finland (where Environmental studies, Biology and Geography all touch upon the topic). Both in Greece and in Romania Biology and Geography are taught separately and will be in the focus of this analysis. In **Table 3** we display primary education subjects in the observed countries.

Table 3: Observed primary education subjects in the countries within the scope of this analysis

Countries	Integrated science classes	Name of integrated science subject	Other classes
Flanders (Belgium)	Yes	World orientation	-
Croatia	Yes	Science and society, Natural Sciences and Mathematics and Environmental education	-
Finland	Yes	Environmental education	Biology, Geography
France	Yes	Questioning the world of living things, matter and objects, Science and Technology, Life and Earth Sciences, History and Geography	Mathematics and Art History
Greece	No	-	Biology, Geography
Germany	Yes	Space, environment and mobility, Nature and life and Technology and the world of work	-
Romania	No	-	Biology, Geography
Portugal	Yes	Environment Study and Natural Sciences	Geography, Physics and Chemistry and Citizenship and Development
England (UK)	Yes	Science	Geography

In secondary education, most countries within the scope of this analysis have a more extended set of subjects. In **Table 4: Observed secondary education subjects in the countries within the scope of this analysis**, we display the ones observed within the scope of this study.

Table 4: Observed secondary education subjects in the countries within the scope of this analysis

Countries	Biology	Geology	Geography	Chemistry	Physics	Mathematics	Science	Environmental studies
Flanders (Belgium)	x		x	x	x	-	x ⁶	-
Croatia	x		x	-	-	-	-	-
Finland								
France	-		x ⁷	-	-	-	x	-
Greece	x		x	-	-	-	-	-
Germany	x		-	-	-	-	-	-
Romania								
Portugal	x	x	-	x	x	-	-	-
England (UK)	-		x	x	x	-	x	-

PROCESS

FIRST PHASE

Considering the observations made regarding the age ranges in primary and secondary education in the countries of interest plus the subjects the curriculum analysis will be focusing on, a plan of action has been composed. As a first step, data collection for *primary and secondary education* has been completed for the following countries:

- Belgium
- Croatia
- Greece
- Germany
- Finland
- France
- Portugal
- Romania

⁶ "Natuur Wetenschappen".

⁷ This subject is taught together with History.

- England (UK)

During this step and in order to facilitate the curriculum analysis exercise, a set of keywords previously discussed with Task 3 leaders and partners, have been used to identify the certain sections of the curriculum, where ocean literacy topics could fit within the respective curricula.

The keywords were translated to the languages of the countries, where needed (e.g. while Finland discloses its national curriculum in English, Croatia does not). The keywords can be found in English below:

ocean, climate, fishery, natural resources, marine, sea, water, aquatic, river, aquaculture, maritime, off-shore, coast/coastal, ship, harbour, current, tide, seabed/seabasin, tectonic movement, oceanic crust, algae, sea life, weather, polar, glaciers, salt, sand

SECOND PHASE

In the second phase, and after compiling the entry points into a table per country (see Annex 1), a complete curriculum analysis has been carried out to find the entry points for ocean literacy topics in both primary and secondary education in all nine countries (see following sections).

PRIMARY EDUCATION CURRICULUM ANALYSIS

EDUCATION SYSTEMS & OCEAN LITERACY ENTRY POINTS

BELGIUM (FLEMISH COMMUNITY)

In Belgium, each of the three Communities (Brussels-Capital, Flanders and Wallonia) are responsible for most education competences⁸. Particularly, in Flanders, the Ministry of Education and Training is in charge of all stages of education and training. The Flemish government decides on a common curriculum (eindtermen), which is made more concrete by the three school groups (netten) into more detailed curricula (leerplannen). This curriculum analysis is on this level as teachers follow these curricula and not the more general from the Flemish government⁹.

All children residing in Belgium are introduced to compulsory education, which lasts from the ages of 6 until 18 years old. A pupil must attend full-time compulsory education until the age of 15. From 15 onwards, students can engage in part-time schooling and choose a structured learning path, combining part-time vocational education in an educational institution with part-time employment.

Elementary education (basisonderwijs) comprises of both pre-school education (kleuteronderwijs) and primary education (lager onderwijs). Primary education is targeted at children from 6 to 12 years old and comprises of six school years.¹⁰ The common core curriculum for primary education consists of areas of learning and cross-curricular themes. Ocean literacy subjects of interest are the following:

- **World orientation**, which covers nature, technique, humankind, society, time and space, use of resources. There is a particular interest in the following topics mentioned in the Flemish curriculum as entry points: **the oceans and seas, floating and sinking, habitats and organisms: examples from the own environment, the marine food web, impact of men on the earth, weather and adaptations to climate.**

CROATIA

In the Republic of Croatia, the Ministry of Science, Education, and Sports (MSES) is responsible for the administration and funding of the education. In addition to the MSES, other ministries and local governments allocate funds to education. The education system in the Republic of Croatia comprises educational cycles as follows:

- The first cycle comprises Grades 1 to 4 of primary school
- The second cycle comprises Grades 5 to 6 of primary school
- The third cycle comprises Grades 7 to 8 of primary school

⁸ Three exceptions remain at federal level. Those are the determination of the beginning and the end of compulsory education; the minimum requirements for the issuing of diplomas and the regulation of retirement for employees in the educational system.

⁹ The Flemish curriculum is currently awaiting update, therefore the information displayed here is subject to change in June 2020.

¹⁰ <https://webgate.ec.europa.eu/fpfis/mwikis/eurydice/index.php/Belgium-Flemish-Community:Overview>

- The fourth cycle comprises Grades 1 to 2 of secondary vocational and art school, or Grades 1 to 4 of secondary grammar school (gimnazija)¹¹

The grade schools are split in two stages:

- Within the first cycle (grades 1-4), the classes are being taught by one teacher that teaches every subject with the exception of foreign languages and Religion, with subjects such as Croatian, Mathematics, Visual Art (likovna kultura), Nature and Society (priroda i društvo), Physical Education, Music Education, and at least one foreign language (usually English, usually in the 1st grade and compulsory in the 4th grade).
- Within the second and third cycles (grades 5-8), the additional subjects taught are: History, Geography, Biology, Chemistry, Physics, Vocational Education, Informatics and in addition to English, often a second language (usually German, French or Italian).

Entry points in terms of ocean literacy in grades 1-8 are as follows:

- **Subject: Natural Sciences**
- **Subject: Mathematics**
- **Subject: Education and Environmental Education and Sustainable Development**
- **Subject: Science and society**
 - **The individual and society**
 - **Energy**
 - **Natural heritage**

FINLAND

In Finland, local autonomy in education is extensive. Local authorities (municipalities) provide the direction for most of the pre-primary, primary and upper secondary education. Individual schools and teachers have a lot of freedom in designing their own curricula and general instructions. However, at the national level, the Ministry of Education and Culture is responsible for education. In addition, the Finnish National Board of Education works with the Ministry to develop educational aims, content and methods for primary, upper secondary and adult education. Finland has a competency-based framework that serves as a guide for local curricula to be developed. This framework is applied horizontally throughout all educational levels.

The compulsory educational system consists of a nine-year comprehensive school, with pupils aged from 7 to 16 years old, attending Finnish peruskoulu (Finnish basic schools) in which attendance is mandatory. In particular, it is divided in 6-year primary schools (alakoulu or ala-aste) followed by comprehensive 3-year middle schools, (yläkoulu or yläaste).¹²

While education in Finland is very much dependent on local authorities, there is a common curriculum. Its main purpose is to promote the continuous improvement of education quality and to reinforce the continuum of education. It lays the foundation for the pupils' transition between educational stages. Entry points in terms of ocean literacy are as follows:

¹¹ https://en.wikipedia.org/wiki/Education_in_Croatia

¹² https://en.wikipedia.org/wiki/Education_in_Finland

- **Subject: Overall**
 - **Topic: Sustainable way of living and sustainable use of natural resources**
 - **Topic: Necessity of a sustainable way of living**
- **Subject: Environmental studies (grades 3-6)**
 - **Topic: Building a sustainable future**
- **Subject: Biology (grades 7-9)**
 - **Topic: Towards a sustainable future**
- **Subject: Geography (grades 7-9)**
 - **Topic: Basic conditions for life on Earth**

FRANCE

The French education system is characterised by a strong central state presence in the organisation and the funding of Education, as it is regulated by the Department for National Education, Higher Education and Research.

