



Survey on the Knowledge, Skills, Interest and Attitudes of Secondary Education Teachers, Students and project Stakeholders in relation to the WaterSTEAM Educational Approach

# NATIONAL REPORT

Greece



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## WATERSTEAM

Landscape, water and active citizenship: a nature based  
STEAM teaching methodology

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## Introduction

The present National Report aims to present the results and findings of the survey implemented in the framework of the WaterSTEAM project in Greece. The survey, addressing secondary education students and teachers, as well as stakeholder organisations in Greece, aimed at identifying the current levels of knowledge, skills, interests and attitudes of the aforementioned project target groups, regarding the theme of the project and the specific aspects of the proposed learning methodology.

The objectives of the implemented survey relate to each of the survey target groups as follows:

Secondary education students:

- Identifying the current knowledge levels regarding the proposed theme of the project, i.e. issues related to the landscapes, the role of water in transforming them and how global environmental issues connect to their protection and management.
- Identifying the current levels of skills related to the aspects of the proposed WaterSTEAM learning methodology, i.e. teamwork, fieldwork, use of office software and software related to GIS and Location-Based Games.
- Exploring the students' interest and attitudes regarding the project theme and aspects of the proposed learning methodology based on Inquiry-Based Learning (IBL), STEAM and environmental awareness / civic engagement, including their perceived connection of the project theme to the school curriculum.

Secondary education teachers (specialised in a wide range of disciplines within the STEAM approach):

- Identifying the current knowledge levels regarding the proposed theme of the project, i.e. issues related to the landscapes, the role of water in transforming them and how global environmental issues connect to their protection and management.
- Exploring the teachers' experience regarding the core aspects of the proposed methodology, i.e. IBL, STEAM, project-work, collaboration with fellow-teachers from different disciplines etc.
- Identifying the current levels of skills and experience related to implementing the aspects of the proposed WaterSTEAM learning methodology in class, i.e. teamwork, fieldwork, collaboration, use of office software and software related to GIS and Location-Based Games in a learning framework.
- Exploring the teachers' interest and attitudes regarding the project theme and implementing aspects of the proposed learning methodology based on Inquiry-Based Learning (IBL), STEAM and environmental awareness / civic engagement, including their perceived connection of the project learning methodology to the school curriculum.
- Identifying perceived problems/issues and potential in implementing aspects of the proposed learning methodology at school.

Stakeholder organisations:

- Identifying the levels of interest of representatives of stakeholder organisations, active in the fields of water management, landscape protection/management/planning and education (i.e. Academic institutions, local authority and central government bodies, research centres, science associations, educational authorities, NGOs, expert consultancy firms, etc.), regarding the project theme and aspects of the proposed learning methodology.
- Exploring the stakeholder organisations' knowledge regarding the STEM and proposed STEAM learning approach, including their experience in collaborating with schools of secondary education and participating in learning activities as experts.
- Defining the stakeholder organisation representatives' views and attitudes regarding the role of secondary education in approaching important environmental issues, and the potential role of stakeholder organisations in the proposed inter-disciplinary STEAM learning methodology, including their collaboration with schools and participation as external experts.

The survey took place through 3 online questionnaires especially designed for each of the survey target groups, made available in Greek using the Lime Survey platform, and administered as follows:

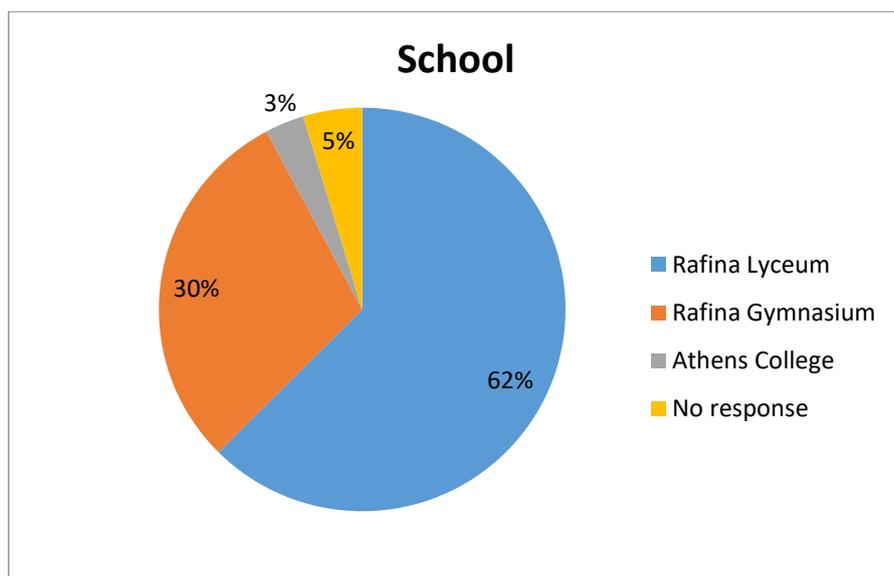
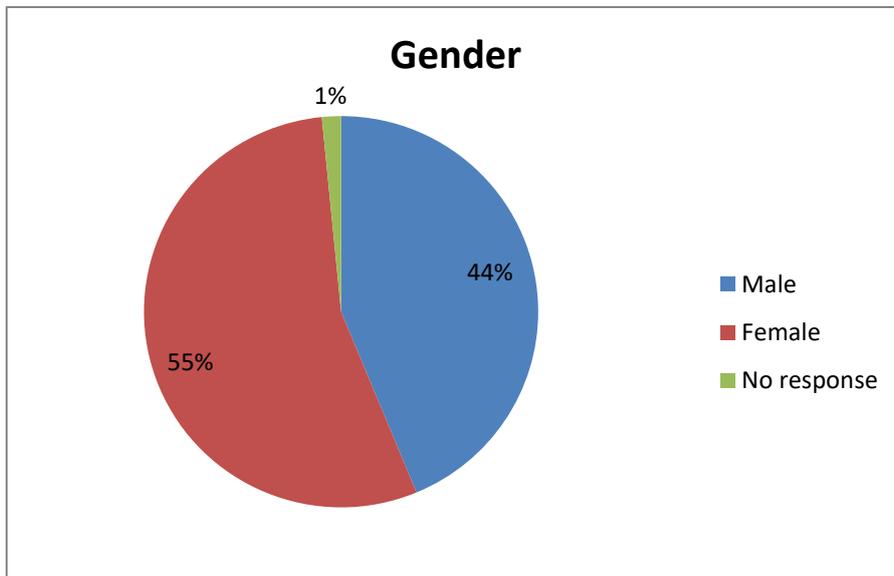
- Regarding the target groups of students and teachers of secondary education, the respective links to the online questionnaires were forwarded to the project partner school "1<sup>st</sup> Rafina Lyceum" that administered them internally to the school teachers who filled the questionnaire in their own time and to the students who filled the questionnaire in at the school computer facilities. The students' questionnaire was also administered to students of the 1<sup>st</sup> Rafina Gymnasium (ages 12-15). Additionally, the teachers' questionnaire was disseminated to other schools and colleagues of the Rafina Lyceum teachers. The survey targeting students and teachers in secondary education took place in the period from 27 May until 27 June 2020. In total, the students' questionnaire was completed by 64 students and the teachers' questionnaire by 21 teachers.
- Regarding the target group of project stakeholders, the link to the respective online questionnaire was disseminated through email communication to a wide range of stakeholder organisations throughout Greece, including Universities, Water authorities, research institutes, science associations, organisations of the civil society, private consultancy firms active on the project theme, etc., accompanied by information on the scope of the project and the survey. The survey targeting representatives of stakeholder organisations took place in the period from 26 May until 4 July 2020. In total, 24 representatives of stakeholder organisations completed the respective online questionnaire.

The resulting data were analysed and are presented per survey target group (i.e. students, teachers and representatives of stakeholder organisations) in the following chapters of the present report.

## Students' Survey

### I) Profile of participating students

The objective of this section of the questionnaire is to establish the profile of the participating students. In total, 64 students participated in the survey; the majority are female (55%) and most study at the Rafina Lyceum (Upper secondary education) – aged 16-17 years old, while 30% are younger students of the Rafina Gymnasium (Lower secondary education), aged 14-15 years old. The vast majority of the participating students live in Rafina or in neighbouring towns (e.g. Artemis, Spata).

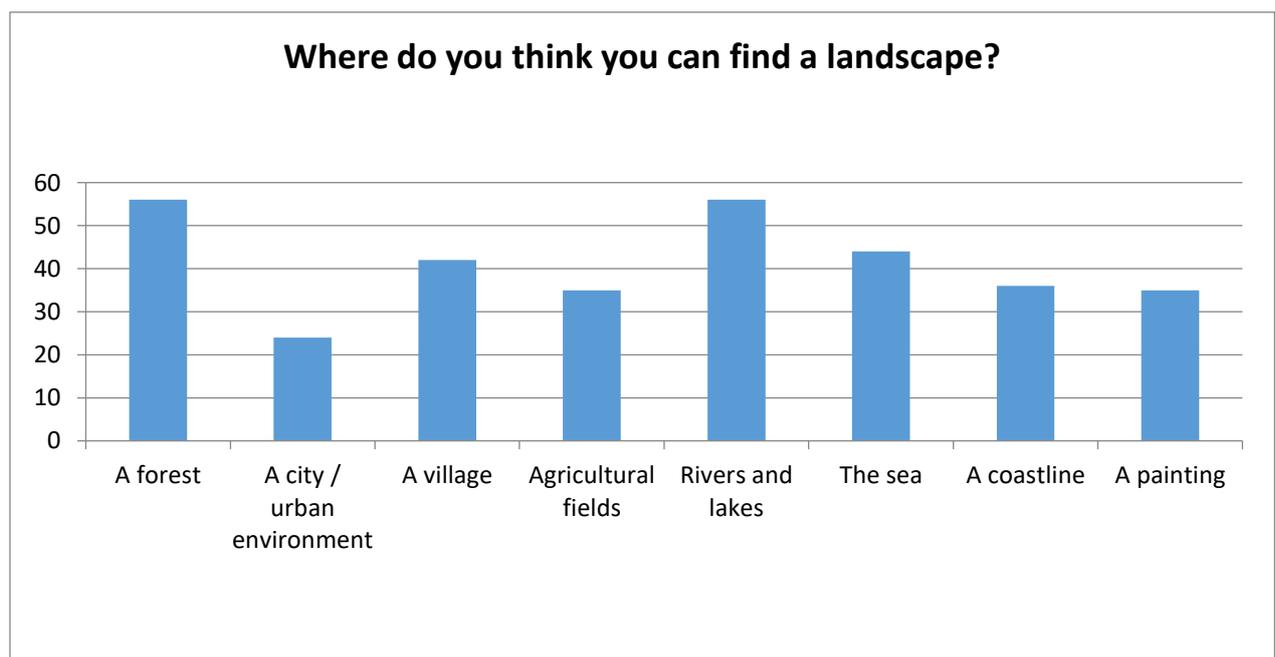


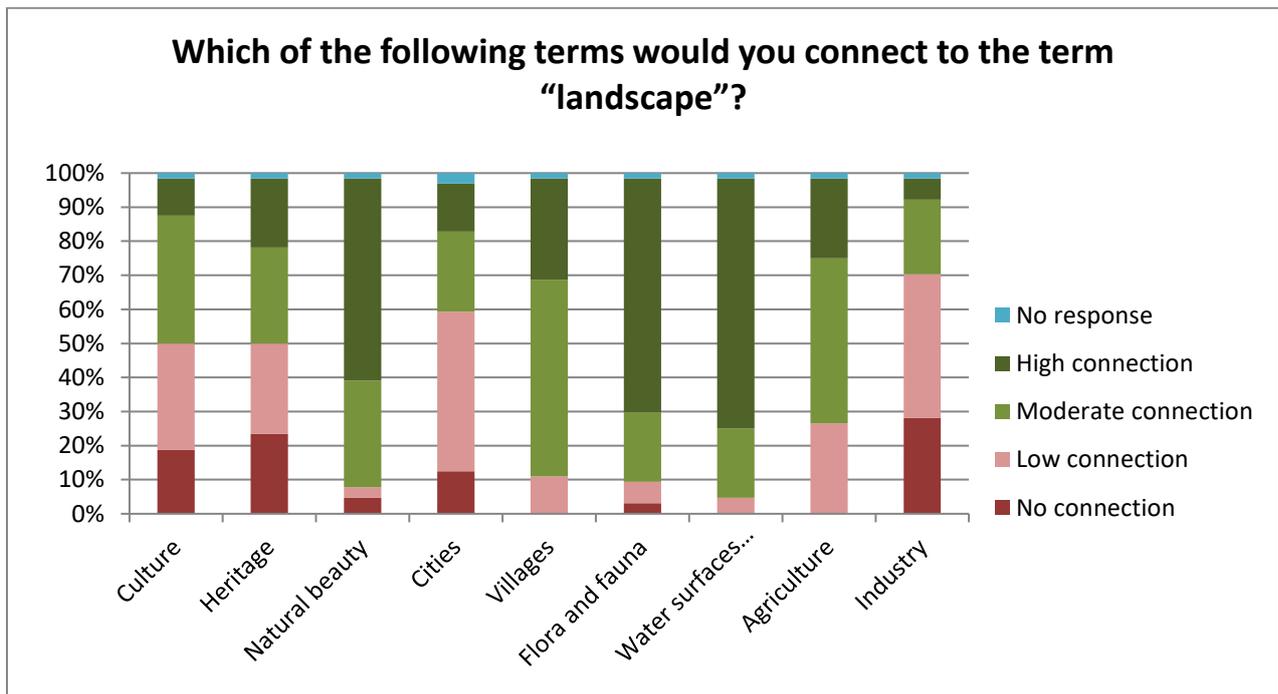
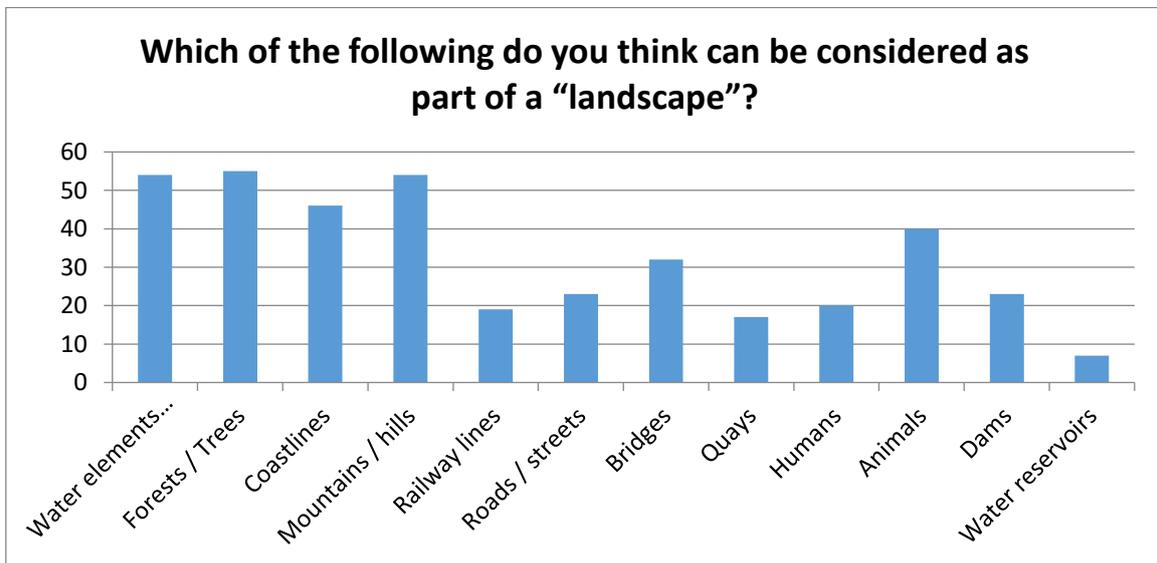
## II) Attitudes and interests towards the proposed theme of the project

In the present section of the report we aim at exploring the students' views regarding the concept of landscape, their current knowledge regarding landscape-related issues, as well as their interest in learning more about the issues proposed by the project.