Primary education is provided in primary schools for children between the ages of 6 and 11 and it marks the start of compulsory schooling. Primary schooling consists of five years of education. These five years are divided into two main cycles of learning. The first three years in primary school are called the cycle *apprentissages fondamentaux*, where the emphasis is put on basic skills such as reading, writing and arithmetic. The next two years form what is known as the cycle *de consolidation*. The main subjects of interest during these years are Mathematics, Discovering the world, Science and Technology, Geology. At the end of this cycle, pupils automatically access secondary education.¹³ The following entry points can be considered for ocean literacy topics:

- **In cycle 2**
 - **Questioning the world of living things, matter and objects**
- **In cycle 3**
 - **The Earth – living things in their environment**
- **In cycle 4**
 - **Seas and oceans: a maritime world**
 - **Prevent risks, adapt to global changes**
 - **Transformed spaces through globalization**
 - **Planet Earth, the environment and human action**
 - **Arts, energies, climatology and sustainable development**
 - **Natural resource management**

GERMANY

In the Federal Republic of Germany, responsibility for the education system is divided between the Federation (central government) and the Länder (regions) and its scope defined in the Basic Law (*Grundgesetz*). Unless the mentioned law grants legislative powers to the Federation, the Länder hold the right to legislate in the school and the higher education sector, in adult and in continuing education. The Basic Law also provides for particular forms of cooperation between the Federation and the Länder within the scope of joint tasks (*Gemeinschaftsaufgaben*).

¹³ <https://webgate.ec.europa.eu/fpfis/mwikis/eurydice/index.php/France:Overview>

General compulsory school (in the form of full-time schooling) lasts nine years and starts the year in which students reach their sixth year. Those who do not attend a full-time general education school or a vocational school at upper secondary level once they have completed their period of compulsory general schooling must still attend part-time schooling (compulsory Berufsschule attendance – Berufsschulpflicht), which normally lasts three years.

Entry points for ocean literacy are:

- **Space, environment and mobility**
- **Nature and life**
- **Technology and the world of work, focus: resources and energy**

GREECE

In Greece, the administration of primary and secondary education is conducted at central, regional and local level by the Ministry of Education, Research and Religious Affairs; the Regional Education Directorates; the Directorates of Education (Prefectures) and the School Units, respectively. However, the Ministry of Education, Research and Religious Affairs holds supervisory control over primary and secondary schools by defining the content of the curricula, recruiting and appointing staff and controlling funding.

The Greek educational system is mainly divided in three different levels: primary, secondary and tertiary, with an additional post-secondary level providing vocational training. Compulsory education in Greece lasts for ten years, from 5 to 15. Within this, primary education is divided into pre-primary school and primary school, lasting six years (ages 6 to 12). Pre-primary education starts when pupils are 4 years old and attendance is compulsory for all 5-year-old children. Primary education lasts six years and concerns children between the ages of 6 to 12 years.

From the 2020-2021 school year, Environmental education will be added as a separate subject to the primary and lower secondary curricula.

The basic subjects in primary education are the following:

- Modern Greek Language
- Mathematics
- **Environmental Studies**
- Physical Education
- Music
- Art
- Theatre
- Flexible Zone
- English

Additional Subjects are the following:

- **Physics**
- **Geography**
- History
- Religion
- Social and Political Studies

- Second Foreign Language¹⁴

In grades 1 to 4, the subject of Environmental Studies is the most closely related to ocean literacy. In grades 5-6, Physics and Geography are also added. Specific topics within the **Geography** curriculum that are entry points for ocean literacy topics are as follows:

- **The distribution of continents and of the oceans**
- **Oceans and seas**
- **The atmosphere**
- **Earth's climate zones**
- **Vegetation zones**
- **The relief of the Earth**
- **The great mountains, the large plains**
- **The largest rivers and Earth's largest lakes**
- **Natural disasters and their consequences in peoples' lives**

PORTUGAL

In Portugal, the Ministry of Education is responsible for the development of general education. The education system is divided in pre-school education (until pupils begin basic education), basic education (6 to 15 years old) and secondary education (15 to 18 years old). The basic education lasts for nine years and is divided into three cycles. Each of these is aimed at completing and building up on the previous one. The following entry points can be considered for ocean literacy topics **within the pre-school education**:

- **Content area: Personal and social training**
 - **Topic: respect and appreciation of the natural and social environment and the landscape heritage**
- **Content area: Knowledge of the world**
 - **Topic: science approach**
 - **Topic: knowledge of the physical and natural world**

Topic: express behaviors of concern for nature conservation and respect for the environment Cycle 1 and 2 comprise the whole primary education period. In particular:

- The first cycle corresponds to years 1 to 4 of schooling;
- The second cycle corresponds to years 5 and 6 of schooling;
- The third cycle corresponds to lower secondary education and lasts for three years.

Throughout basic education (apart from the provision of general basic education), pupils can choose specialized artistic courses in the areas of music and dance. The following entry points can be considered for ocean literacy topics **within each cycle**:

Cycle 1 (school years 1 to 4):

- **Subject: Environment Study**
 - **Topic: Nature – identify risk situations and behaviours for the aquatic environment and propose appropriate protective measures; recognize the uneven distribution between continents and oceans; correlate physical state**

¹⁴ https://en.wikipedia.org/wiki/Education_in_Greece#Primary_education

changes with the water cycle; relate the characteristics of living beings with their habitat; relate biodiversity threats with the need to develop responsible attitudes towards Nature; distinguish and locate different water resources on a map (water courses, ocean, lakes, lagoons, etc.); identify different erosive agents (wind, running water, waves, precipitation, etc.), recognizing that they give rise to different landscapes on the Earth's surface

- Topic: Society – maritime expansion
- Topic: Nature/Society/Technology – identify local environmental and social problems, namely related to water, energy and waste, and present intervention proposals; distinguish different forms of ocean interference in human life (climate, health, food, etc.); recognize how environmental changes imbalances the ecosystems and influence the lives of living beings and society
Subject: Citizenship and Development
 - Topic: Sustainable development
 - Topic: Environmental education

Cycle 2 (school years 5 to 6):

- Subject: Natural Sciences
 - Topic: Water, air, rocks and soil - Terrestrial materials - characterize terrestrial and aquatic environments; availability and circulation of water on Earth; the properties of water and its relationship with the role of water in living beings; distinguish water suitable for consumption from water used for consumption, analyzing local, regional or national problematic issues; discuss the importance of sustainable water management in terms of its use, exploitation and protection, with local, regional, national or global examples
- Subject: National History and Geography
 - Topic: Portugal in the 15th and 16th centuries – the main stages of the maritime exploration process; the importance of knowing winds and currents for maritime exploration; identify the main ships and nautical instruments used by the Portuguese in maritime expansion
- Subject: Citizenship and Development
 - Topic: Sustainable development
 - Topic: Environmental education

Cycle 3 (school years 7 to 9):

- Subject: Natural Sciences
 - Topic: Earth in transformation – ocean floor morphology; relate ocean floor expansion and destruction with the plate-tectonics theory
 - Topic: Sustainability on Earth – the main phases of water cycle; the importance of the collection, treatment and sustainable management of waste and suggested measures to reduce risks and minimize damage to water contamination due human action; relate waste and water management with the promotion of sustainable development
- Subject: Geography
 - Topic: Natural environment – sustainable management of the territory by monitoring local risks, such as those of water courses and coastal areas; the erosive action of water courses and the sea; identify factors responsible for

conflict situations in the management of natural resources (river basins, coast)

- **Subject: Physics and Chemistry**
 - **Topic: Materials – concepts of fusion/solidification, boiling/condensation and evaporation in the interpretation of everyday situations and the water cycle; separation techniques required in the treatment of drinking water and effluents and their importance for the balance of ecosystems and quality of life**
- **Subject: Citizenship and Development**
 - **Topic: Sustainable development**

Topic: Environmental education

Implemented by the school year of 2017-2018 – initially only on a pedagogical experience basis – the Portuguese program for **Curricular Autonomy and Flexibility** in basic and secondary education, allows flexible and contextualized management of the curriculum, valuing interdisciplinary knowledge.

ROMANIA

Education in Romania is regulated and enforced by the Ministry of National Education. Each step has its own form of organization and is subject to different laws and directives¹⁵.

Compulsory schooling usually starts at age 6, with the "preparatory school year" (clasa pregătitoare), which is mandatory in order to enter the first grade. Schooling is compulsory until the 10th grade (age of 16 or 17). The school educational cycle ends in the twelfth grade, when students graduate with the baccalaureate.

By the end of 2020, teachers in both primary and secondary will be free to choose 30% of the curriculum. This might create new opportunities for ocean literacy. Entry points for ocean literacy are:

- **Subject: Mathematics and natural sciences: In the preparatory class and grades I and II, the Mathematics and environmental exploration are integrated.**
- **Subject: Human beings and society**
- Subject: Civic education (grade III-IV)
- Subject: History (grade IV)
- **Subject: Geography (grade IV)¹⁶**

UNITED KINGDOM (ENGLAND)

In the UK, schools providing primary education are generally addressed to children from 4 to 11 years old. Primary schools are often subdivided into infant schools for children from 4 to 7 and junior schools for ages 7 to 11.

In a few areas there is a "three-tier" system. In this system, children go to lower school or "first school" until about 9, followed by middle school until about 13 and upper school.

¹⁵ https://en.wikipedia.org/wiki/Education_in_Romania

¹⁶ https://eacea.ec.europa.eu/national-policies/eurydice/content/teaching-and-learning-primary-education-38_en

In areas that adopted a three-tier system, the term primary school is often used as an alternative to First School, taking in ages up to 9 or 10 years old.

In the private sector, fee-paying schools that provide primary education are known as preparatory schools, and they often cater for children up to the age of thirteen. These schools are normally designed to prepare pupils for entrance examinations for fee-paying independent schools¹⁷. Each region in the UK has different schooling systems¹⁸. The following ocean literacy entry points were identified **in key stages 1 and 2**:

KEY STAGE 1 (AGES 5-7, INFANT SCHOOL)

- **Subject: Science**
 - **Topic: Living things and their habitats**
 - **Topic: Seasonal changes**
- **Subject: Geography**
 - **Topic: Locational knowledge**

KEY STAGE 2 (AGES 7-11, JUNIOR SCHOOL)

- **Subject: Geography**
 - **Topic: Human and physical geography**
 - **Topic: Locational knowledge**

COLLECTIVE RESULTS – PRIMARY EDUCATION

In **Table 5** below, we present the results of the curriculum analysis in primary education for the nine observed countries.

Table 5: Collective results for primary education

Country	Subject of interest	Topics
Belgium (Flanders)	World orientation	<ul style="list-style-type: none"> • The oceans and seas • Floating and sinking • Habitats and organisms: examples from the own environment • The marine food web • Impact of men on the Earth • Weather and adaptations to climate
Croatia	Natural Sciences, Mathematics, Education and Environmental Education and Sustainable Development	N/A

¹⁷ https://en.wikipedia.org/wiki/Primary_education#United_Kingdom

¹⁸ <https://webgate.ec.europa.eu/fpfis/mwikis/eurydice/index.php/Countries>

Country	Subject of interest	Topics
	Science and society	<ul style="list-style-type: none"> • The individual and society • Energy • Natural heritage
Finland	Overall	<ul style="list-style-type: none"> • Sustainable way of living and sustainable use of natural resources • Necessity of a sustainable way of living
	Environmental studies (grades 3-6)	<ul style="list-style-type: none"> • Building a sustainable future
	Biology (grades 7-9)	<ul style="list-style-type: none"> • Towards a sustainable future
	Geography (grades 7-9)	<ul style="list-style-type: none"> • Basic conditions for life on Earth
France	Mathematics, Discovering the world, Science and Technology, Geology	<ul style="list-style-type: none"> • Questioning the world of living things, matter and objects • The Earth – living things in their environment • Seas and oceans: a maritime world • Prevent risks, adapt to global changes • Transformed spaces through globalization • Planet Earth, the environment and human action • Arts, energies, climatology and sustainable development • Natural resource management
Greece	Geography	<ul style="list-style-type: none"> • The distribution of continents and of the oceans • Oceans and seas • The atmosphere • Earth's climate zones • Vegetation zones • The relief of the Earth • The great mountains, the large plains • The largest rivers and Earth's largest lakes • Natural disasters and their consequences in peoples' lives
Germany	N/A	<ul style="list-style-type: none"> • Space, environment and mobility • Nature and life

Country	Subject of interest	Topics
		<ul style="list-style-type: none"> Technology and the world of work, focus: resources and energy
Portugal	Environment Study	<ul style="list-style-type: none"> Nature Society Nature/Society/Technology
	Natural Sciences	<ul style="list-style-type: none"> Water, air, rocks and soil - Terrestrial materials Earth in transformation Sustainability on Earth
	National History and Geography	<ul style="list-style-type: none"> Portugal in the 15th and 16th centuries
	Geography	<ul style="list-style-type: none"> Natural Environment
	Physics and Chemistry	<ul style="list-style-type: none"> Materials - Physical and chemical transformations Materials - Separation of substances from a mixture
	Citizenship and Development	<ul style="list-style-type: none"> Sustainable development Environmental education
Romania	Mathematics and natural sciences Human beings and society Civic education (grade III-IV) History (grade IV) Geography (grade IV)	<ul style="list-style-type: none"> Environmental exploration
United Kingdom (England)	Science (Infant school (ages 5-7))	<ul style="list-style-type: none"> Living things and their habitats Seasonal changes
	Geography (Infant school (ages 5-7))	<ul style="list-style-type: none"> Locational knowledge
	Geography (Junior school (ages 7-11))	<ul style="list-style-type: none"> Human and physical geography Locational knowledge

SECONDARY EDUCATION CURRICULUM ANALYSIS

EDUCATION SYSTEMS & OCEAN LITERACY ENTRY POINTS

BELGIUM (FLEMISH COMMUNITY)

When graduating from primary school around the age of 12, students enter secondary education. Here they have to choose a course that they want to follow, depending on their skill level and interests.

Secondary education consists of three cycles (Dutch: graden; French: degrés; German: grad):

- First stage (year 1 and 2)
- Second stage (year 3 and 4)
- Third stage (year 5 and 6)

The Belgian secondary education grants the pupils more choice as they enter a higher cycle. The first cycle provides a broad general basis, with only a few options to choose from (such as Latin, additional Mathematics and Technology). This should enable students to orient themselves in the most suitable way towards the many different courses available in the second and third stages. The second and third cycle are much more specific in each of the possible directions. While the youngest pupils may choose at the most two or four hours per week, the oldest pupils have the opportunity to choose between different "menus": like Mathematics and Science, Economics and Languages or Latin and Greek. They are then able to shape the largest part of the time they spend at school. However, some core lessons are compulsory like the first language and sport, etc. This mix between compulsory and optional lessons grouped in menus make it possible to keep class structures even for the oldest students.

As from the 2020-2021 school year, a new curriculum for secondary education will be installed.

Entry points regarding ocean literacy are:

- **Subject: Physics**
 - **Topics:** demonstration of long waves in water tank: reflection, refraction, bending; frictional force; law of Archimedes: floating, sinking; heat capacity; hydrostatic pressure
- **Subject: Geography**
 - **Topics:** oceans and seas; the water cycle; plate tectonics, seafloor spreading and geomorphology: oceanic crust, formation of islands, deep sea drilling, trenches; coastal geomorphology: cliffs, fjords, sandy beaches, rocky shores, estuary, mangroves, coral beaches; excursion to the coast (optional); ocean currents' influence on climate; properties of seawater: ocean currents, salinity (optional); the moon and influence on earth: tides (optional); harbours
- **Subject: Geography/Natural Sciences (3-hour module)**
 - **Topic:** ecosystem services of the ocean and environmental problems; oxygen and carbon cycle in ocean; water cycle
- **Subject: Biology**
 - **Topics:** origin of life: hydrothermal vents; evolution from land to marine: marine mammals; chemosynthesis; environmental problems: fresh water, air,

land, sea (optional: teacher can choose between problems in either fresh water, air, land or sea); the senses: the ear - problems in diving; biology field study: study of marine habitat (optional: teacher is free to choose a habitat to study)

- **Subject: Chemistry**
 - **Topics:** ocean acidification (ocean as buffer) – pH; stoichiometry: measuring carbonate in sea sand; carbon chemistry: offshore petroleum; salt; chemosynthesis
- **Subject: Natural Sciences (this course is a combination of Biology, Physics, Chemistry for non-scientific courses of study)**
 - **Topics:** the sea as a buffer – pH; environmental problems - sea: plastic pollution

CROATIA

Secondary schools in Croatia are subdivided into:

- Gymnasiums
- Vocational schools
- Art schools

Gymnasiums have four available educational tracks; prirodoslovno-matematička gimnazija (specializing in math, informatics and science), jezična gimnazija (with a focus on foreign languages and with less science), klasična gimnazija (with a curriculum centred around classics, namely Latin and Ancient Greek) and opća gimnazija (which covers a general education and is not as specific).

The subjects taught include: Croatian, Math, English, 2nd Foreign Language (of choice), 3rd Foreign Language (an option in foreign language centric schools only), Latin, Art History, Music Appreciation, History, Geography, Biology, Chemistry, Physics, Sociology, Psychology, Information Technology, Politics and Economics, Philosophy, Logics, Physical Education and an elective. Students may choose either Religious Studies or Ethics as the elective. Education in gymnasia lasts for four years.

Vocational schools teach a student a certain craft, such as cooking or carpentry, and last either three or four years. Schools of economics and engineering go under this category too.

Art schools that focus on visual art, music, etc. Students go to art schools also for four years.

Secondary schools supply students with primary subjects needed for the necessary work environment in Croatia. People who completed secondary school are classified as "medium expertise" (srednja stručna sprema or SSS).

Entry points for ocean literacy topics are as follows:

- **Subject: Biology**
 - **Topics:**
 - evolution of the living world on Earth
 - energy in the Living World; behaviour and responsibility within the framework of sustainable development

- adaptations of organisms to specific living conditions ethical issues in biological research and the application of biological discoveries, and decisions about own actions
- behaviour and responsibility within the framework of sustainable development
- **Subject: Geography**
 - **Topics:**
 - global distribution of land and sea (continents and oceans)
 - natural-geographical features and socio-economic significance of the sea
 - formation of the seafloor, the main relief forms in the submarine, the influence of tectonics, volcanism and the living world on the formation of islands and coasts
 - the atmosphere and the weather, the most important climate elements, weather data and, the importance of the weather forecast
 - climate characteristics, climate diagrams, climate classifications, the climate of different continents
 - sea and underwater as a source of food and energy
 - characteristics of the sea, the possibilities of exploitation of the sea and the underwater and identifies the Adriatic Sea as a wealth of Croatia
 - characteristics of the seas of Europe and their coasts
 - inland waters on Earth and in Croatia and supports their sustainable exploitation

FINLAND

The compulsory educational system in Finland consists of a nine-year comprehensive school from 1st to 9th grade, from the ages of 7 to 16 (Finnish peruskoulu, Swedish grundskola, "basic school"), in which attendance is mandatory. There are no "gifted" programs, and the more advanced children are expected to help those who are slower to catch on.