### The concept of landscape

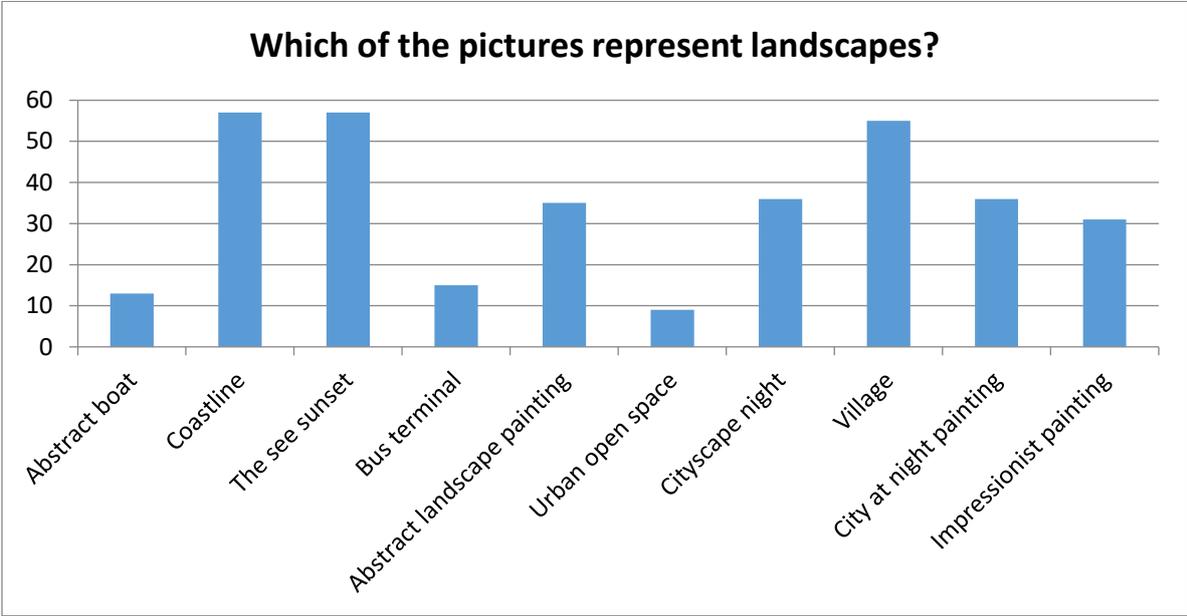
Regarding their views on the concept of landscape, the students were asked to select where they think they can find a landscape, what spatial elements can constitute part of a landscape, and to identify the connection of different terms to the term "landscape". The vast majority of students believe a landscape is found on a forest, on rivers and lakes, on a village and on the sea, while less believe they can find a landscape on agricultural fields, a coastline or a painting, with only a third of the students connecting the urban environment with the term landscape. A similar pattern emerges when students clearly connect natural spatial elements (i.e. forests, water elements, mountains) to the concept of landscape, and in their majority do not view manmade elements as part of a landscape (i.e. roads, railway lines, dams). It is worth also to note that students in general view animals as part of a landscape, but not humans. Moreover, students seem to establish a good connection between concepts referring to nature and the term "landscape" (e.g. natural beauty, flora and fauna, water surfaces), while they see a lower connection between landscape and concepts referring to the intensive human intervention (e.g. cities, industry). It is also worth to point out that students recognise a good connection between landscape and concepts referring to the rural life (e.g. villages, agriculture), and their views are divided regarding the connection of landscape to the concepts of culture and heritage.





The students were also shown a set of photos and paintings (see images below numbered 1-10) and were asked to identify which of the images represented a landscape. In their vast majority, the students selected photos representing natural or rural landscapes (coastline, see sunset, village – images 2, 3 and 8), while very few selected everyday urban landscapes (e.g. a bus terminal, an urban open space – images 4 and 6). However, more than half of the

students selected a photo of an outstanding night cityscape (image 7) and a painting featuring an urban space (road) at night (image 9); despite their urban character, the images' link to the concept of landscape in enhanced by the outstanding beauty of the view.





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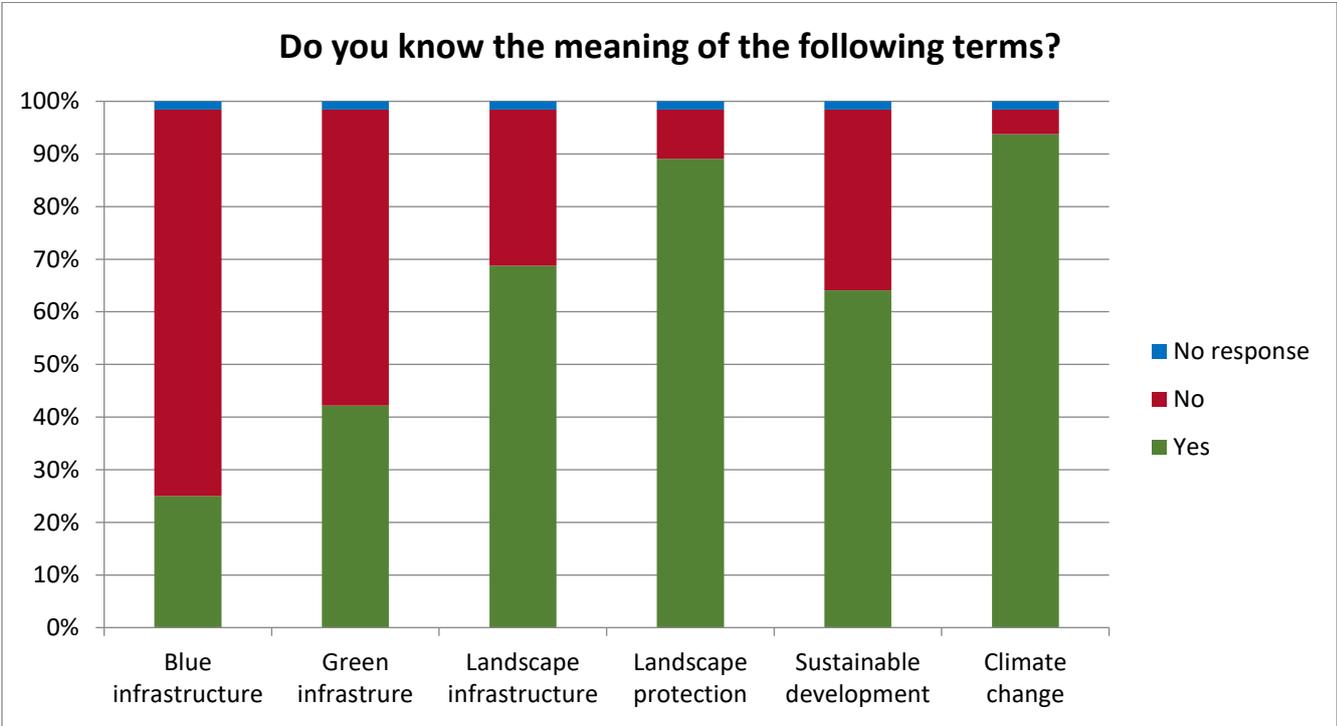
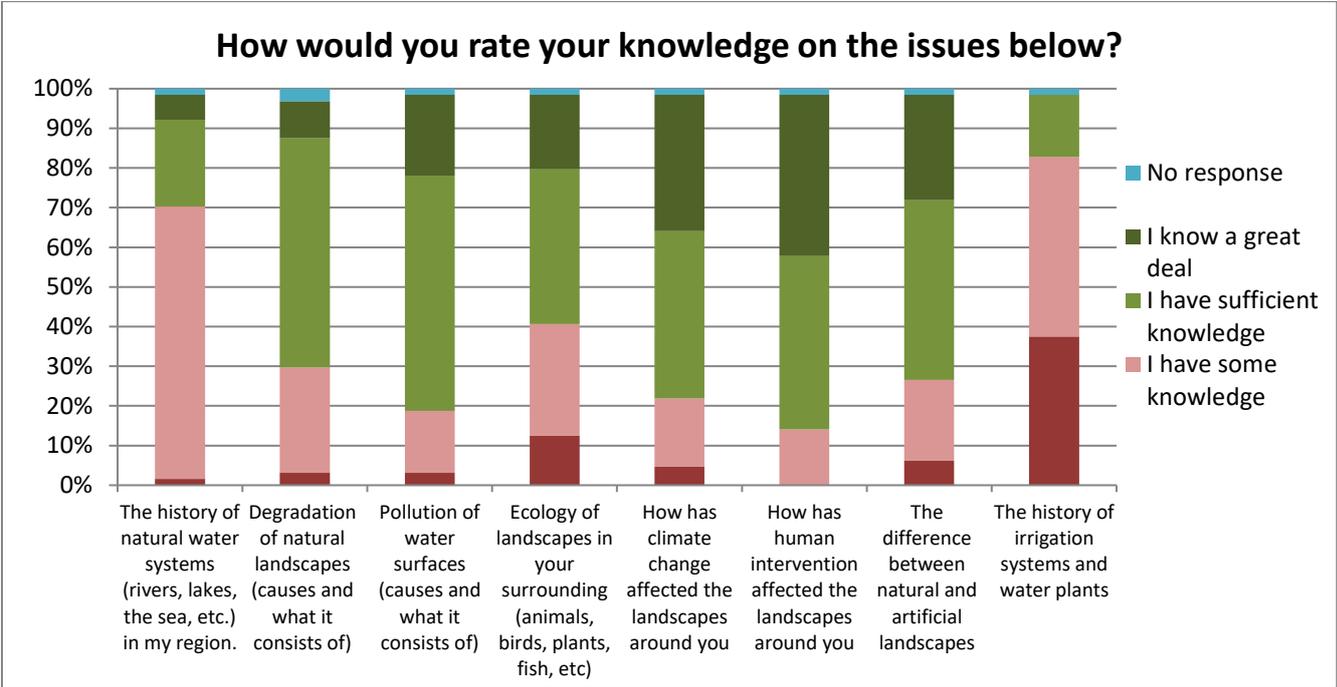
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### Knowledge on issues related to the project theme

The students were asked to assess their knowledge regarding landscape-related issues and related terminology. As presented in the graph below, the participating students in their majority consider they have sufficient knowledge or know a great deal about issues related to the pollution of water surfaces, the impact of climate change and human intervention to the landscapes surrounding them, and the difference between natural and artificial landscapes. On the contrary, they assess their knowledge as insufficient in topics related to the historical aspects of water elements (i.e. water elements in their region and irrigation systems/water plants).

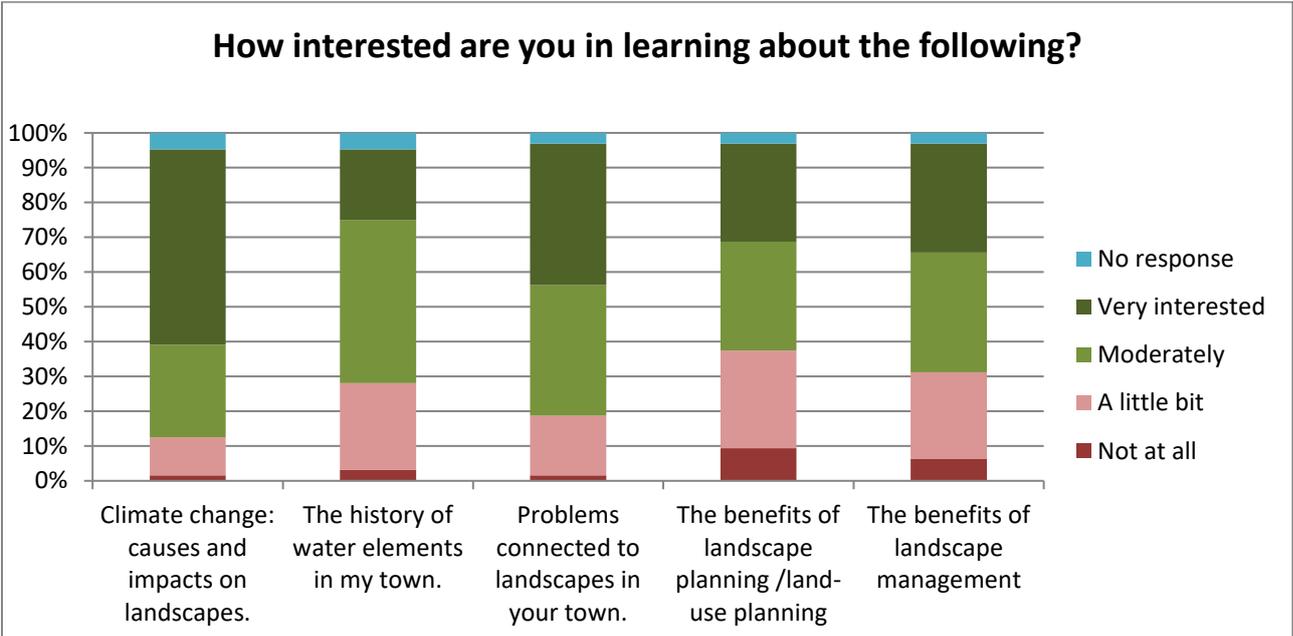
When asked whether they know the meaning of selected terms related to the project theme, almost all students stated they are familiar with the terms “climate change” and “landscape protection”, while the majority are familiar with the terms “landscape infrastructure” and “sustainable development”. On the contrary, the majority of the participating students are not familiar with the terms “green infrastructure” and “blue infrastructure”. It is worth to point out that only 64% of the students are familiar with the term “sustainable development”,

although the concept is not new and has been introduced in education; the term “climate change” on the other hand, is known to 94% of the students.



Interest in learning more on the project topics

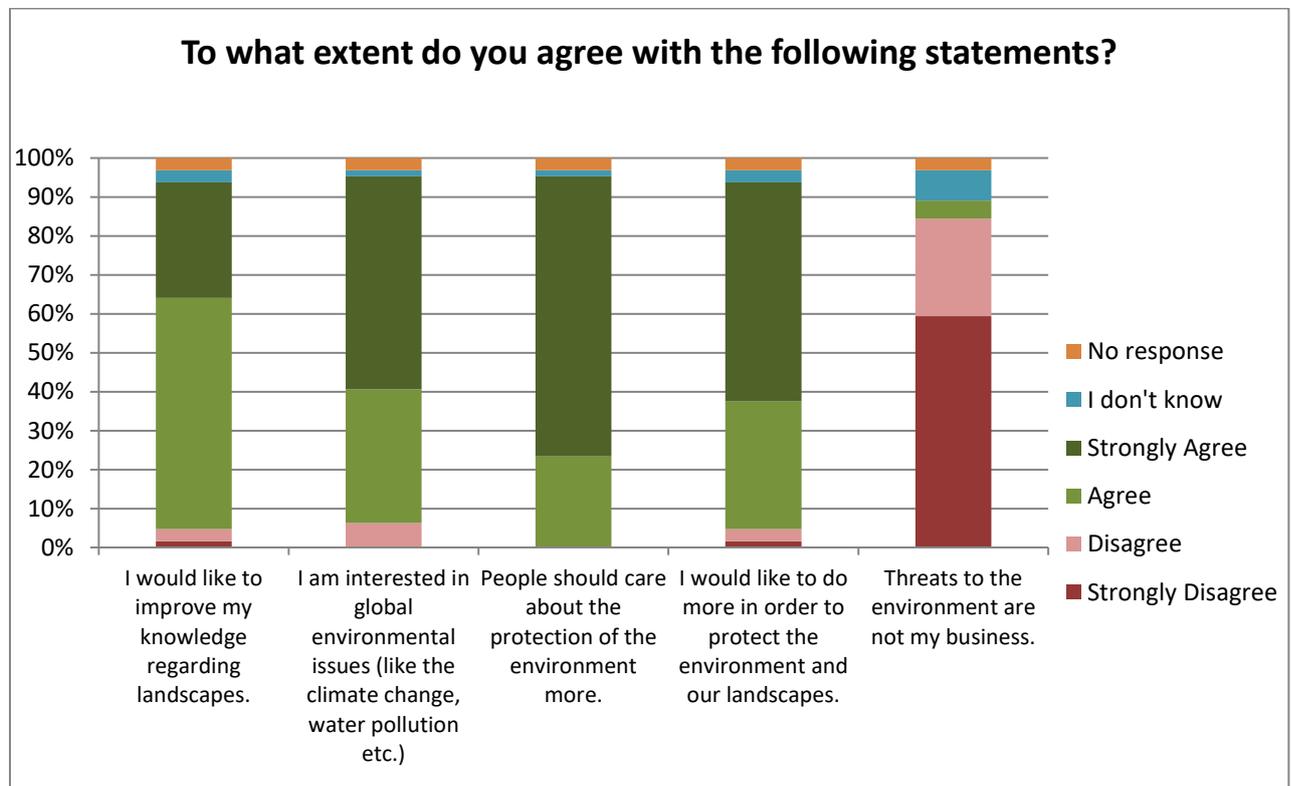
Regarding the students’ interest in learning about issues related to the project theme, although the majority of the students declare moderately or very interested in learning about all the topics proposed (see graph below), their interest seems to focus on the topic of causes and impact of climate change to landscapes, and problems connected to landscapes in their town. The lower levels of interest reported on issues related to the benefits of landscape planning and landscape management, are arguably justified by their lack of knowledge or understanding of the terms.