In Finland the basic common subjects for compulsory education, including of course secondary education, are defined in the Basic Education Act and its amendments¹⁹. These include: mother tongue and Literature, the second national language, foreign languages, **Environmental Studies**, Health Education, Religious Education or Ethics, History, Social Studies, Mathematics, Physics, Chemistry, **Biology, Geography (including the use of geo-information, geo-media)**, Physical Education, Music, Art, Crafts, and Home Economics.

When it comes to Geography and as from 2020, Geography will be integrated²⁰ within the subject "Environmental Studies" during the first six years (Finnish National Board of Education, 2016). In lower secondary schools, Geography will keep its status as an individual subject.

¹⁹ <http://www.finlex.fi/en/laki/kaannokset/1998/en19980628.pdf>

²⁰ https://helda.helsinki.fi/bitstream/handle/10138/237694/191_629_1_SM.pdf?sequence=1

Education providers, municipalities and private education providers, draw up local curricula and annual plans on the basis of the national core curriculum. As explained by the Finnish National Agency for Education²¹, in 2016 and after the reform was completed, multidisciplinary learning modules have been introduced to the education system. These learning modules are tools for integrating learning and for increasing the dialogue between different subjects. For the first time it is compulsory for the schools to organise one such module at least once every school year. The core curriculum obliges the schools to plan and implement these in cooperation between different subjects and involving pupils in their planning. Apart from these obligations, the municipalities and schools have the freedom to plan the modules according to local needs and interests.

FRANCE

Secondary education in France is divided into two successive stages: lower secondary and upper secondary. Lower secondary education (collège) comprises Grades 6 to 9 (typically ages 11 to 15). The lycée is the second, and last, stage of secondary education in the French educational system. Lycées are divided into (i) the lycée général, leading to two or more years of studies, (ii) the lycée technologique, leading to short-term studies, and (iii) the lycée professionnel, a vocational qualification leading directly to a particular career. General and technological education courses are provided in "standard" lycées, while vocational courses are provided in separate professional lycées. At the end of the final year of schooling, most students take the baccalauréat diploma. In France, there are three main types of baccalauréat: the baccalauréat général (general baccalaureate), the baccalauréat technologique (technological baccalaureate), and the baccalauréat professionnel (professional baccalaureate)²².

In France, the lycée général is the usual steppingstone to university degrees. During their year in Seconde, students make their final choice of série (course) for the final two years. The "streams" can be the following:

- Scientifique (various hard sciences)
- Économique et social (economics and social sciences)
- Littéraire (humanities)²³

All students take philosophy courses in terminale, while French language classes end in the première, excepting the série Littéraire.

The entry points for ocean literacy topics are as follows:

- **Subject: History-geography, geopolitics and science**
 - Topics: Studying the political divisions of the world
- **Subject: Life and Earth Sciences**
 - **Topics:**
 - The structure of the Earth, contrasts between continents and oceans
 - The dynamics of the lithosphere, characterization of horizontal mobility
 - Humanity and ecosystems: ecosystem services and their management

²¹ <https://www.oph.fi/sites/default/files/documents/new-national-core-curriculum-for-basic-education.pdf>

²² <https://en.wikipedia.org/wiki/Baccalaur%C3%A9at>

²³ https://en.wikipedia.org/wiki/Secondary_education_in_France

- Ecosystems: dynamic interactions between living things and between them and their environment
- The dynamics of convergence zones

GERMANY

After children complete their primary education (at 10 years of age, 12 in Berlin and Brandenburg), children are assigned to different secondary school tracks (Bildungsgänge) according to their ability level (based on prior achievement) and predicted academic aptitude. Secondary education is divided into lower and upper secondary education. Lower secondary education begins at Grade 5 (ages 10 to 12) in 14 states and ends at Grade 9 or 10 (ages 15 to 16). While secondary school track options are diversifying, students typically are assigned to one of the following tracks:

- Basic general education (Hauptschulbildungsgang: covering grade 5 or 7 to grade 9 or 10, and qualifies students to proceed to vocational training or higher types of secondary school
- Extensive general education (Realschulbildungsgang): Covering grades 5 or 7 to grade 10, and qualifies students to proceed to vocational training, upper secondary school, or a vocationally oriented upper secondary school (Fachoberschule) that may qualify students for universities of applied sciences
- In-depth general education (Gymnasialer Bildungsgang): covering Grade 5 or 7 to grade 12 or 13, and leads to the General Higher Education Entrance Qualification (Allgemeine Hochschulreife, Abitur), which qualifies students for university and other tertiary education

These three secondary school tracks are taught separately either at specific types of secondary schools (Hauptschule, Realschule, or Gymnasium) or in parallel within schools that offer two or three of the tracks (comprehensive schools).

Entry points for ocean literacy topics are:

- **Subject: Biology**
 - Topic: Ecosystems and their changes - Ecosystem of a forest; aquatic environments; climate change

GREECE

In Greece, secondary schooling is divided into two sections: gymnasio (which is compulsory) and lykeio (which is not compulsory).

COMPULSORY SECONDARY EDUCATION

Gymnasio is the first level of secondary education (equivalent to middle or junior high school) and is compulsory for children aged 12 to 15. It lasts three years. Written examinations are held at the end of each term. A leaving certificate allows pupils to continue their studies by enrolling at a lykeio or enter a vocational training programme at the Technical-Vocational Educational Institutes (TEE).

NON-COMPULSORY SECONDARY EDUCATION

There are two types of schooling available following completion of compulsory education in Greece:

- Unified upper secondary schools (eniaia lykeia/lykeio)
- Technical-vocational Educational Institutes (TEE)

In the unified upper secondary schools, the duration of schooling is three years. Lykeio is equivalent to senior high school and, though not compulsory, the majority of students complete it.

At the end of lykeio studies, pupils receive their leaving certificate (Apolitirio Eniaiou Lykeiou), and have the following options:

- To seek admission to higher education
- To study at a Vocational Training Institute (IEK)
- To seek employment in the public or private sector

Ocean literacy entry points identified are the following:

- **Subject: Physics**
 - **Topics:** Water changes - the "cycle" of water, the expansion and contraction of water - a natural "abnormality"
- **Subject: Geography**
 - **Topics:** Relation between people and the environment. Climate, sea, oceans, soil and the importance of natural resources

PORTUGAL

Secondary education (grades 10 to 12) in Portugal is organized into different education or training tracks providing access to higher education or entering active life. The **scientific-humanistic track** prepares students to enter higher education in the sciences, technology, and humanities. **Specialized arts tracks** prepare students to either enter active life or to follow higher education studies in music and performance arts, audiovisual arts, and dance. Vocational, education and formation, and **professional tracks** prepare students to enter active life, but also allow the pursuit of higher education studies. The flexibility of transferring between courses oriented to enter active life or to pursue higher education is guaranteed. In addition to the core curricula enforced by the Ministry of Education and Science, schools have some autonomy to adapt and introduce **specific professional and vocational tracks adapted to local contexts and economies**. Within each of these courses, there are different specializations²⁴. As it follows:

SCIENTIFIC HUMANISTIC²⁵

Within this route, you can find four different courses:

- Science and Technology
- Socioeconomic Sciences
- Languages and Humanities
- Visual Arts

²⁴ https://www.dge.mec.pt/sites/default/files/Curriculo/AFC/dl_55_2018_afc.pdf

²⁵ https://www.dge.mec.pt/sites/default/files/Curriculo/AFC/dl_55_2018_afc.pdf

Below are listed the different courses available through the “Science and Technology” path.

SCIENCE AND TECHNOLOGY²⁶

GENERAL COURSES

- Portuguese
- Foreign language I, II and III
- Philosophy
-
- Citizenship and Development
- Physical education

SPECIFIC COURSES

- Mathematics A and B
- Biology and Geology
- Physics and Chemistry A
- Descriptive Geometry A
- Biology
- Physics
- Geology
- Chemistry
- Anthropology
- Sociology
- Informatics applications B
- Political Sciences
- Social Sciences-applied Mathematics
- History A and B
- Culture and Arts History
- Portuguese Literature
- Portuguese Language Literatures
- Literature Classics
- Law
- Economics A and C
- Philosophy A
- Geography A and C
- Latin A and B
- Greek
- Foreign language I, II and III
- Psychology B
- Drawing A
- Materials and Technologies
- Arts Workshop
- Multimedia Workshop B

²⁶ <http://www.dge.mec.pt/cursos-cientifico-humanisticos-do-ensino-secundario-2>

FACULTATIVE FREQUENCY COURSES

- Religious and moral education

Entry points for ocean literacy are:

- **Subject: Biology and Geology**
 - **Topic: Geology and Methods** – plate-tectonics theory (lithospheric plate, divergent, convergent and transforming/conservative boundaries, rift and subduction zone, dorsal and oceanic pits)
- **Subject: Biology**
 - **Topic: Environment preservation and recovery** – interpretation of data related to air, water or soil contamination; carry out responsible citizenship interventions aimed at preventing/minimizing/remedying a problem under study and promoting the sustainable use of natural resources
- **Subject: Geography**
 - **Topic: The natural resources** – Possibilities on sustainable exploitation of Portugal's natural resources (mineral, energy, water and maritime; identify the main hydrographic basins and their relationship with water availability; correlate water availability to energy production, agricultural use, water supply to the population or other uses; the current situation of fishing activity; the importance of the Exclusive Economic Zone, identifying resources and measures within the scope of its management and control; correlation between climate specificities, water availability and watercourse regimes in different Portuguese regions; correlate the geographical position of the main national ports with the direction of winds, sea currents, the characteristics of the coast and the relief of the seabed; the pressure on the coast and the need for sustained development of leisure and nature exploration activities
 - **Topic: From the continental drift theory to the plate-tectonics theory** – correlation of ocean floor topography and paleomagnetic evidences with the plate-tectonics theory; plan and carry out practical simulation activities on the expansion of ocean floor and subduction zones
- **Subject: Physics and Chemistry**
 - **Topic: Reactions in aqueous systems** – water characteristics and its ability to salts and carbon dioxide dissolution from the atmosphere: a transversal overview of the importance of water to the Planet and to the development of human society;
- **Subject: Physics**
 - **Topic: Mechanics (Fluids)** – the application of the Archimedes' law to analyse concrete equilibrium situations of floating bodies, submerged bodies and bodies that can float or submerge (such as submarines)
- **Subject: Economics**
 - **Topic: Development and human rights (Ecology)** – the right to a healthy environment and sustainable development
 - **Topic: Development and use of resources (Ecological costs)** – ecological consequences of modern economic growth and the indiscriminate use of resources
- **Subject: Citizenship and Development**
 - **Topic: Sustainable development**

■ **Topic: Environmental education**

ROMANIA

The Romanian high school curriculum (for a theoretical high school) usually consists of 12 to 14 subjects taught each semester: Romanian Literature, History, two foreign languages (generally English, French, German, Italian, Spanish), Religion, Mathematics, Physics, IT, Chemistry, Biology, Geography, Physical Education, Art, Music.

- **Biology (grades 5-8)**
 - Topic: Adequate communication in different scientific and social contexts
 - Topic: The manifestation of a healthy lifestyle in a natural environment conducive to life
 - Topic: The manifestation of a healthy lifestyle in a natural environment conducive to life
 - Topic: Human health and the environment
 - Topic: Living creatures in the environment
 - Topic: Identifying the environment
 - Topic: Appropriate use of biology-specific terminology in oral and written communication
- **Geography (5th grade)**
 - Topic: Earth - a planet in transformation
 - Topic: Climatic floors and hydrographic basins
 - Topic: Weather and climate
- **Geography (6th grade)**
 - Anthroposphere - man and human activities
- **Geography (8th grade)**
 - Climate, water, vegetation, fauna and soils

UNITED KINGDOM (ENGLAND)

The UK has recently developed a "Marine curriculum", this is however not yet available for the public. There are different lesson plans that include marine topics and are already online²⁷.

Secondary education is mainly covered by KS3, KS4 and KS5. **Key Stage 3** (commonly abbreviated as **KS3**) is the legal term for the three years of schooling in maintained schools in England and Wales normally known as Year 7, Year 8 and Year 9, when pupils are aged between 11 and 14. In Northern Ireland the term also refers to the first three years of secondary education, although these are known as Year 8, Year 9 and Year 10.

The term is used to define the group of pupils who must follow the relevant programmes of study from the National Curriculum²⁸. All pupils in this Key Stage must follow a programme of education in at least 15 areas:

- English
- Mathematics
- Science
- Computing

²⁷ <https://www.national-aquarium.co.uk/nma-learning/education/lessonideas/>

²⁸ [https://en.wikipedia.org/wiki/National_Curriculum_\(England,_Wales_and_Northern_Ireland\)](https://en.wikipedia.org/wiki/National_Curriculum_(England,_Wales_and_Northern_Ireland))

- Design and Technology
- History
- Geography
- Modern Foreign Language
- Art and Design
- Music
- Physical Education
- Citizenship
- Sex Education
- Career Education
- Welsh (in Wales only)

At the end of this stage, pupils aged 14 — in Year 9 — are assessed as part of the national programme of National Curriculum assessment. Until 2008 this involved a series of externally marked tests.¹ However, from 2009, this is based on on-going teacher assessment, with results for each school being published in performance tables.

Key Stage 4 is the legal term for the two years of school education, which incorporate GCSEs, and other examinations, in maintained schools in England normally known as Year 10 and Year 11, when pupils are aged between 14 and 16.

The term is used to define the group of pupils who must follow the relevant programmes of study from the National Curriculum. All pupils in this Key Stage must follow a programme of education in the following areas:

- English
- Mathematics
- Science
- Information and Communication Technology (England only)
- Physical Education
- Citizenship
- Sex Education
- Careers Education
- Religious Education
- Work-related learning
- Welsh (Wales only)

In addition, there is a statutory duty on schools to provide an optional programme of education for pupils in this Key Stage in each of the following areas:

- The Arts
- Design and Technology
- The Humanities
- Modern Foreign Languages

At the end of this stage, pupils aged 16 - in Year 11 - are normally entered for a range of external examinations. Most frequently, these are GCSE (General Certificate of Secondary Education) examinations, although a range of other qualifications is growing in popularity, including NVQ National Vocational Qualifications. These examinations are set by one of the examination boards. Results of examinations at this age are published as part of the Department for Children, Schools and Families' Performance Tables.

Key Stage 5 is a label used to describe the two years of education for students aged 16-18, or at sixth form, in England, Wales and Northern Ireland, aligning with previous Key Stages as labelled for the National Curriculum.

Halfway through Key Stage 5, students sit the GCE Advanced Subsidiary Levels examination and at the end of Key Stage 5, they sit the A2 Level examinations. Both AS and A2 level combined form the GCE Advanced Level qualification.

Key Stage 5 is also the stage of education where students go through more intense and challenging courses in very specific subjects like mathematics and physics. This stage is the last stage of secondary education for members of sixth form. When A levels are achieved the students will be able to apply to university.

Entry points regarding ocean literacy topics:

KEY STAGE 3 (AGES 11-13)

- **Subject: Geography**
 - **Topic: Human and physical geography**
- **Subject: Science/Chemistry**
 - **Topic: Earth and atmosphere**
- **Subject: Physics**
 - **Topic: Waves**

KEY STAGE 4 (AGES 14-16)

- **Subject: Science**
 - **Topic: Earth and atmospheric science**

COLLECTIVE RESULTS – SECONDARY EDUCATION

In **Table 6** below, we present the results of the curriculum analysis in secondary education for the nine observed countries.

Table 6: Collective results for secondary education

Country	Subject of interest	Topics
Belgium (Flanders)	Physics	<ul style="list-style-type: none"> demonstration of long waves in water tank: reflection, refraction, bending frictional force law of Archimedes: floating, sinking heat capacity hydrostatic pressure
	Geography Geography/Natural Sciences (3-hour module)	<ul style="list-style-type: none"> oceans and seas the water cycle plate tectonics, seafloor spreading and geomorphology: oceanic crust,

Country	Subject of interest	Topics
		<p>formation of islands, deep sea drilling, trenches</p> <ul style="list-style-type: none"> coastal geomorphology: cliffs, fjords, sandy beaches, rocky shores, estuary, mangroves, coral beaches excursion to the coast (optional) ocean currents' influence on climate properties of seawater: ocean currents, salinity (optional) the moon and influence on earth: tides (optional) harbours, ecosystem services of the ocean and environmental problems oxygen and carbon cycle in ocean
	Biology	<ul style="list-style-type: none"> origin of life: hydrothermal vents evolution from land to marine: marine mammals chemosynthesis environmental problems: fresh water, air, land, sea (optional: teacher can choose between problems in either fresh water, air, land or sea) the senses: the ear - problems in diving biology field study: study of marine habitat (optional: teacher is free to choose a habitat to study)
	Chemistry	<ul style="list-style-type: none"> ocean acidification (ocean as buffer) – pH stoichiometry: measuring carbonate in sea sand carbon chemistry: offshore petroleum salt chemosynthesis
	Natural Sciences (this course is a combination of Biology, Physics, Chemistry for non-scientific courses of study)	<ul style="list-style-type: none"> the sea as a buffer – pH environmental problems - sea: plastic pollution
Croatia	Biology	<ul style="list-style-type: none"> evolution of the living world on Earth energy in the Living World; behaviour and responsibility within the framework of sustainable development