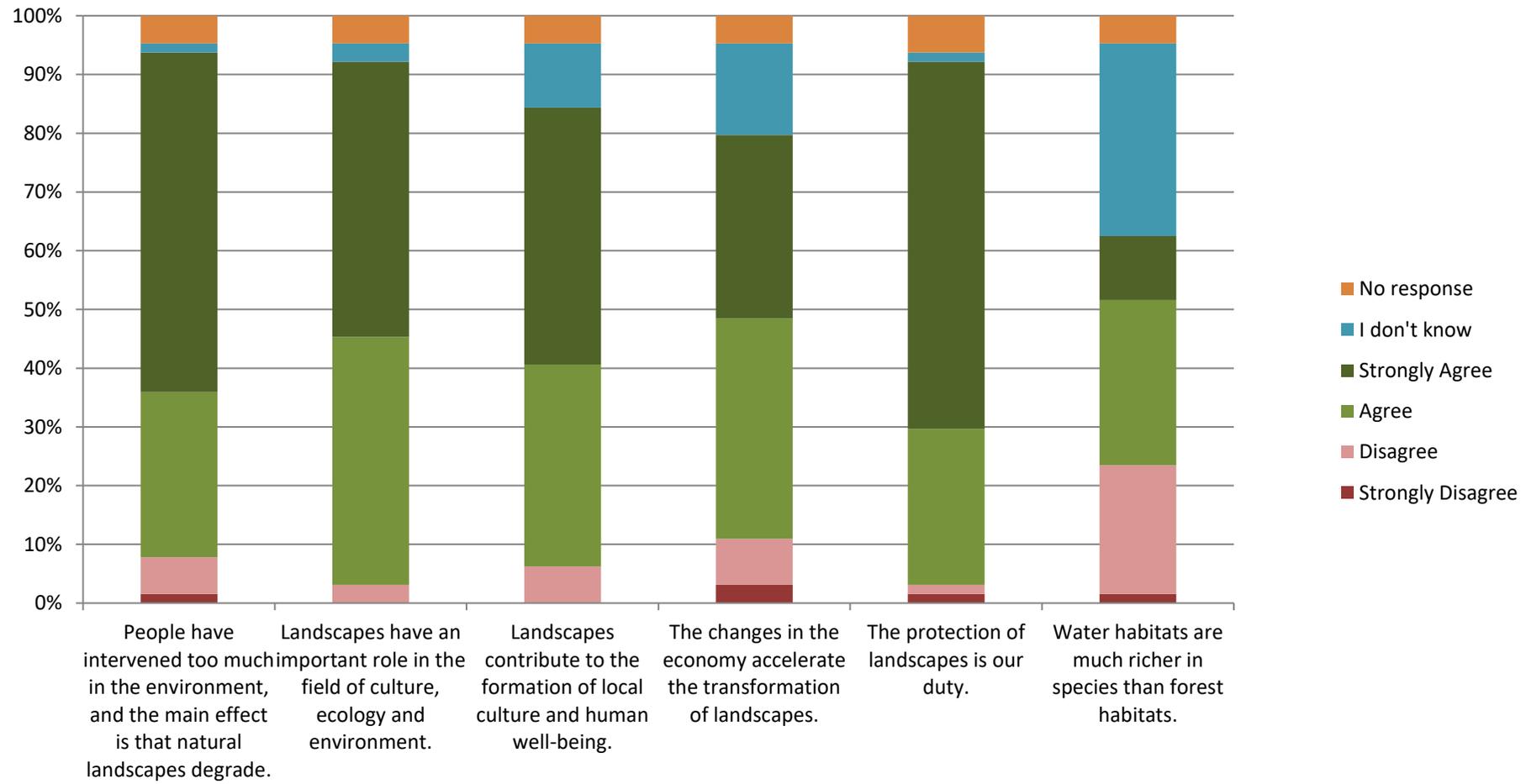
## Attitudes towards the proposed project themes

The attitudes of the participating students in relation to the project themes were explored by asking them to what extent they agree with a set of statements.

Overall, the students present very positive attitudes regarding the need for increased awareness and action in order to protect the environment and our landscapes, while they clearly state their interest in improving their knowledge about landscapes and global environmental issues like climate change and water pollution. Moreover, they strongly consider the protection of landscapes to be our duty. In their vast majority, they recognise the importance of landscapes for our culture, the environment and our well-being, and are aware that the human intervention has caused the degradation of natural landscapes and that the changes in the economy accelerate the transformation of landscapes.



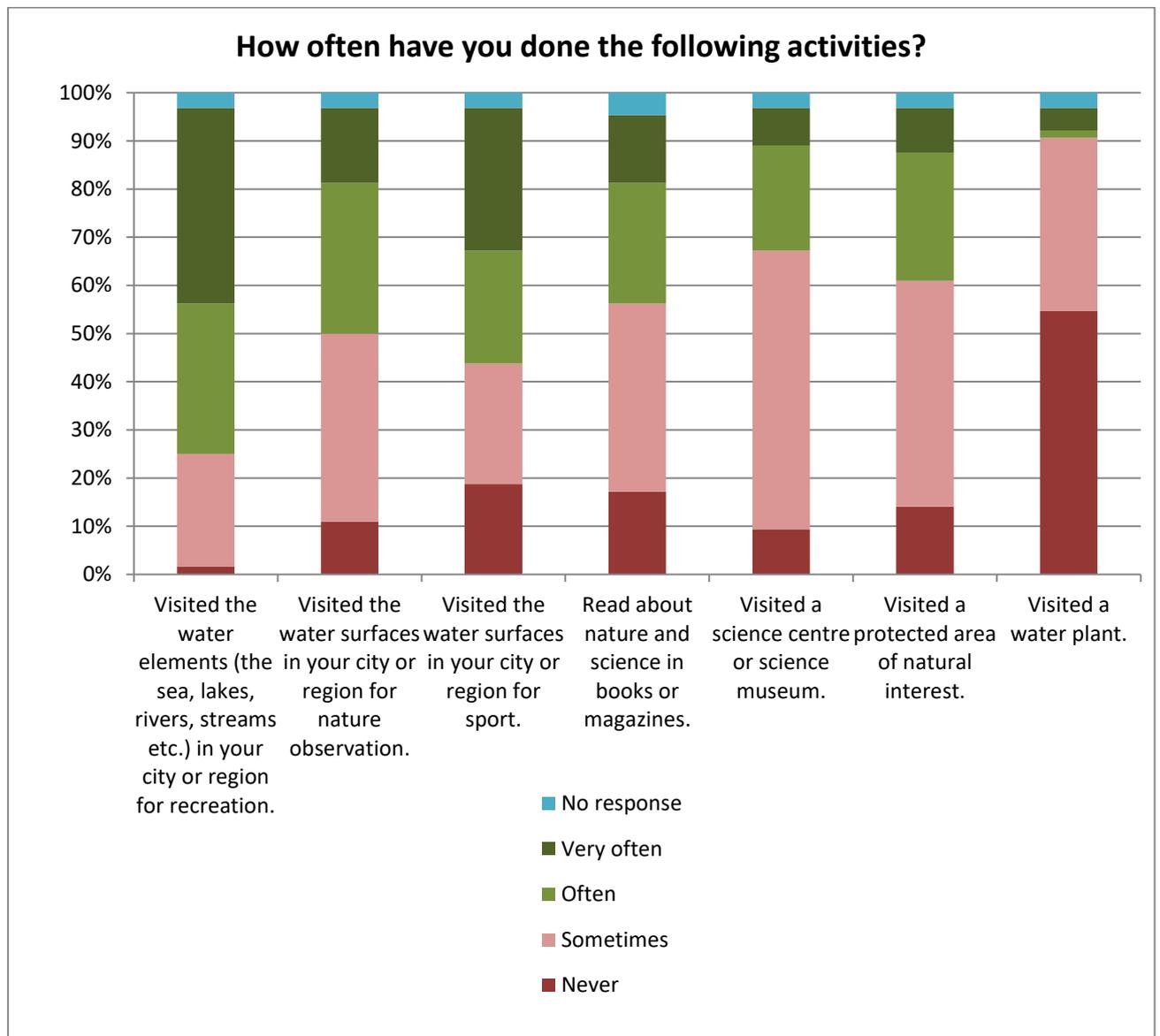
## To what extent do you agree with the following statements?



## Personal contact with landscapes and interest in science

The students were asked how often they have engaged in a set of activities in the past, in order to establish their personal contact with landscapes and water elements, as well as their personal interest in science.

While the majority of students state they visit water elements in their region (the sea, lakes or rivers) for recreation often or very often, their number declines regarding their visits for sport and nature observation. Moreover, the majority of the students declare they have never visited a water plant. Regarding activities related to their personal interest in science (i.e. read about nature and science in a magazine, visit a science centre/museum or an area of natural interest), a smaller percentage of the students (around 30-40%) declares they engage in these activities often or very often.



### III) Attitudes towards the learning aspects of WaterSTEAM methodology

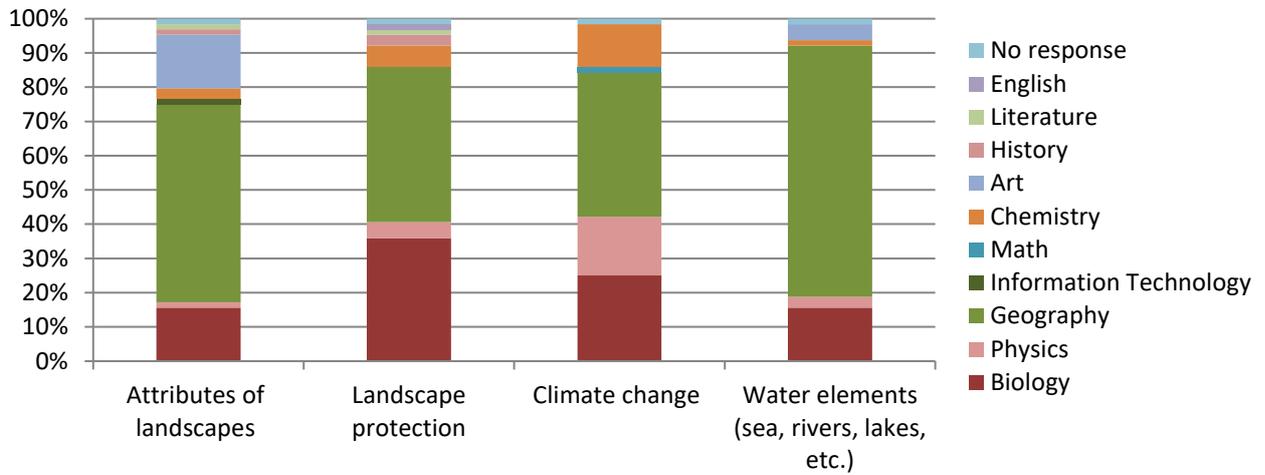
In the present section of the report we aim at exploring the students' attitudes and interest regarding the aspects of the learning methodology proposed by the project.

#### Connection of school subjects to core project topics

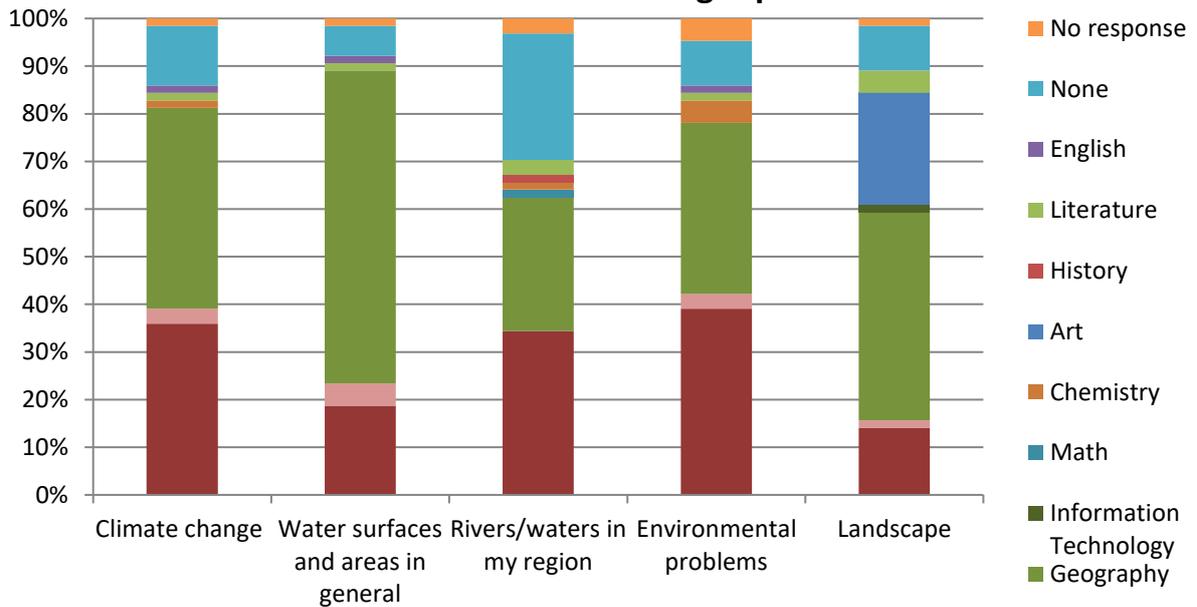
The participating students were asked to relate core topics of the project theme with school subjects, in order to explore their views regarding ways of integrating the content of the WaterSTEAM learning methodology to the existing school curriculum. It is important here to note that the students could select only one of the available school subjects to relate to the given topics. The topic regarding the attributes of landscapes was mostly related to Geography, while connections were also established with Art and Biology. The topic of landscape protection was equally related to Geography and Biology, while water elements were mostly related to Geography. It is worth to note that the topic of climate change was related to 4 school subjects (Geography, Biology, Physics and Chemistry), recognising the interdisciplinary character of the issue.

The students were also invited to select the school subjects in which they have already heard about certain topics related to the project theme. Again, the students could select only one of the available options of school subjects or "None". The students responded they have heard about the issues presented mainly in Geography and Biology. It is important to note that Art was selected by over 20% of the students in relation to landscape. Also, the greatest percentage of "None" (i.e. number of students that declared they have not heard about a topic in any school subject) was recorded for the topic of rivers/waters in their region (26%), revealing the need to better foster a connection of the school curriculum with the students' surroundings.