Country	Subject of interest	Topics
		<ul style="list-style-type: none"> • adaptations of organisms to specific living conditions ethical issues in biological research and the application of biological discoveries, and decisions about own actions • behaviour and responsibility within the framework of sustainable development
	Geography	<ul style="list-style-type: none"> • global distribution of land and sea (continents and oceans) • natural-geographical features and socio-economic significance of the sea • formation of the seafloor, the main relief forms in the submarine, the influence of tectonics, volcanism and the living world on the formation of islands and coasts • the atmosphere and the weather, the most important climate elements, weather data and, the importance of the weather forecast • climate characteristics, climate diagrams, climate classifications, the climate of different continents • sea and underwater as a source of food and energy • characteristics of the sea, the possibilities of exploitation of the sea and the underwater and identifies the Adriatic Sea as a wealth of Croatia • characteristics of the seas of Europe and their coasts • inland waters on Earth and in Croatia and supports their sustainable exploitation
Finland	Environmental studies, Biology, Geography (including the use of geo-information, geo-media)	N/A
France	History-geography, geopolitics and science	<ul style="list-style-type: none"> • Studying the political divisions of the world

Country	Subject of interest	Topics
	Life and Earth Sciences	<ul style="list-style-type: none"> The structure of the Earth, contrasts between continents and oceans The dynamics of the lithosphere, characterization of horizontal mobility Humanity and ecosystems: ecosystem services and their management Ecosystems: dynamic interactions between living things and between them and their environment The dynamics of convergence zones
Germany	Biology	<ul style="list-style-type: none"> Ecosystems and their changes - Ecosystem of a forest Aquatic environments Climate change
Greece	Physics	<ul style="list-style-type: none"> Water changes - the "cycle" of water, the expansion and contraction of water - a natural "abnormality"
	Geography	<ul style="list-style-type: none"> Relation between people and the environment. Climate, sea, oceans, soil and the importance of natural resources
Portugal	Biology and Geology	<ul style="list-style-type: none"> Geology and Methods
	Biology	<ul style="list-style-type: none"> Environment preservation and recovery
	Geography	<ul style="list-style-type: none"> The natural resources From the continental drift theory to the plate-tectonics theory
	Physics and Chemistry	<ul style="list-style-type: none"> Reactions in aqueous systems
	Physics	<ul style="list-style-type: none"> Mechanics (Fluids)
	Economics	<ul style="list-style-type: none"> Development and human rights (Ecology) Development and use of resources (Ecological costs)
	Citizenship and Development	<ul style="list-style-type: none"> Sustainable development Environmental education
Romania	Biology (grades 5-8)	<ul style="list-style-type: none"> Adequate communication in different scientific and social contexts

Country	Subject of interest	Topics
		<ul style="list-style-type: none"> • The manifestation of a healthy lifestyle in a natural environment conducive to life • The manifestation of a healthy lifestyle in a natural environment conducive to life • Human health and the environment • Living creatures in the environment • Identifying the environment • Appropriate use of biology-specific terminology in oral and written communication
	Geography (grades 5-8)	<ul style="list-style-type: none"> • Earth - a planet in transformation • Climatic floors and hydrographic basins • Weather and climate • Anthroposphere - man and human activities • Climate, water, vegetation, fauna and soils
United Kingdom (England)	Geography (Key stage 3 (ages 11-13))	<ul style="list-style-type: none"> • Human and physical geography
	Science/Chemistry (Key stage 3 (ages 11-13))	<ul style="list-style-type: none"> • Earth and atmosphere
	Physics (Key stage 3 (ages 11-13))	<ul style="list-style-type: none"> • Waves
	Science (Key stage 4 (ages 14-16))	<ul style="list-style-type: none"> • Earth and atmospheric science

CONCLUSIONS

The exercise of the curriculum analysis, which has covered the primary and secondary curricula of nine countries, has been organised in different phases and by taking into account, the particularities of each educational system i.e. different age levels, subjects and national priorities.

In primary education, the majority of common topics have been identified under the Natural Sciences, which included elements from Environmental Education, Nature and plants, material processes and states of matter, Space and time and finally, animals and humans.

In secondary education, where most observed countries take a more traditional, subject-based teaching structure, common topics have mainly been identified under the subjects of Physics, Chemistry, Geography, Geology and Biology.

In some cases, such as Belgium (Flanders), Greece, the UK or Romania, the curriculum is undergoing changes at the time of writing. These changes might open new possibilities for ocean literacy and marine topics.

ANNEX

PRIMARY EDUCATION DETAILED CURRICULUM ANALYSIS FOR BELGIUM (FLANDERS)

Subject	Topics	Comments
		This curriculum analysis is of the Flemish speaking part of Belgium. The Flemish government decides on a common curriculum (<i>eindtermen</i>), which is made more concrete by the three school groups (<i>netten</i>) into more detailed curricula (<i>leerplannen</i>). This curriculum analysis is on this level as teachers follow these curricula and not the more general from the Flemish government.
World orientation		A combination of Science, Technology, Mathematics, ICT and Art
	name the oceans and seas	
	Floating and sinking	
	Habitats and organisms: examples from the own environment	Optional to choose for a marine habitat if the school is from the coast
	Food web	A marine food web
	Impact of men on the earth	Impact of men on the sea
	Weather and adaptations to climate	

SECONDARY EDUCATION DETAILED CURRICULUM ANALYSIS FOR BELGIUM (FLANDERS)

Subject	Topics	Comments
Physics	demonstration of long waves in water tank: reflection, refraction, bending	The curriculum speaks about waves without further mentioning whether it should be sound or ocean. Almost all teachers use sound waves.
	Frictional force	

Subject	Topics	Comments
	Law of Archimedes: floating, sinking	
	Heat capacity	
	Hydrostatic pressure	
Geography	Oceans and seas	
	The water cycle	
	Plate tectonics, Seafloor spreading and geomorphology: oceanic crust, formation of islands, deep sea drilling, trenches	
	Coastal geomorphology: cliffs, fjords, sandy beaches, rocky shores, estuary, mangroves, coral beaches	
	Excursion to the coast	Optional
	Ocean currents' influence on climate	
	Properties of seawater: ocean currents, salinity	Optional
	The Moon and influence on Earth: tides	Optional
	Harbours	
Geography/natural sciences	Ecosystem services of the ocean and environmental problems	3-hour module
	Oxygen and carbon cycle in ocean	
	Water cycle	
Biology	Origin of life: hydrothermal vents	
	Evolution from land to marine: marine mammals	
	Chemosynthesis	

Subject	Topics	Comments
	Environmental problems: fresh water, air, land, sea	Optional: teacher can choose between problems in either fresh water, air, land and sea.
	The senses: the ear - problems in diving	
	Biology field study: study of marine habitat e.g. deep sea, tidal zone, ... and environmental problems	Optional: a teacher is free to choose a habitat to study
Chemistry	Ocean acidification (ocean as buffer) - pH	
	Stoichiometry: measuring carbonate in sea sand	
	Carbon chemistry: offshore petroleum	
	Salt	
	Chemosynthesis	
Natural sciences	The sea as a buffer - pH	This course is a combination of Biology, Physics, Chemistry for non-scientific courses of study
	Environmental problems - sea: plastic pollution	Optional: a teacher can choose between the many environmental problems

PRIMARY EDUCATION DETAILED CURRICULUM ANALYSIS FOR CROATIA

Subject	Topics	Comments
Natural Sciences, Mathematics		
Education and Environmental Education and Sustainable Development		Natural sciences and mathematics, which enables experiential learning and consideration of relationships, for example, man and plants, man and animals, experiments in chemistry, environmental chemistry, chemistry in daily life, meteorology, investigation of causes and consequences of natural disasters,

Subject	Topics	Comments
		cartography, genetics, astronomy and the like
Science and society		The issue of environmental protection and sustainable development is a strategic issue for every country. It is also the focus of interest of the international community and is the subject of numerous declarations, conventions and interstate agreements. For sustainable development, which implies economic and social growth and development, while preserving the quality of the environment and judicious use of natural resources, education is crucial. A thorough change in the centuries-old collective awareness of the inexhaustible capacity of the environment is needed, which will contribute to and compensate for any disruption caused by human activities. New generations need to build a different attitude towards the environment, and develop skills and skills that will help them cope with inherited and emerging problems.
Science and society		How are the activities of people with the natural and social environment in my homeland related? Why are some activities characteristic of my homeland, eg agriculture, livestock, fishing and forestry, industry, energy, shipbuilding, construction, manufacturing, trade, transport, catering? Do I see my role in developing my place / homeland?
Science and society	The individual and society	Activities of people with natural and social environment in different parts of the Republic of Croatia (for example, close experience of students)? How some are parts of Croatia different, and how are they similar to our homeland when it comes to the economy and human activities? Why are some activities characteristic and more developed in some areas of the Republic of Croatia, eg agriculture, animal husbandry, fishing and forestry, industry, energy, shipbuilding, and why are some activities independent of the environment, e.g. construction, manufacturing, trade, transport, catering ? What activities are

Subject	Topics	Comments
		most talked about today? What activities are you looking for, how do we qualify for future occupations? Will people's occupations be the same in the future as they are today? How will I contribute to the economy someday? Do I see my role in developing my place / homeland?
Science and society		Different natural or built landscapes, weather conditions and natural resources influence the development of certain activities, the way of life and the relation to the environment.
Science and society	Energy	The natural heritage (the beauties of nature) are parks, forests, rivers, lakes, seas, plants, animals
Science and society		Examples are the conversion of energy from one form to another: energy from food to heat and motion energy, energy from the sun, wind, water to electricity, etc. Ways in which heat losses can be substantially reduced e.g. dressing adjustments, etc. Savings or rational use of energy is possible by turning off the lights, closing the doors and windows, properly ventilating the room in winter (often enough, but not too long before the room is completely cooled). Describes how to use, etc. Energy savings or rational use of energy is possible by turning off the lights, closing doors and windows, properly ventilating the room in winter (often enough, but not too long before the room is completely cooled). Describes ways to use energy in the homeland and discusses additional options: wind farms, hydroelectric power plants, solar collectors, sea waves, etc. Students can imagine the world, for example without electricity.
Science		Observes the habitat (extracurricular classes) and studies the wildlife that resides on it (forest, grassland, river, lake, sea, pond, swamp, etc.).