### Which of the school subjects would you relate to the topics below?

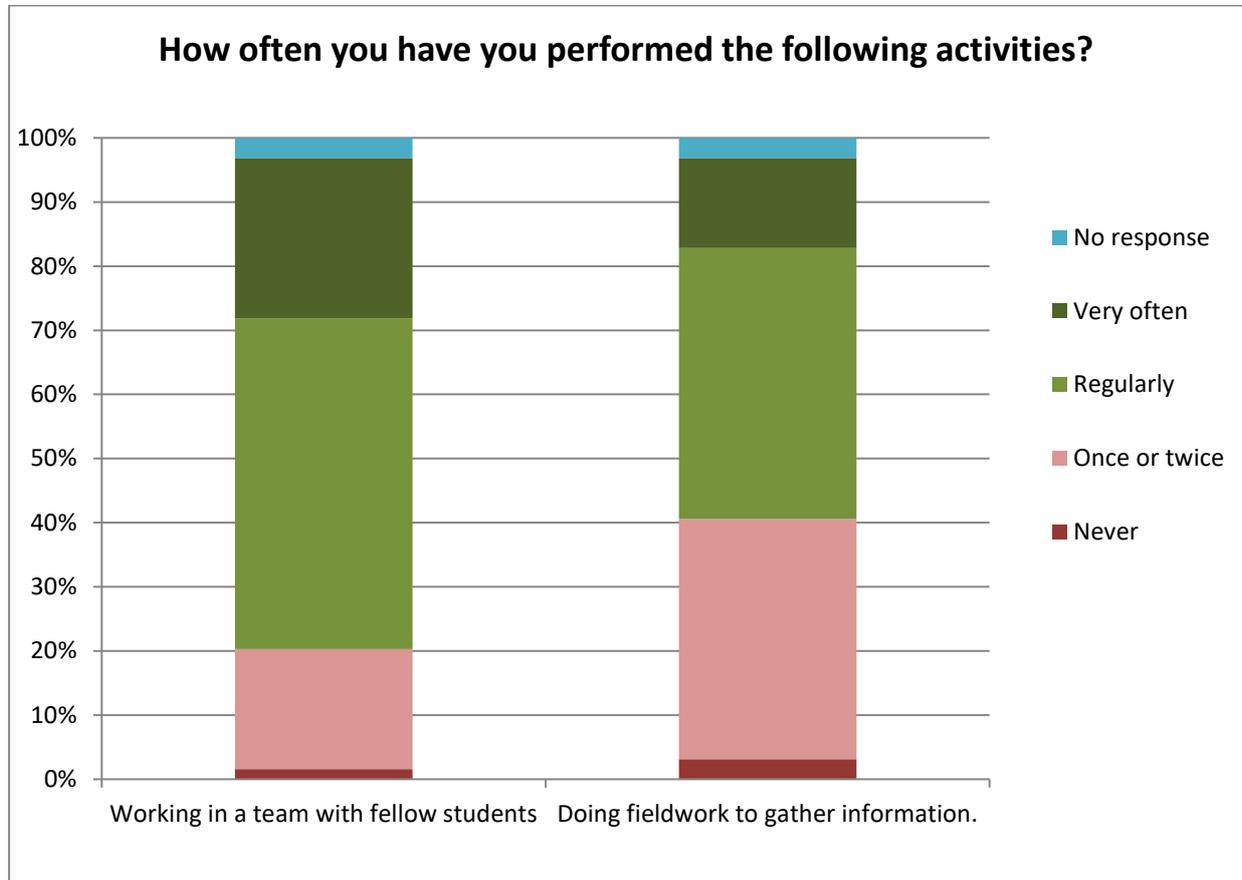


### In which of the school subjects below have you already heard about the following topics?



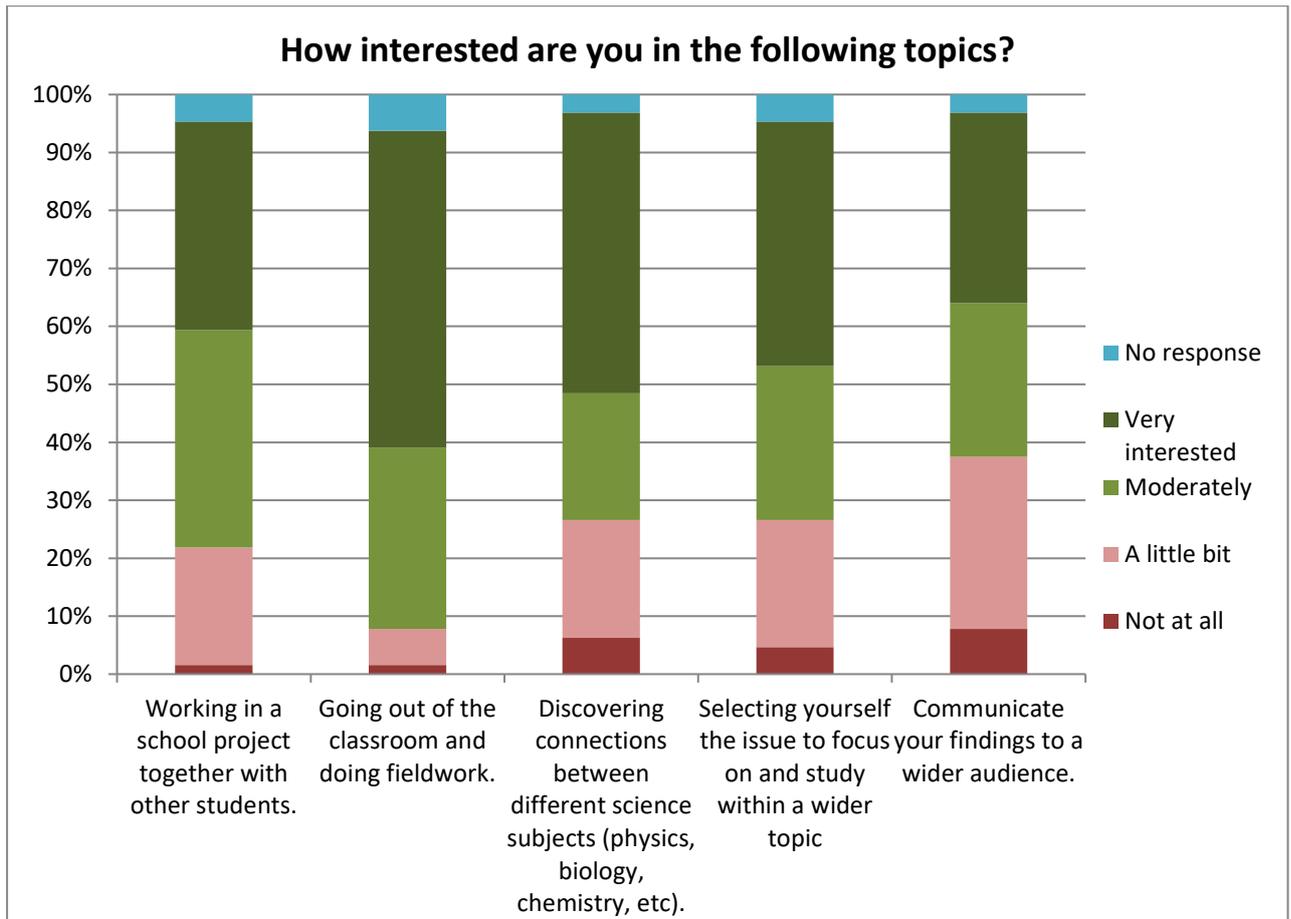
### Experience on teamwork and fieldwork

The majority of students responded that they have engaged in teamwork with fellow students and fieldwork to gather information regularly or very often. However, an important section of the students (40%) have stated they have engaged in fieldwork only once or twice.

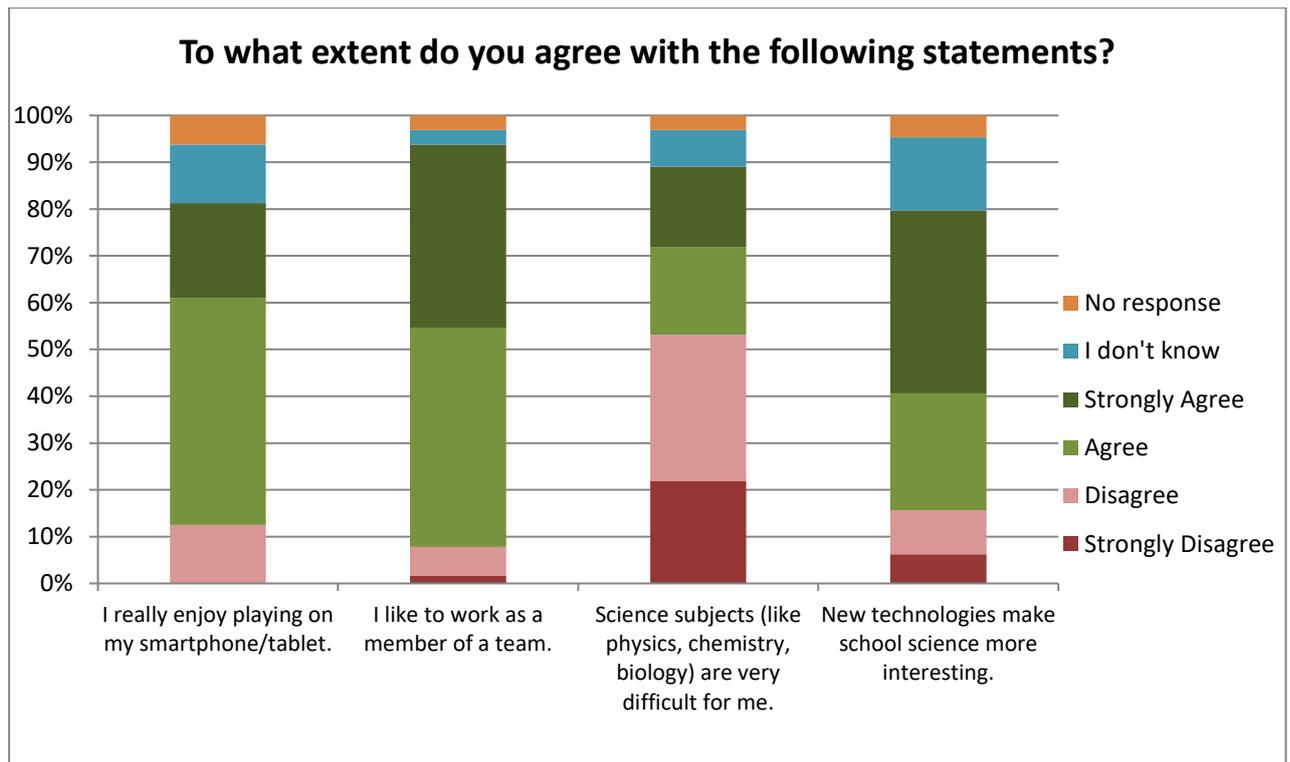


### Attitudes and interest towards key elements of the WaterSTEAM learning methodology

Overall, the majority of the participating students declare interested in key elements of the WaterSTEAM learning methodology (see graph below). The greatest level of interest is recorded in going out of the classroom and doing fieldwork, while other key elements like project-work, discovering interdisciplinary connections between science subjects, and inquiry-based student-centred learning also attract the interest of the students. The lower levels of interest are recorded in communicating the findings to a wider audience; this may link to the limited opportunities for contact with wider audiences (especially outside the school community) offered within the existing school curriculum.



The attitudes of students in relation to core elements of the proposed learning approaches, like teamwork, the use of mobile devices (smartphones/tablets) and the integration of new technologies in science learning are very positive. It is also important to note that an important section of the participating students (36%) find science subjects at school to be very difficult; the WaterSTEAM methodology aims at connecting the detached science content taught at school to the real global and local issues, thus linking it to the students' own experience and interests, making it relatable and understandable.



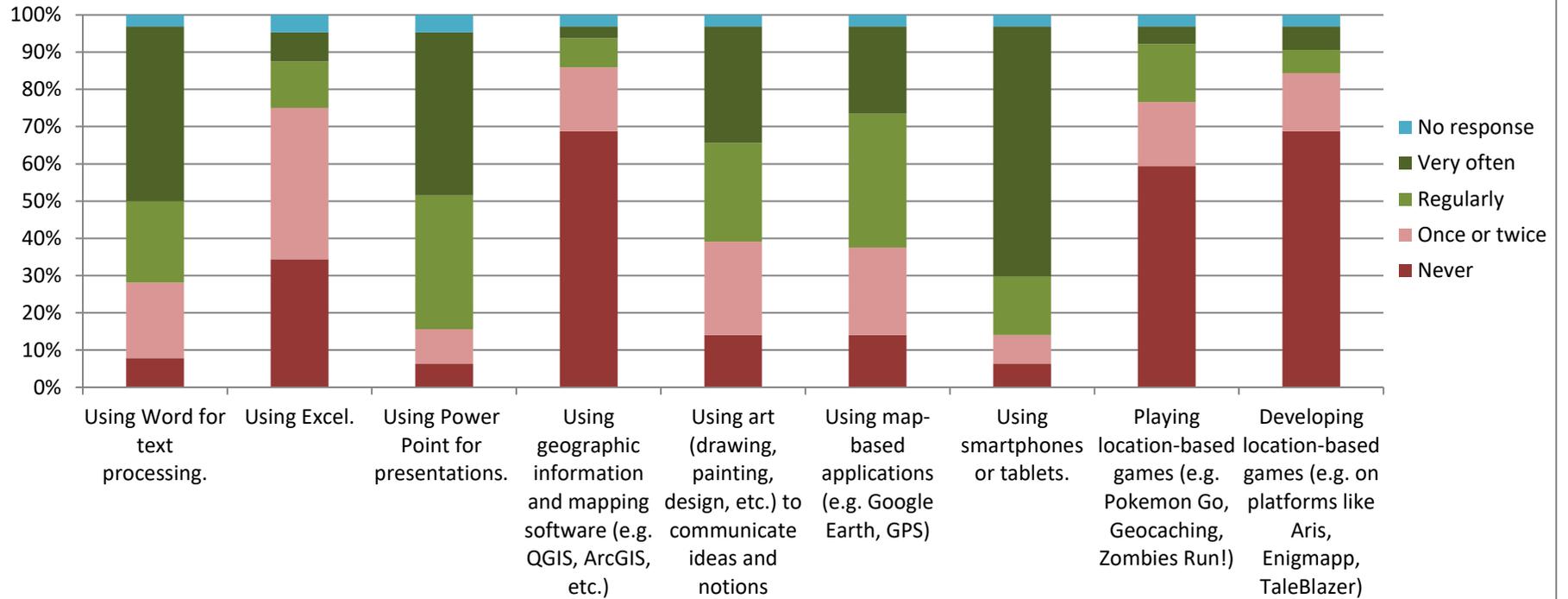
#### IV) Use of Augmented Reality tools

In the present section of the report we aim to explore the students' experience in using the technological tools foreseen in the WaterSTEAM methodology (mobile devices, office software, mapping software and Location Based Games) as well as their interest and attitudes towards the technological aspects of the learning methodology proposed by the project.

##### Experience in using the foreseen ICT tools

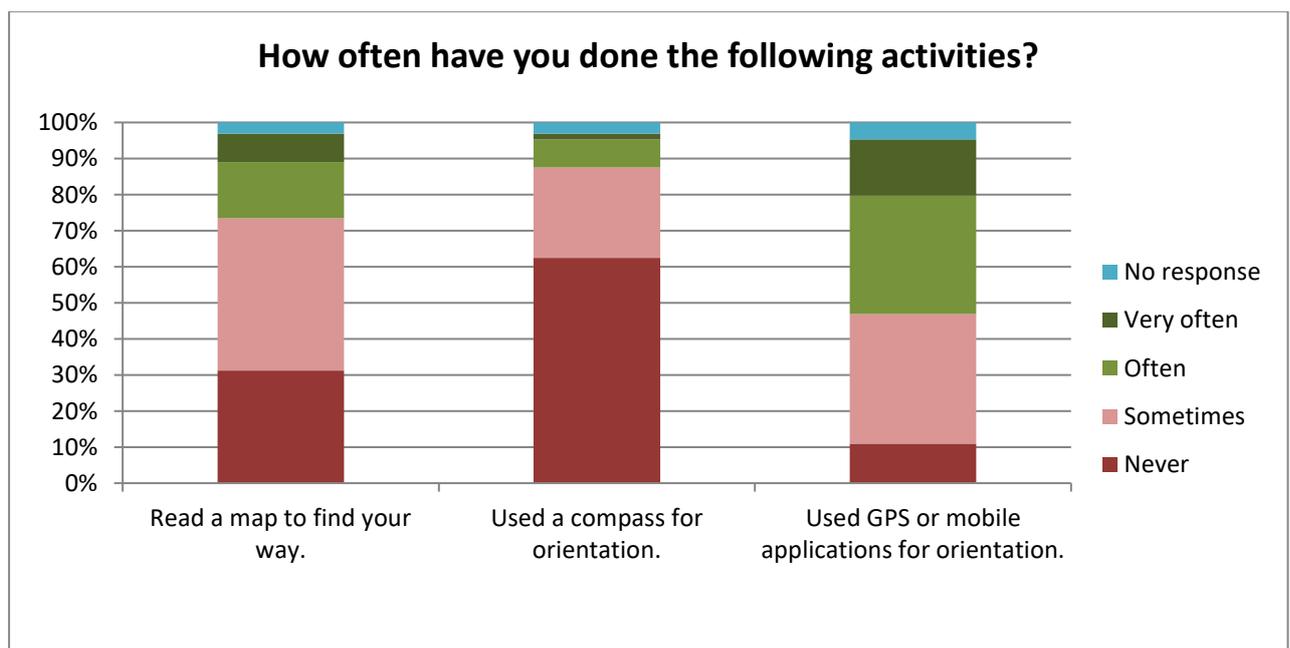
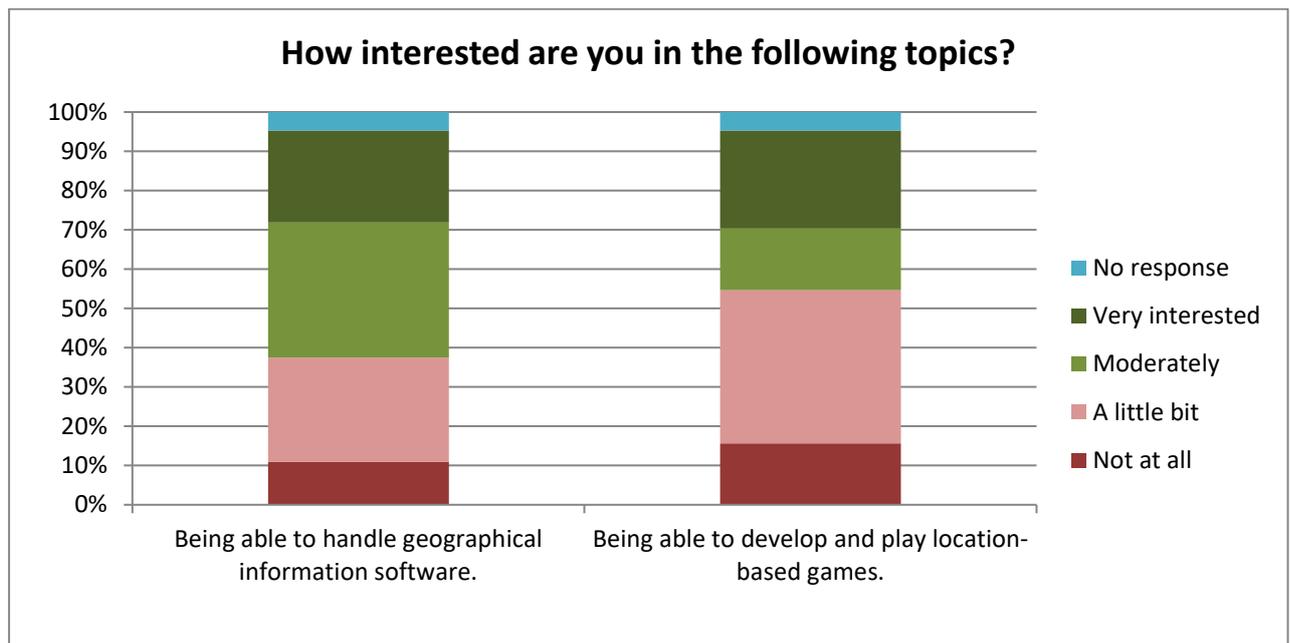
The participating students' experience in using text processing and presentations' software (e.g. Microsoft Word and Powerpoint) is extensive, although an important section (28%) declared they don't use text processing software regularly. On the opposite, only a limited number of students (20%) use spreadsheet software (e.g. Excel) regularly. Although the vast majority of students do not have experience in using specialised GIS software (only 11% state they regularly use it), the majority (59%) use map-based applications like Google Earth regularly. Moreover, students in their majority have regularly or very often used art (drawing, design, painting etc.) to communicate ideas and notions. Finally, although they appear to be fairly fluent in the use of smartphones and tablets, only a small percentage has experience in playing or developing Location Based Games (20% and 13% respectively).

## How often you have you performed the following activities?



Regarding the students' interest in acquiring skills related to the use of more advanced ICT tools, while the majority is fairly interested in being able to use GIS (Geographical Information System) software, the level of interest regarding the development of Location Based Games is lower; this finding should be seen in connection to the limited experience of most students with Location Based Games.

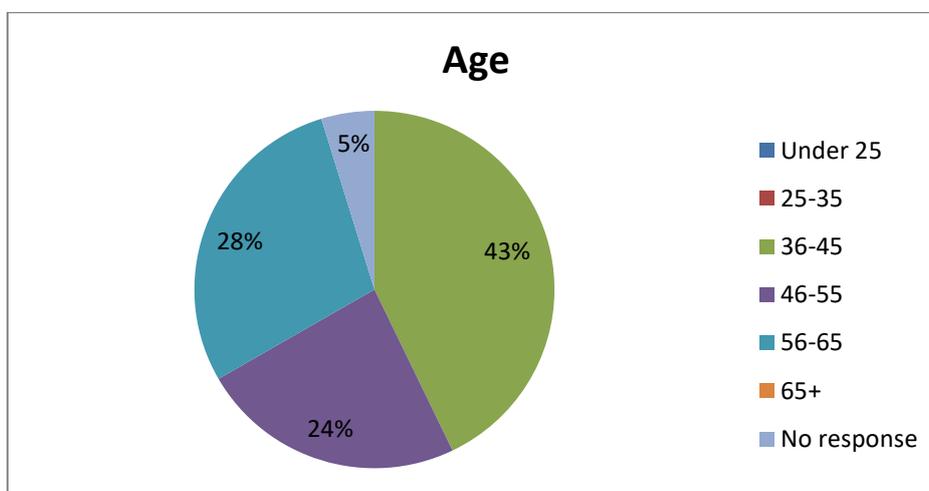
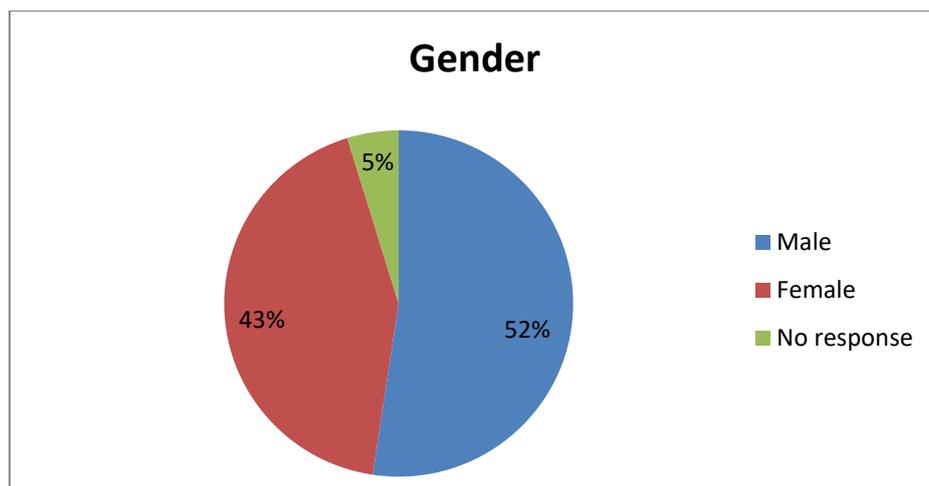
Finally, while students demonstrate a good level of experience in the use of GPS for orientation, their majority has never used a compass for orientation and only a small percentage often use a map to find their way (23%).

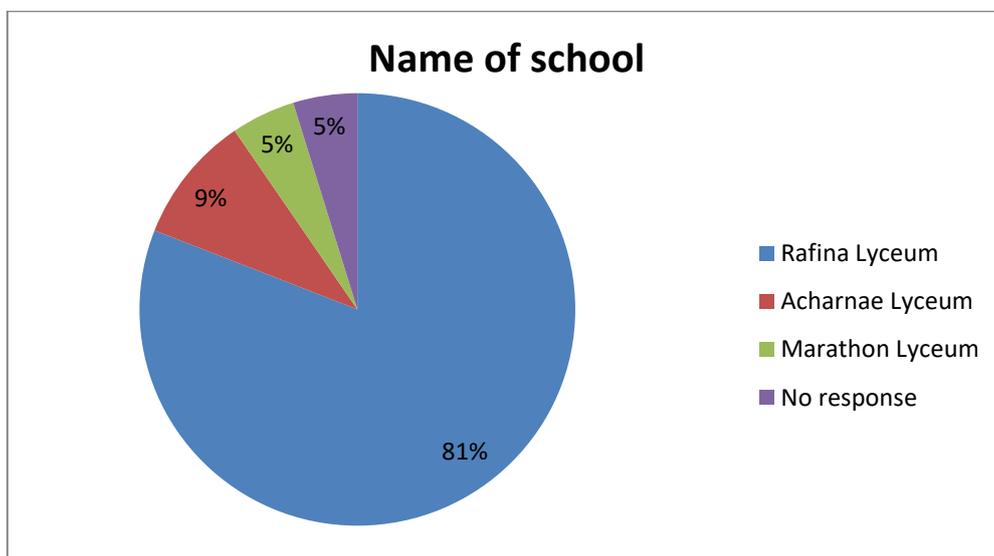
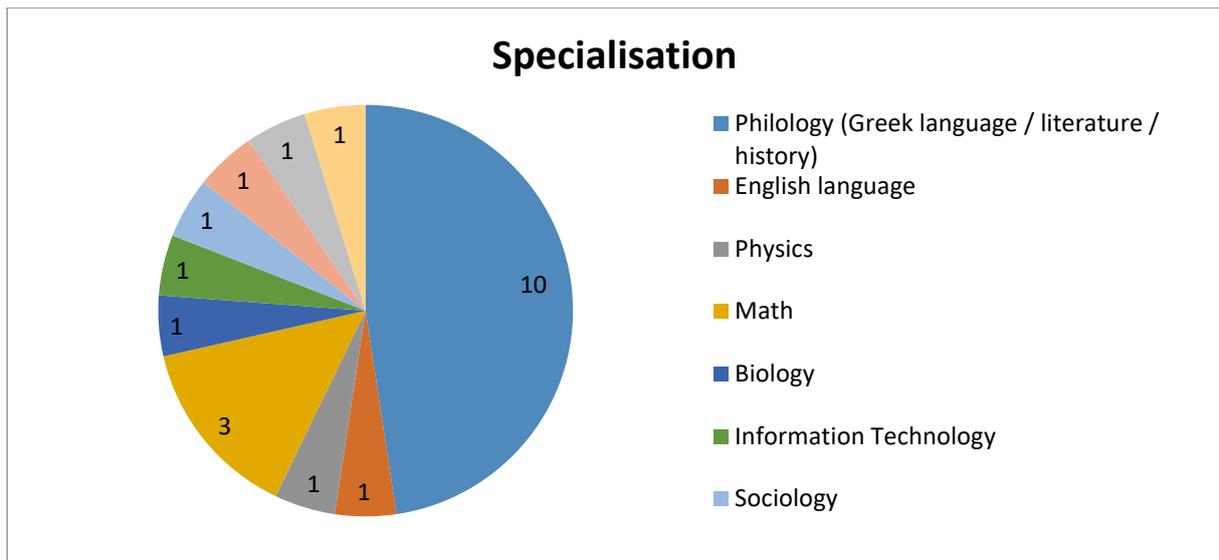


## Teachers' Survey

### I) Profile of participating teachers

In total, 21 teachers of secondary education participated in the survey, their vast majority (17 of them) teaching in Rafina Lyceum. They are evenly distributed between male and female, and most of them (43%) are between 36 and 45 years old (there were no younger participants) with older age groups being equally populated. A wide range of specialisations was recorded amongst the participating teachers with 9 different specialisations – Philology, English, Physics, Math, Biology, Information Technology, Sociology, Economics and Theology. Most of the participants (66%) have specialised in theoretical disciplines. Especially the Philology specialisation is very strongly represented amongst the sample, with almost half of the teachers being philologists; in Greek secondary education the philology specialisation is by far the dominant amongst the teachers specialisations with 25% of all teachers working in secondary education being philologists – philologists teach a good number of standard subjects in the curriculum (Greek language, Greek literature, Ancient Greek language, Ancient Greek literature, History, Philosophy) as well as optional subjects.





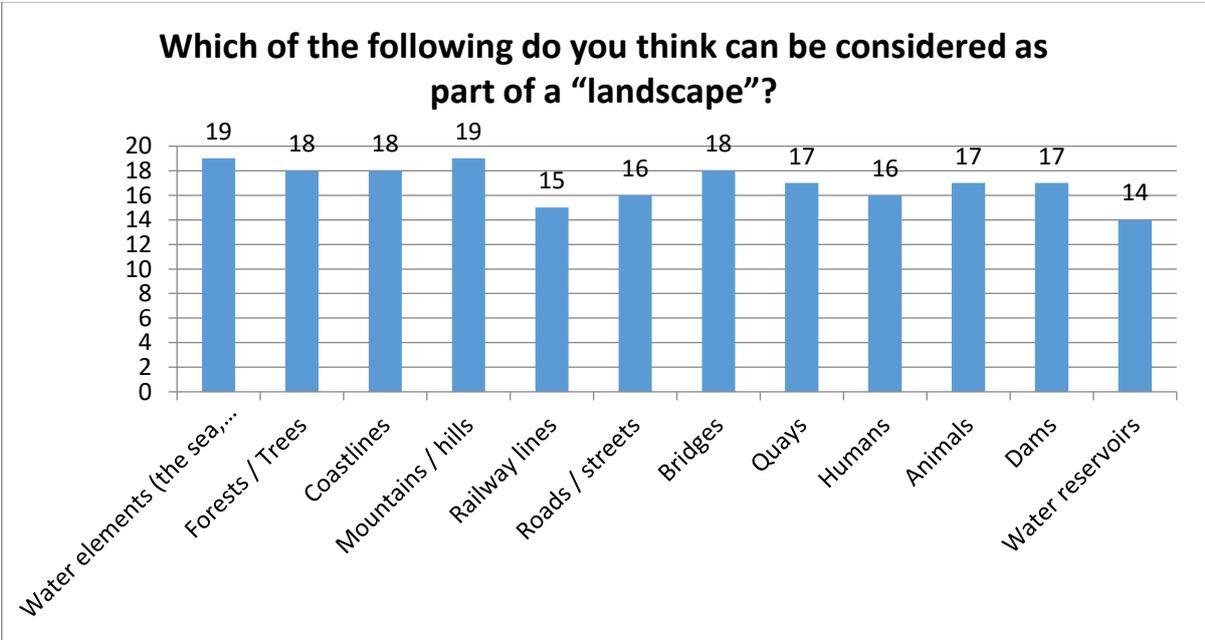
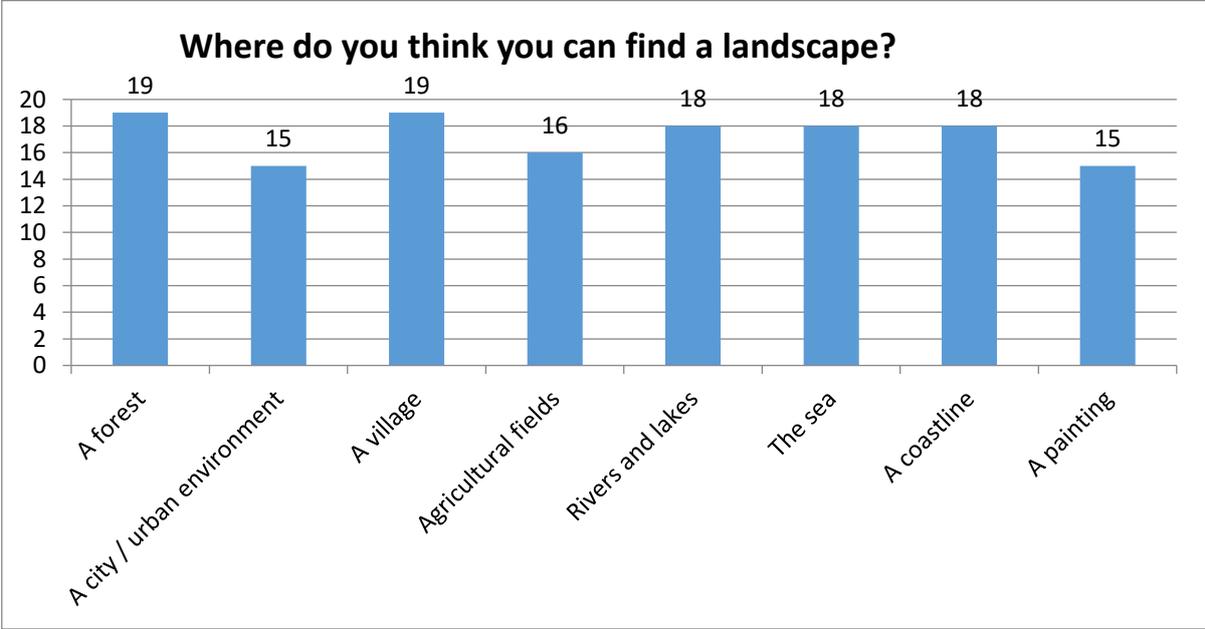
## II) Attitudes and interests towards the proposed theme of the project

In the present section of the report we aim at exploring the teachers' views regarding the concept of landscape, their current knowledge regarding landscape-related issues, their interest in teaching about the issues proposed by the project and their attitudes on the project theme.