Subject	Topics	Comments
Science and society		<p>The outcome is achieved through fieldwork in at least one habitat. The results can be compared to examples of other habitats, and data can be obtained through additional fieldwork or literature searches, finding interesting things about different organisms. - select two habitats of different ecosystems (e.g. meadows and forests, lake and ponds, stagnant and liquid, stream and river, sea and inland water) to investigate living conditions, carry out observations and measurements (temperature, amount of light, humidity, pH, speed air or water currents, composition and soil properties), or within the same ecosystem, select areas with different conditions and, based on the results, highlight similarities and differences with relation to the habitats in the habitats</p> <p>- to investigate the competition of organisms in meeting the basic necessities of life (plants for light, space, water and substances from the soil, and animals for habitat, food and breeding partners) - study the principle of the parasite way of life on known examples from the environment and relate them to hygiene measures - Feeding relationships should be addressed in several examples of food chains, omitted from the processing of the food pyramid - determine population density in habitat near the school or in the schoolyard - discuss the impact of overuse of plastic packaging, energy and water</p>

SECONDARY EDUCATION DETAILED CURRICULUM ANALYSIS FOR CROATIA

Subject	Topic	Comments
Biology	Evolution of the living world on Earth	<p>The student links abiotic conditions in the ocean to the origin and development of life. The student compares the adaptations of unicellular organisms to different living conditions. The student links environmental change to adaptation and survival of organisms by reflecting on the principle of economy. The student puts the ability to respond to stimuli and the survival of different organisms. Explains the importance of developing the senses and nervous system in animals / humans.</p>

Subject	Topic	Comments
	Energy in the Living World	Formation of the first organisms and energies in the ocean
	Behaviour and responsibility within the framework of sustainable development	The student recognizes the need to protect certain species and certain natural habitats and areas of Croatia.
	Adaptations of organisms to specific living conditions	It compares adaptations to specific environmental conditions. Discusses the impact of natural disasters on the ecosystem. The importance of biodiversity conservation for humans can be explained through ecosystem services on national examples (e.g. the importance of natural floodplains for regulating water levels of large rivers, the role of pollinators in food production, etc.), and human responsibility through sustainable use or trade and cross-border transport topics endangered species
	Ethical issues in biological research and the application of biological discoveries, and makes decisions about their own actions	Examining the impact of human activities on natural processes and the possibilities of reducing pollution can be explained in the context of sustainable development, dynamic equilibrium in the ecosystem, renewable energy sources, pollution, pollution, equilibrium disorders, etc. It is important to comment on the advantages and disadvantages of renewable energy sources, wastewater treatment plants, the importance of environmental impact studies and the like. There is a need to discuss the justification of herbarium production, animal collections, the importance of protecting endangered species and protecting nature.
	Behaviour and responsibility within the framework of sustainable development	Anthropogenic impacts can be analysed in both positive and negative examples (e.g. the impact of water pollution on the sustainability of aquatic ecosystems, habitat restoration: afforestation of degraded habitats).
Geography	Global distribution of land and sea (continents and oceans)	

Subject	Topic	Comments
	Natural-geographical features and socio-economic significance of the sea	Distinguishes the five oceans and the open and closed seas for which he gives examples and describes the basic features of the ocean and the Mediterranean Sea, World Seas - division into five oceans, open and closed seas; their geographical distribution, physical properties of the sea - temperature, salinity, colour and transparency.
	Formation of the seafloor, the main relief forms in the submarine, the influence of tectonics, volcanism and the living world on the formation of islands and coasts	Origin and age of the seabed and paleomagnetism as evidence, basic features of active and passive continental rim, ocean basins, deep sea ditches and ocean ridges, different types of islands, describes the conditions for coral growth and the formation of coral reefs and coral islands, explains the causes of earthquakes and volcanism in the Pacific Fire Ring, explains the occurrence and consequences of the tsunami
	The atmosphere and the weather, the most important climate elements, weather data and, the importance of the weather forecast	
	Climate characteristics, climate diagrams, climate classifications, the climate of different continents	
	Sea and underwater as a source of food and energy.	
	Characteristics of the sea, the possibilities of exploitation of the sea and the underwater and identifies the Adriatic Sea as a wealth of Croatia	

Subject	Topic	Comments
	Characteristics of the seas of Europe and their coasts	
	Inland waters on Earth and in Croatia and supports their sustainable exploitation	

PRIMARY EDUCATION DETAILED CURRICULUM ANALYSIS FOR FINLAND

Subject	Topic	Comments
Overall	Necessity of a sustainable way of living	Climate change
Environmental studies	Building a sustainable future	Climate change
Biology	Towards a sustainable future	climate change
Geography	Basic conditions for life on Earth	Climate
	Sustainable way of living and sustainable use of natural resources	

PRIMARY EDUCATION DETAILED CURRICULUM ANALYSIS FOR FRANCE

Subject	Topic	Comments
Questioning the world of living things, matter and objects	Questioning the world of living things, matter and objects	From known space to deep space: countries, continents, oceans; the Earth and the stars (the Moon, the Sun, etc.), visualizing the planet to identify the presence of oceans. Identify a change in the state of water in a phenomenon of daily life.
Science and Technology	The Earth. Living things in their environment	Connect human needs, exploitation of natural resources and the expected impacts and manage (risks, rejections, valuations, depletion stocks)

Subject	Topic	Comments
History and Geography	Seas and Oceans: a maritime world.	The seas and the oceans are also climate regulators, exploited areas for fishing and other resources, at the centre of conflicts of interest numerous. These are fragile environments, the conservation of which is a major problem for societies. Also mentioned: Mediterranean sea, limited resources, to manage and renew. Energy, water: resources to spare and better use.
	Prevent risks, adapt to global changes	
	Transformed spaces through globalization	
Life and Earth Sciences	Planet Earth, the environment and human action	The following topics are all mentioned: climate, biodiversity, fishery and fishing, exploitation of natural resources
Art History	Arts, energies, climatology and sustainable development	
Mathematics	Natural resource management.	Natural resource management. Calculation of water, energy consumption ...; extraction, production, market prices, quotient quantities and product quantities.

SECONDARY EDUCATION DETAILED CURRICULUM ANALYSIS FOR FRANCE

Subject	Topic	Comments
History-geography, geopolitics and science	Studying the political divisions of the world	Borders in debate: Crossing borders: the law of the sea (identical on all seas and oceans, regardless of borders).
Life and Earth Sciences	The structure of the Earth, Contrasts between continents and oceans	
	The dynamics of the lithosphere, characterization of horizontal mobility	
	Humanity and ecosystems: ecosystem services and their management	Climate

Subject	Topic	Comments
	Ecosystems: dynamic interactions between living things and between them and their environment	
	The dynamics of convergence zones	Tectonic plates

PRIMARY EDUCATION DETAILED CURRICULUM ANALYSIS FOR GERMANY

Subject	Topic	Ages	Comments
	Space, environment and mobility		Maps and sketches from the near area, as well as climate and weather maps, tables, satellite images, etc., help in the development of elementary geographic orientation patterns in close and distant areas also show cross-border elementary geographic structures (e.g. landscape and vegetation forms).
			Responsible use of the natural and designed living environment and its resources
	Nature and life		Fabrics and their transformation: examine visible material changes of animate and inanimate nature, present results and describe them (e.g. physical states of water, drying processes for fruits)
			Warmth, light, fire, water, air, sound
	Technology and the world of work, Focus: resources and energy		

SECONDARY EDUCATION DETAILED CURRICULUM ANALYSIS FOR GERMANY

Subject	Topic	Comments
Biology	Ecosystems and their changes	Ecosystem of a forest; aquatic environments; climate change