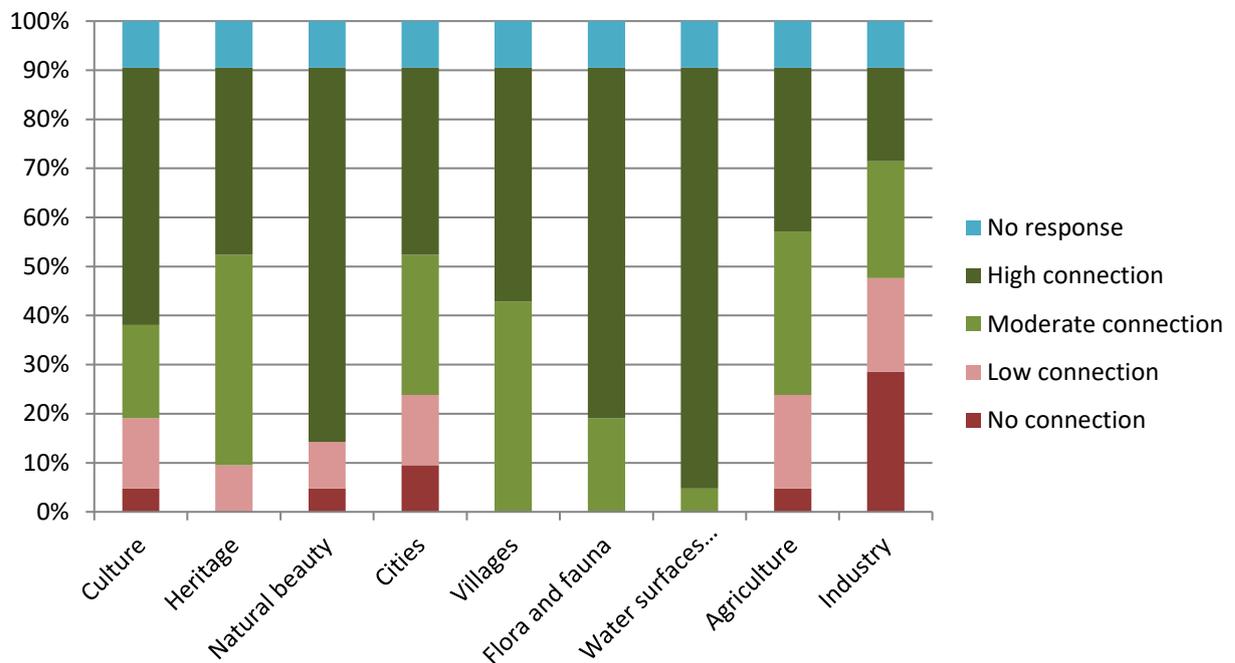
### The concept of landscape

The majority of the teachers display a good understanding of the concept of landscape according to the ELC, relating all proposed options of spaces and spatial elements to the concept of landscape. However a 25% of the teachers do not relate the urban environment, agricultural fields and manmade spatial elements (e.g. railway lines and water reservoirs) to the landscape concept – a notable exception is bridges, being recognised as part of a

landscape by 18 of the 21 teachers. Teachers strongly relate landscape to water surfaces, natural beauty, flora/fauna, villages, heritage and culture; the connection is weaker regarding cities and agriculture, while the weakest connection appears to be between landscape and industry – almost half of the teachers see no or low connection.



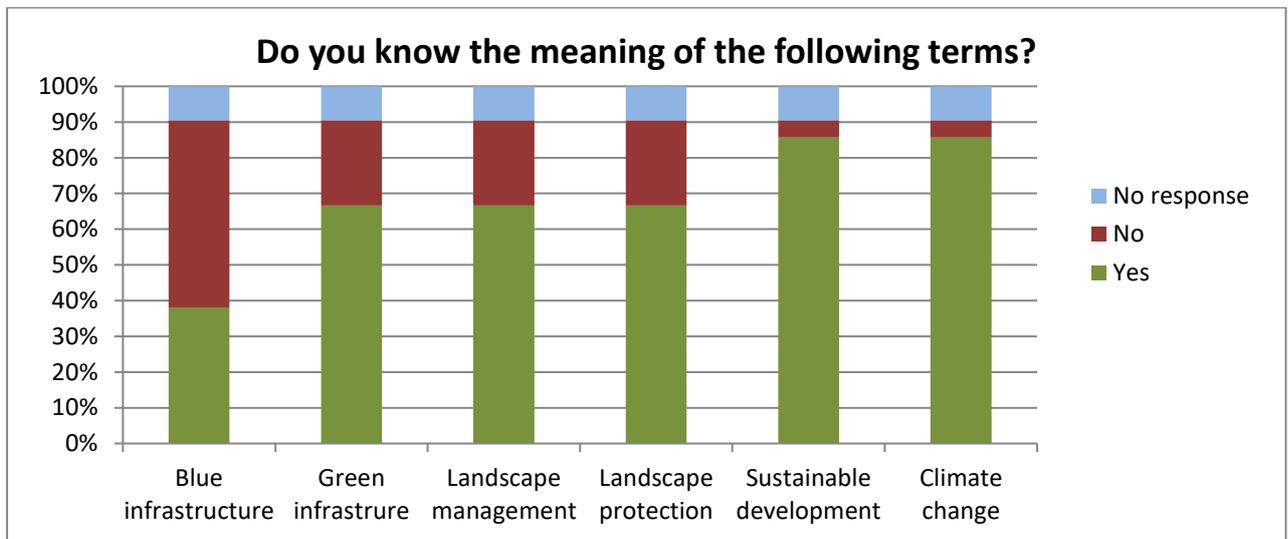
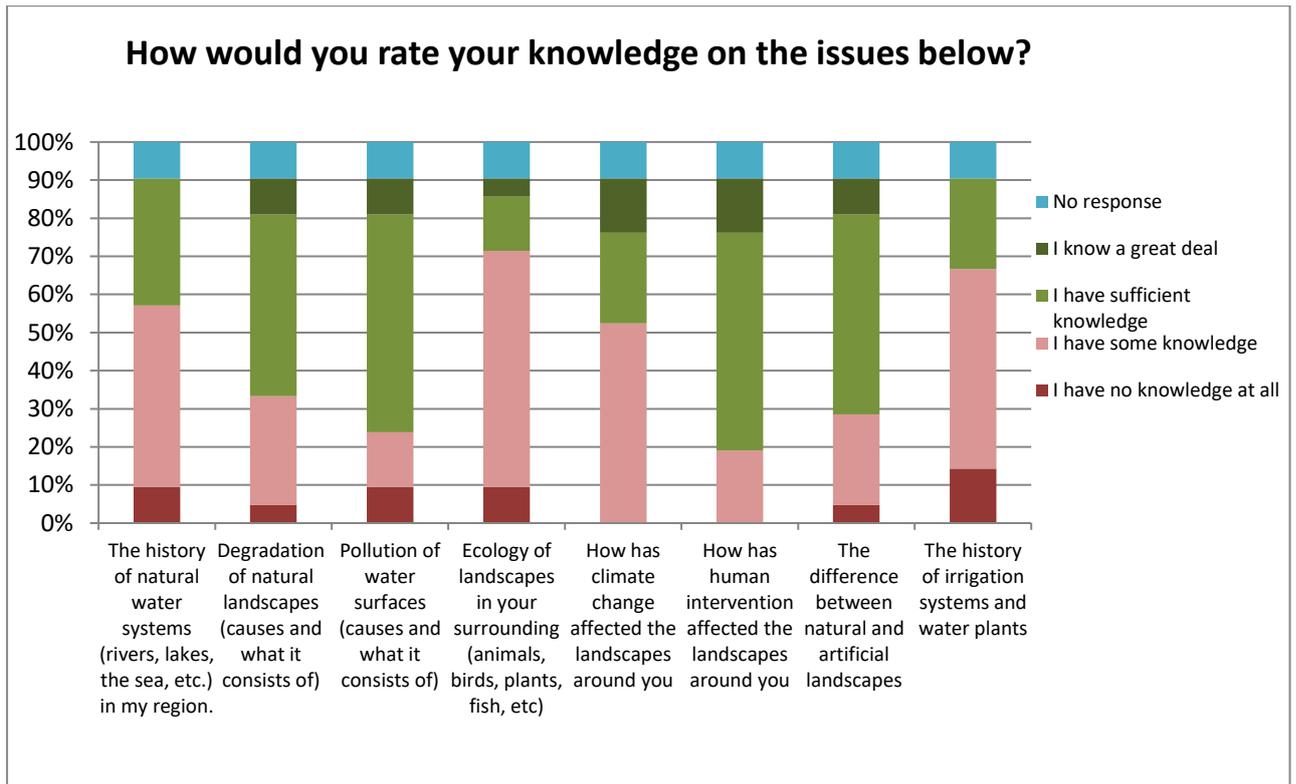
### Which of the following terms would you connect to the term “landscape”?



#### Knowledge on landscape-related issues

Regarding their knowledge on landscape-related issues, the majority of teachers rate their knowledge as sufficient in topics like the pollution of water surfaces, the impacts of human intervention on their local landscapes, the degradation of natural landscapes and the difference between the natural and artificial landscapes. Knowledge gaps are recorded by most of the teachers in issues regarding the history of natural water systems and irrigation systems, the ecology of local landscapes and the impact of climate change on the local landscapes. Most are familiar with the terms proposed in the survey; almost all of the teachers are familiar with the terms “sustainable development” and “climate change”, however less (65%) are familiar with terms like “landscape protection/management” and “green infrastructure”. Most of the teachers do not know the meaning of the term “blue infrastructure”.

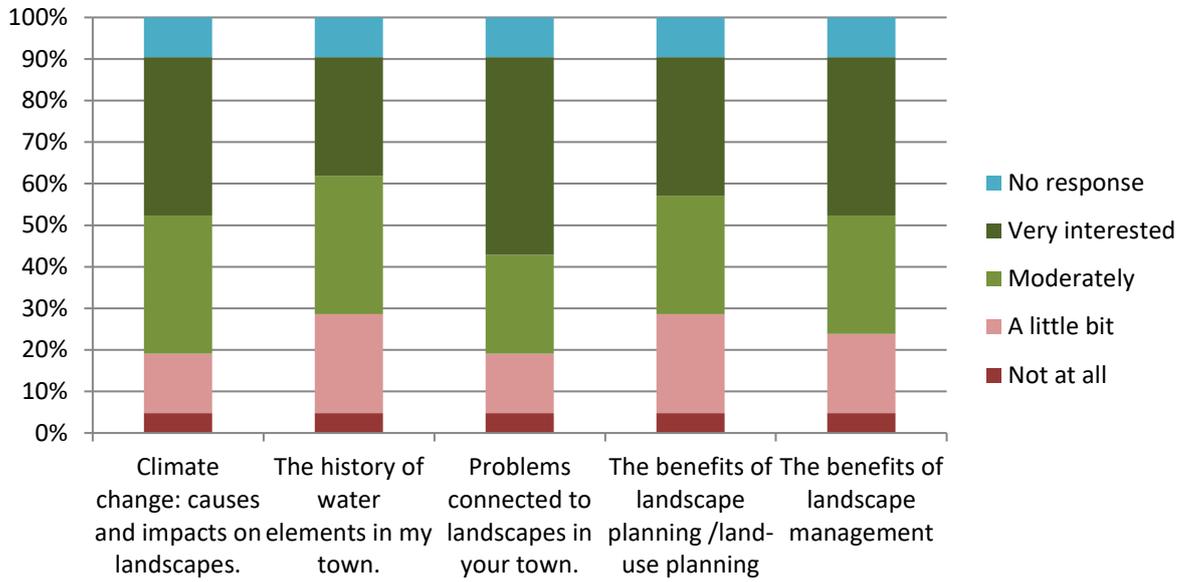
The limited knowledge recorded in the certain landscape-related issues and terminology mentioned above should be seen in connection to the theoretical specialisations of an important section of the participating teachers (e.g. Philology, Theology, English, Sociology), not directly relevant to some of the specific issues proposed in the survey.



#### Interest in teaching the proposed project topics

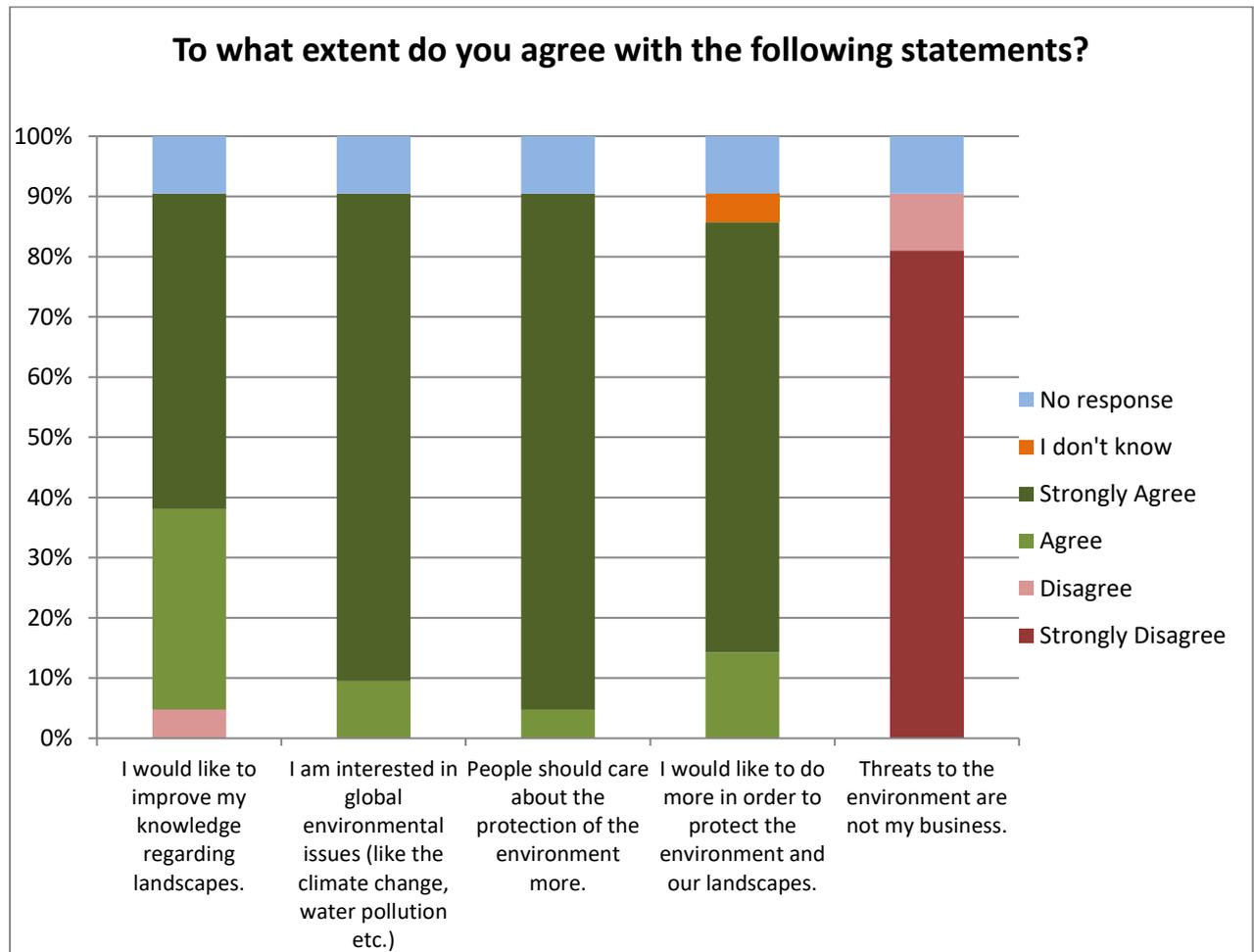
Although most of the teachers who participated in the survey are of theoretical specialisation (as opposed to science), the interest of the sample in teaching about the proposed project topics is remarkable (see graph below); the majority (60%-70%) declare moderately or very interested in teaching about the impacts of climate change on landscapes, the history of local water elements, landscape problems, and the benefits of landscape planning and management.