PRIMARY EDUCATION DETAILED CURRICULUM ANALYSIS FOR GREECE

Subject	Topic	Comments
		As from the 2020-2021 school year, Environmental education will be added as a separate subject to the primary and lower secondary curricula. As soon as we have more information about the areas covered, we will include them.
Geography (11yo)	The distribution of continents and of the oceans	
	Oceans and seas	
	The atmosphere	
	Earth's climate zones	
	Vegetation zones	
	The relief of the Earth	
	The great mountains, the large plains	
	The largest rivers and Earth's largest lakes	
	Natural disasters and their consequences in people's lives	

SECONDARY EDUCATION DETAILED CURRICULUM ANALYSIS FOR GREECE

Subject	Topics
Physics (12yo, lower secondary)	Water changes - The "cycle" of water
	The expansion and contraction of water - A natural "abnormality"
Geography	Relation between people and the environment. Climate, sea, oceans, soil and the importance of natural resources

PRIMARY EDUCATION DETAILED CURRICULUM ANALYSIS FOR PORTUGAL

Subject	Topic	Comments
Environment Study	Nature Society Nature/Society/Technology	It involves the identification of risk situations and behaviours for individual and collective health and safety, in different contexts; Using location on the terrestrial globe; Using cartographic representations (paper or digital); In close connection with the local community through the identification of a problem (environmental or social) and proposing solutions for its resolution
Natural Sciences	Water, air, rock and soil – Terrestrial materials Earth in transformation Sustainability on Earth	Exploring local or regional examples, from data collected in the field; Using diversified information (news, diagrams, graphs, images); By valuing knowledge from other disciplines (e.g.: Geography, Physics and Chemistry sciences and National History and Geography)
National History and Geography	Portugal in the 15 th and 16 th centuries	
Geography	Natural Environment	At local and national scale
Physics and Chemistry	Environmental education Materials - Physical and chemical transformations Material - Separation of substances from a mixture	Through an interdisciplinary perspective
Citizenship and Development	Sustainable development Environmental education	

SECONDARY EDUCATION DETAILED CURRICULUM ANALYSIS FOR PORTUGAL

Subject	Topic	Comments
Biology and Geology	Geology and Methods	
Biology	Environment preservation and recovery	Interpretation of data relevant and/or near to the students; Carry out responsible citizenship interventions (feasible and grounded)
Geography	The natural resources From the continental drift theory to the plate-tectonics theory	List possibilities, showing critical reflection and reasoned argumentation; Create summary tables for each region; Presenting specific cases reported from different sources; E.g. of practical simulation activities: information research, laboratory or outside the classroom activities, interviews with experts, exhibitions or debates
Physics and Chemistry	Reactions in aqueous systems	
Physics	Mechanics (Fluids)	
Economics	Development and human rights (Ecology) Development and use of resources (Ecological costs)	Topics of discussion: ecology, sustainable development, protection of the environment, environmental rights; Topics of discussion: decreasing the base of available resources (drinking water, green areas, riverside areas, plant and animal species, productive soils and mineral resources), ecological footprint, biocapacity, pollution (atmospheric, water and soil; sources of pollution), acid rain, ozone layer and greenhouse effect and climate change
Citizenship Development and	Sustainable development	

	Environmental education	
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SECONDARY EDUCATION DETAILED CURRICULUM ANALYSIS FOR ROMANIA

Subject	Topic	Comments
Biology	Adequate communication in different scientific and social contexts	Identifying the effects of over-exploitation of natural resources in the short and long term (for example: predictions regarding the consequences of deforestation, hunting and intensive / illegal fishing, etc.), carrying out evolutionary scenarios under the impact of continuous changes of environmental factors
	The manifestation of a healthy lifestyle in a natural environment conducive to life	Designing/participating in practical activities of selective waste collection, recycling, waste reduction of energy consumption, balanced resource management and reduction of pollution, promoting a healthy lifestyle, planning and maintaining the green space of school, tree planting, etc.
	The manifestation of a healthy lifestyle in a natural environment conducive to life	Carrying out projects for the local community regarding the rational use of resources natural resources, the use of renewable resources, pollution reduction solutions, etc.
	Human health and an environment	
	Living creatures in the environment	Other livelihoods in our country (cave, Danube Delta - Reservation of the Biosphere, the Black Sea) and other areas of the planet
	Identifying the environment?	Black Sea: sea salad, jellyfish, midie, stone crab, sea dog, morun/trout/scepter, ash/guvid, yellow-legged seagull, sea lion, cormorant sea, common dolphin
	Identifying the environment?	Flowing waters: willow/alder/poplar, river grass, carp/trout/heifer, cliff/stork
	Appropriate use of biology-specific	Presentation of exhibitions with holiday photos to identify different ecosystems (meadow, forest, sea,

Subject	Topic	Comments
	terminology in oral and written communication	river, lake) or the various types of living creatures encountered
Geography	Earth - a planet in transformation	Continents and ocean basins; major form of relief
	Hydrosphere	General characteristics and importance, Planetary Ocean - components and location. Water dynamics ocean, Inland waters
	Climatic floors and hydrographic basins	
	Weather and climate	Climatic zones of the Earth. The influence of climate on geospheres
	Anthroposphere - man and human activities	
	Climate, water, vegetation, fauna and soils	

PRIMARY EDUCATION DETAILED CURRICULUM ANALYSIS FOR THE UNITED KINGDOM (ENGLAND)

Subject	Topic	Comments
Science	Living things and their habitats	Pupils should be introduced to the idea that all living things have certain characteristics that are essential for keeping them alive and healthy. They should raise and answer questions that help them to become familiar with the life processes that are common to all living things. Pupils should be introduced to the terms 'habitat' (a natural environment or home of a variety of plants and animals) and 'micro-habitat' (a very small habitat, for example for woodlice under stones, logs or leaf litter). They should raise and answer questions about the local environment that help them to identify and study a variety of plants and animals within their habitat and observe how living things depend on each other, for example, plants serving as a source of food and shelter for animals. Pupils

Subject	Topic	Comments
		should compare animals in familiar habitats with animals found in less familiar habitats, for example, on the seashore, in woodland, in the ocean, in the rainforest.
Geography	Locational knowledge	Locational knowledge: name and locate the world's seven continents and five oceans, name, locate and identify characteristics of the four countries and capital cities of the United Kingdom and its surrounding seas. Use basic geographical vocabulary to refer to: key physical features, including: beach, cliff, coast, forest, hill, mountain, sea, ocean, river, soil, valley, vegetation, season and weather
Science	Seasonal changes	Pupils should be taught to: observe changes across the four seasons, observe and describe weather associated with the seasons and how day length varies.
Geography	Human and physical geography	The national curriculum for geography aims to ensure that all pupils: develop contextual knowledge of the location of globally significant places – both terrestrial and marine – including their defining physical and human characteristics and how these provide a geographical context for understanding the actions of processes. Human and physical geography, describe and understand key aspects of: physical geography, including: climate zones, biomes and vegetation belts, rivers, mountains, volcanoes and earthquakes, and the water cycle
Geography	Locational knowledge	Name and locate counties and cities of the United Kingdom, geographical regions and their identifying human and physical characteristics, key topographical features (including hills, mountains, coasts and rivers), and land-use patterns; and understand how some of these aspects have changed over time

SECONDARY EDUCATION DETAILED CURRICULUM ANALYSIS FOR THE UNITED KINGDOM (ENGLAND)

Subject	Topic	Comments
Geography	Human and physical geography	Understand, through the use of detailed place-based exemplars at a variety of scales, the key processes in: physical geography relating to: geological timescales and plate tectonics; rocks, weathering and soils; weather and climate, including the change in climate from the Ice Age to the present; and glaciation, hydrology and coasts, human geography relating to: population and urbanisation; international development; economic activity in the primary, secondary, tertiary and quaternary sectors; and the use of natural resources, understand how human and physical processes interact to influence, and change landscapes, environments and the climate; and how human activity relies on effective functioning of natural systems
Science/Chemistry	Earth and atmosphere	Earth and atmosphere: the composition of the Earth, the structure of the Earth, the rock cycle and the formation of igneous, sedimentary and metamorphic rocks, Earth as a source of limited resources and the efficacy of recycling, the carbon cycle, the composition of the atmosphere, the production of carbon dioxide by human activity and the impact on climate.
Science	Earth and atmospheric science	Evidence for composition and evolution of the Earth's atmosphere since its formation, evidence, and uncertainties in evidence, for additional anthropogenic causes of climate change, potential effects of, and mitigation of, increased levels of carbon dioxide and methane on the Earth's climate, common atmospheric pollutants: sulphur dioxide, oxides of nitrogen, particulates and their sources, the Earth's water resources and obtaining potable water
Geography		The national curriculum for geography aims to ensure that all pupils: develop contextual knowledge of the location of globally significant places – both terrestrial and marine – including their defining physical and human characteristics and how these provide a geographical context for understanding the actions of processes understand the processes that give rise to key physical and human geographical features of the world, how these are interdependent and how they bring about spatial variation and change over time

Subject	Topic	Comments
Physics	Waves	Observed waves: waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition.



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