### How interested are you in teaching about the following?

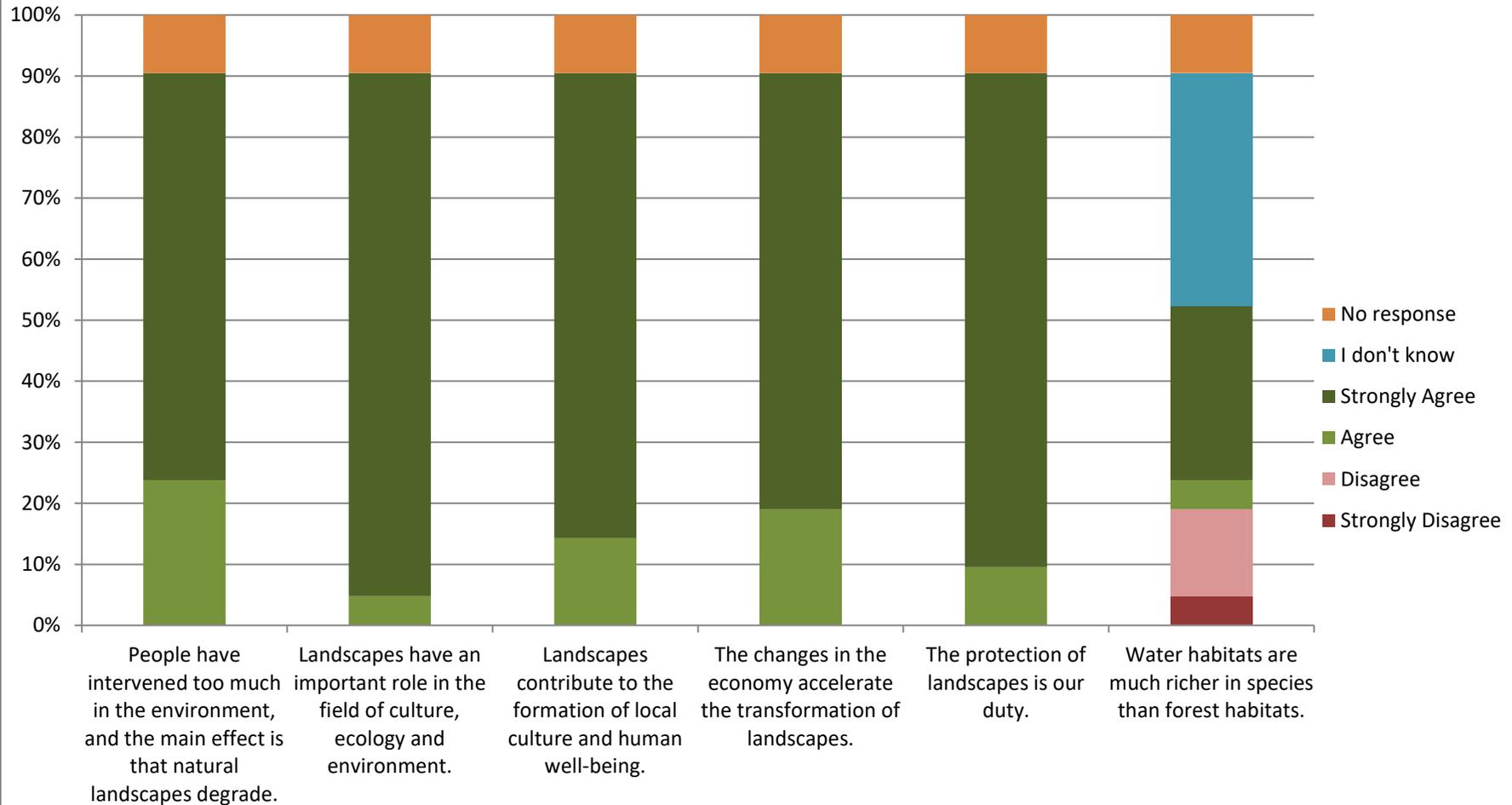


## Attitudes towards the project theme

All the participating teachers demonstrate very positive attitudes towards different aspects of the project theme. They state they are interested in global environmental issues and appear eager to improve their knowledge regarding landscapes, while they support awareness raising and action for the protection of the environment. In addition, they all recognise the important role of landscapes in the fields of culture, ecology and human wellbeing, as well as the need to act for the protection of landscapes.

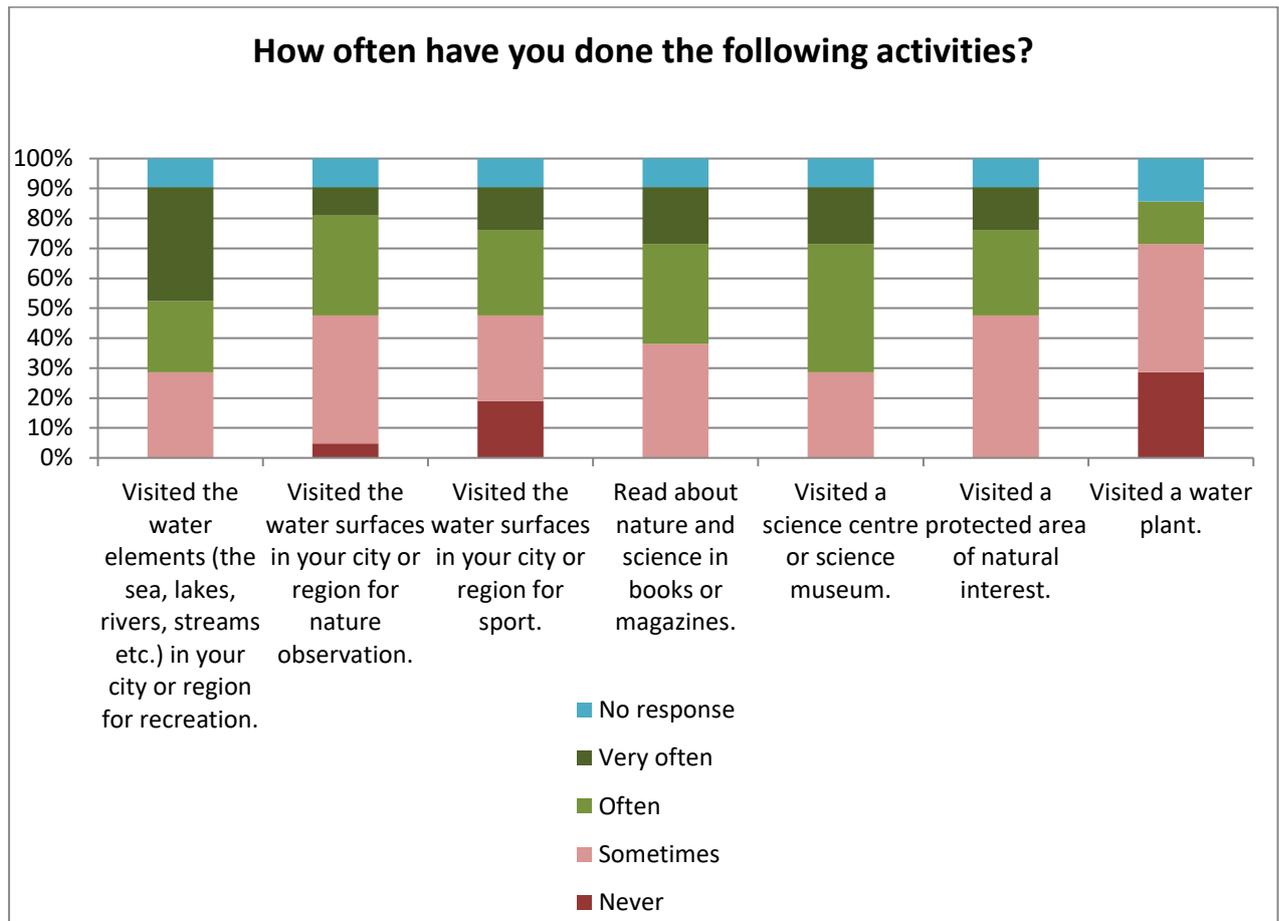


## To what extent do you agree with the following statements?



Personal connection with water elements and science

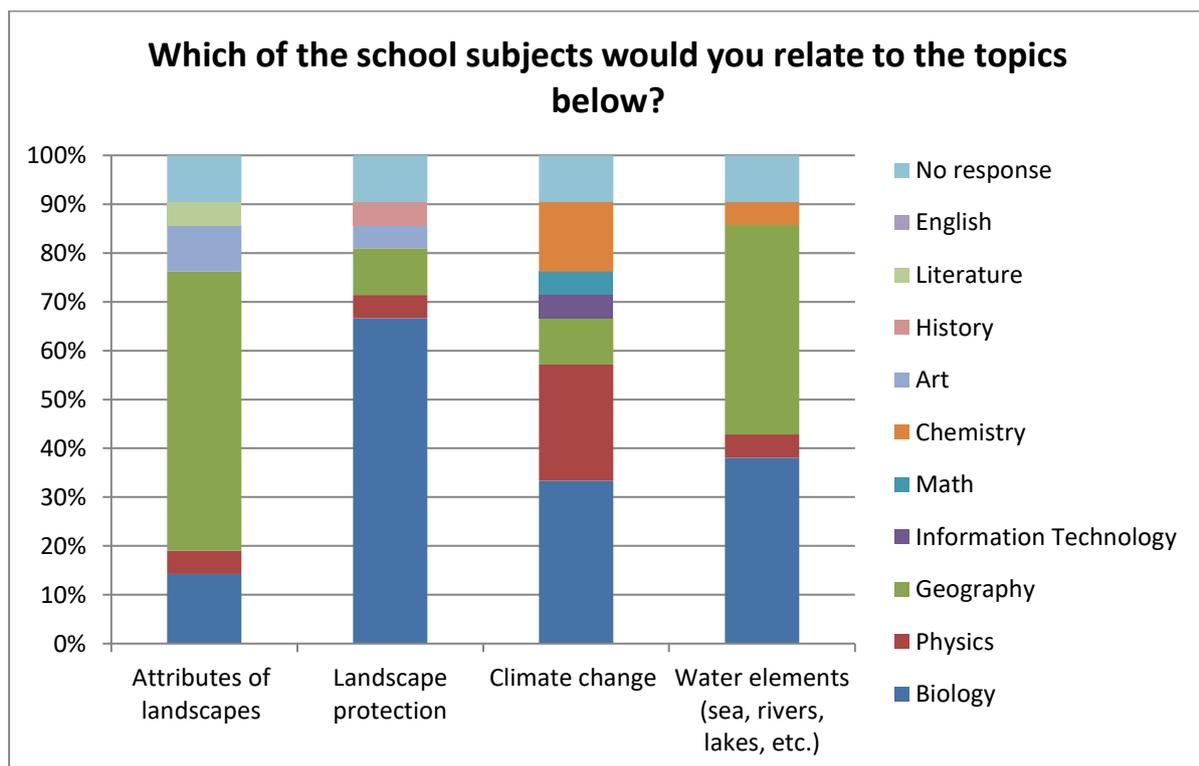
The findings related to the teachers’ personal connection with water elements, protected areas of natural interest and science reflects to an extent the profile of their specialisation; while the majority of teachers state they often visit water elements in their region for recreation, fewer often visit these areas for nature observation or sport, visit an area of natural interest or a water plant. However, most of the teachers state they often visit a science centre or museum, or read about nature and science in books or magazines.



### III) Attitudes towards the learning aspects of STEAM methodology

#### Connection of school subjects to project topics

The teachers were asked to relate only one school subject to the proposed project topics, i.e. the landscapes' attributes, landscape protection, climate change, and water elements. Overall, teachers appear to recognise the interdisciplinary character of the topics proposed. Most of the teachers relate the topic of landscapes' attributes to Geography, while fewer relate the topic to Biology, Art, Physics and Literature. The topic of landscape protection is related mainly to Biology, with few teachers relating it to Geography, Physics, Art and History. The topic of climate change is recognised as the most interdisciplinary, with teachers giving equal weight to Biology and Physics, and less weight to Chemistry, Geography, Information technology and Math. Finally, the topic of water elements (the sea, rivers, lakes) is equally related to Geography and Biology, with 2 teachers relating it to Physics and Chemistry.



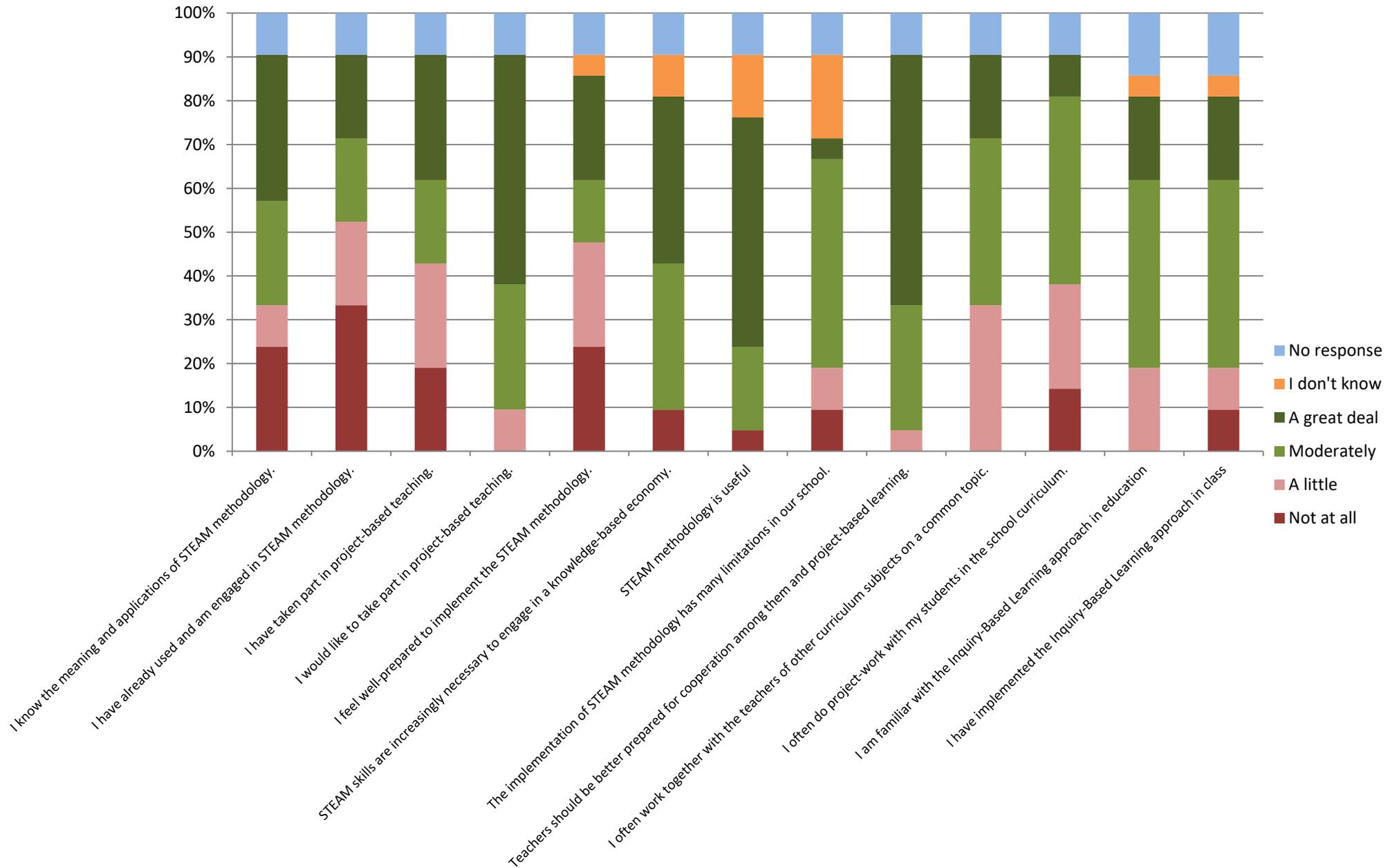
### Experience and views on aspects of the proposed learning methodology

The teachers were invited to rate their experience and views regarding core aspects of the proposed WaterSTEAM methodology, i.e. the STEAM approach and the Inquiry Based Learning (IBL) approach.

Although the vast majority of the teachers regard the STEAM methodology as useful for their students and recognise the increasing need for STEAM skills to engage in a knowledge-based economy, a smaller number of teachers (57%) state they know the meaning and applications of the STEAM methodology, and even fewer have already used it or are working with STEAM (32% stated they have never used it before and 20% stated they have used it a little); moreover, only 38% feels well-prepared to implement a STEAM methodology in school and most of the teachers believe that the implementation of the STEAM methodology has many limitations in their school.

The great majority of the participating teachers (80%) declare interested in taking part in project-based teaching, however 42% have no or limited experience in project-based teaching. Most of the teachers state they often work together with other teachers of curriculum subjects on a common topic and engage in project-work with their students in the school curriculum, however their great majority strongly believes that teachers should be better prepared for collaboration among them and project-based learning activities. Finally, 62% of the teachers stated they have a good understanding of the Inquiry-Based Learning approach in education and have implemented IBL in class.

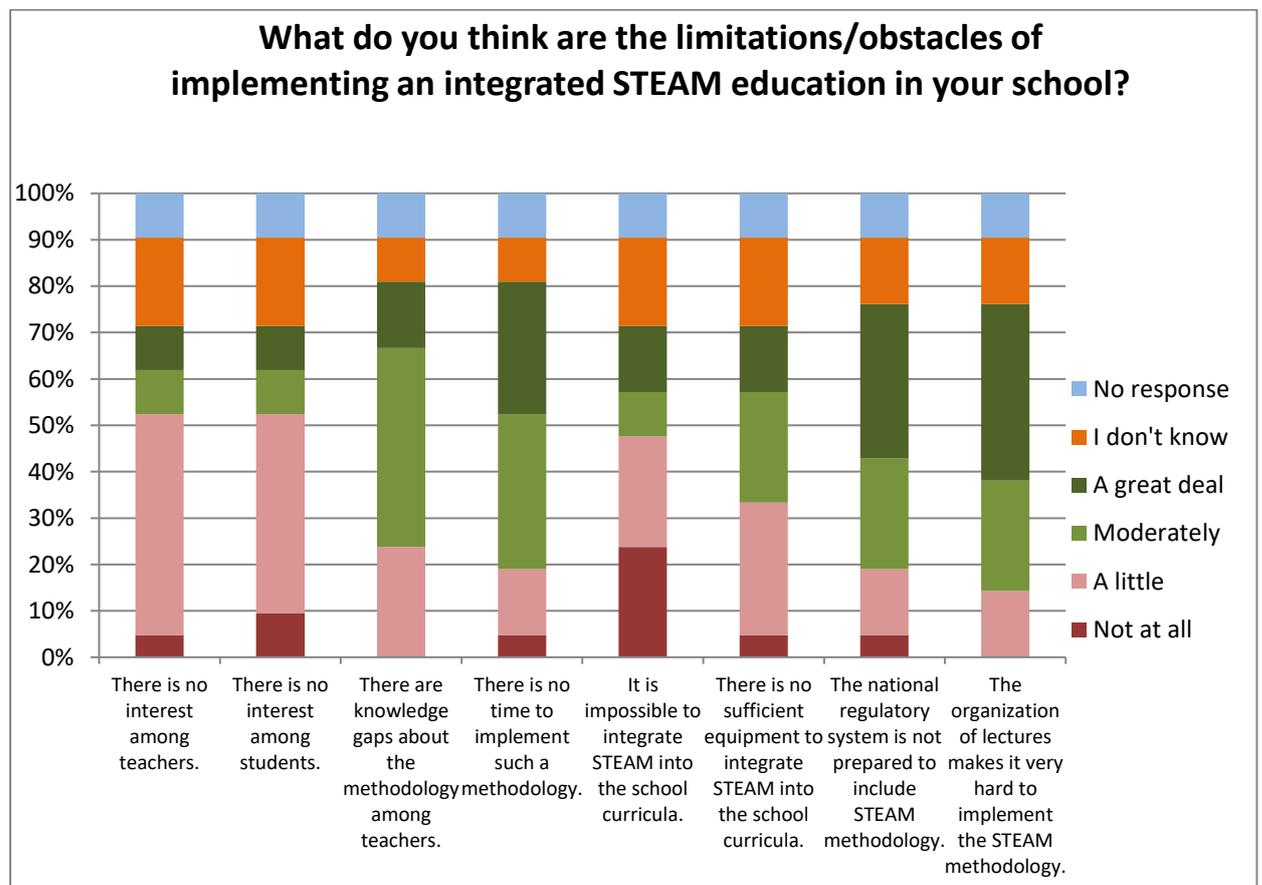
## To what extent the following statements express your opinion or knowledge or practice



## Obstacles for the implementation of an integrated STEAM education

The participating teachers were invited to rate the importance of different limitations or obstacles in implementing an integrated STEAM education in their school. While most of the teachers clearly consider a lack of interest among students and teachers not to be an issue for the implementation, they feel the main issues limiting the successful implementation of STEAM learning in their school are related to the organisation of the curriculum and the national education system framework, as well as the lack of knowledge among teachers for implementing the methodology. In specific, most teachers estimate there is no sufficient time to implement the methodology in school; the national framework in secondary education is not prepared to include STEAM methodology, and the way the teaching is organised makes it very hard to implement a STEAM methodology in school. However, most teachers believe it is possible to integrate a STEAM methodology in the school curriculum.

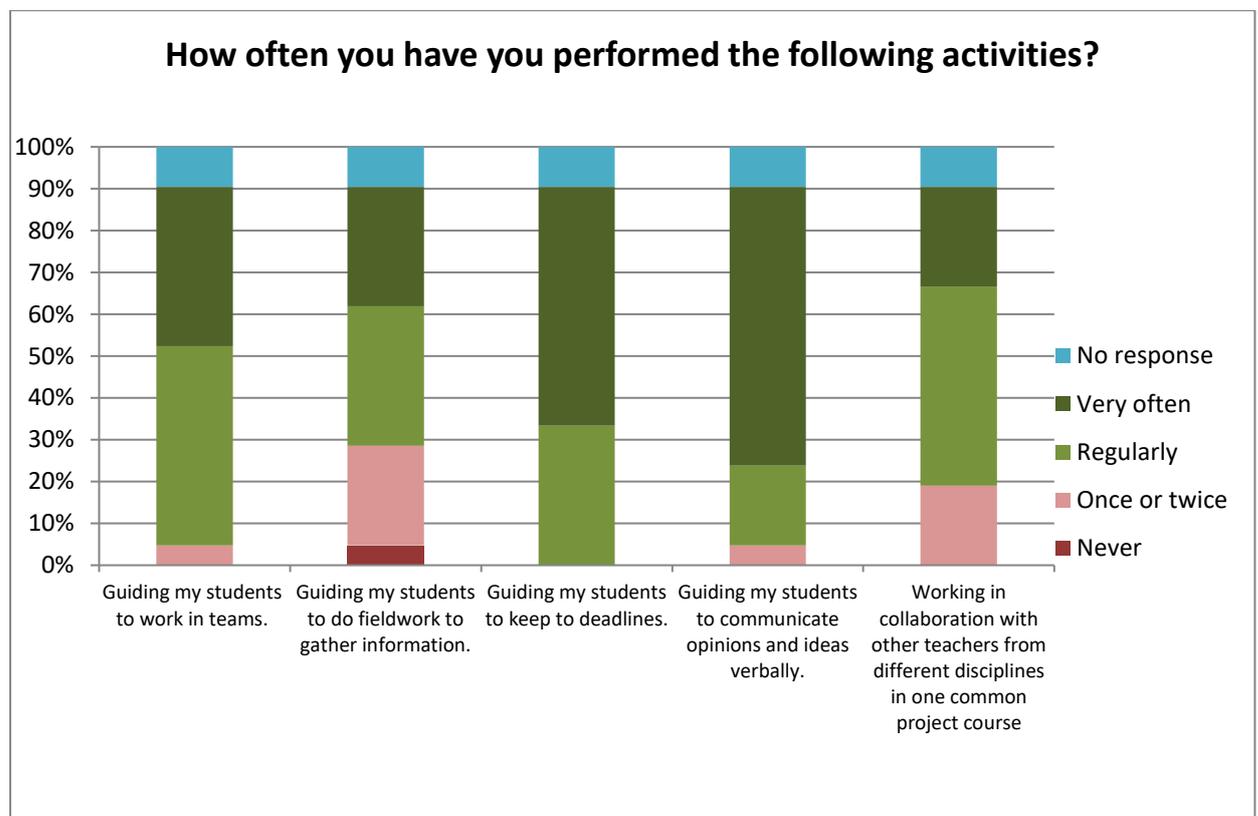
It should be noted that 20% of the teachers responded “I don’t know” to most of the obstacles/limitations proposed; this percentage identifies with the number of teachers who responded they do not know at all the meaning of STEAM in the previous section (see graph above).



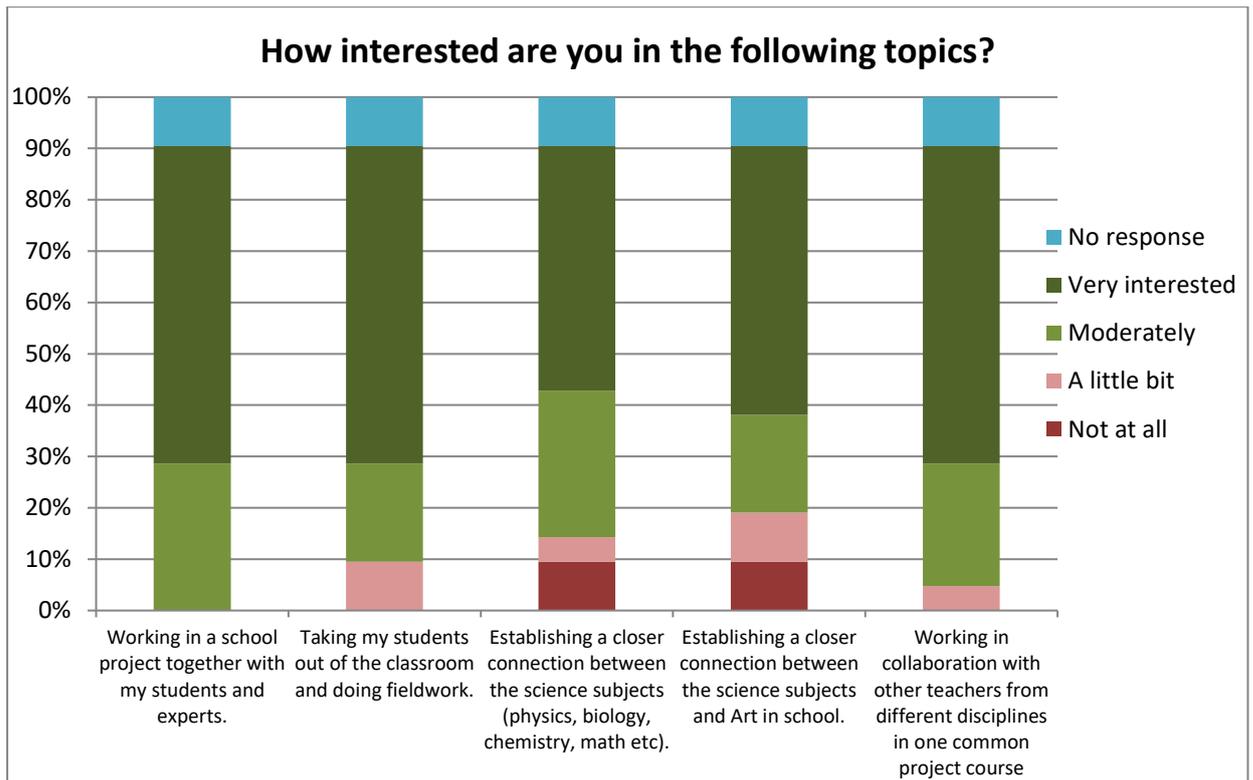
### Collaboration: experience, attitudes and interest

The teachers were invited to rate their experience in specific aspects of the proposed learning methodology related to teamwork, fieldwork, and collaboration with other teachers from different disciplines.

The great majority of teachers stated they regularly or very often guide their students to work in teams, keep to deadlines and communicate their ideas and opinions verbally. A 70% of the teachers stated they regularly work in collaboration with other teachers from different disciplines in a common project course, while a 60% regularly guide their students to do fieldwork in order to gather information.



In total, teachers show great interest in key aspects of the project methodology. The participating teachers demonstrate great interest in working together with their students and experts in a school project, as well as collaborating with fellow teachers from different disciplines. The majority also shows great interest in taking their students out of the classroom to do fieldwork, and establishing closer connections between science subjects at school (i.e. Math, Physics, Chemistry, Biology, Geography etc.) as well as between science subjects and Art in school.

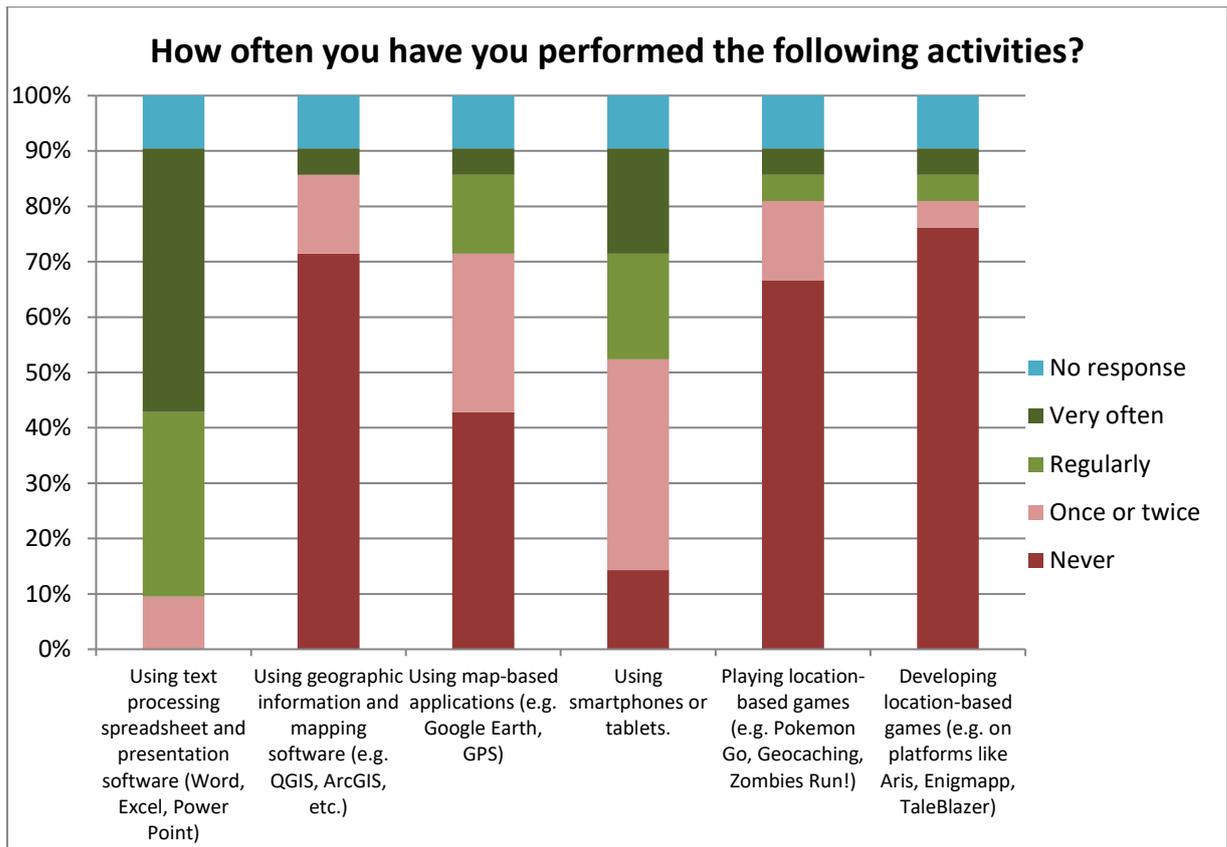


#### IV) Use of Augmented Reality tools

A distinctive objective of the survey has been to define the teachers' experience, interest and attitudes towards the proposed use of ICT tools (including AR tools) within the WaterSTEAM learning methodology.

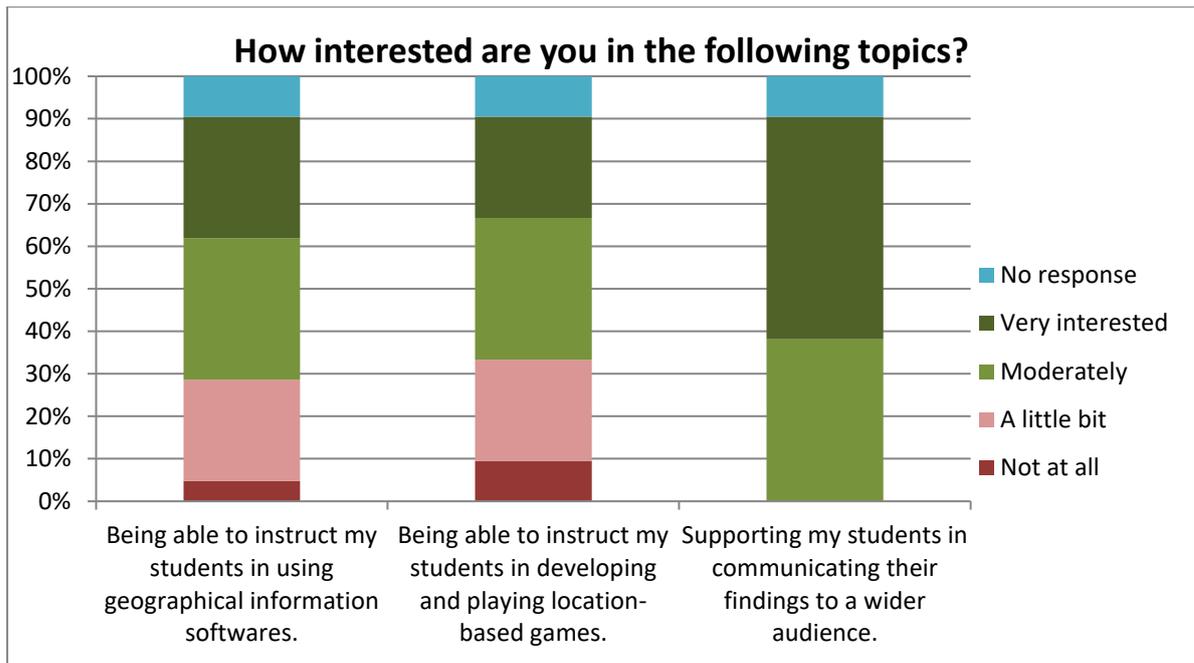
The great majority of teachers are fairly experienced in the use of office software (i.e. text processing, spreadsheet and presentation applications). Most of the teachers have never used specialised GIS and mapping software (e.g. ArcGIS) as expected, however one of the teachers at the Rafian Lyceum stated he uses such software very often – this expertise can prove very helpful during the implementation of the WaterSTEAM methodology. However, although map-based applications like Google Earth or GPS mobile applications are far more common and widespread amongst the general public, the participating teachers demonstrate low levels of experience (42% stated they have never used them and 28% that they have used them only once or twice). The same applies regarding the use of mobile devices (i.e. smartphones and tablets), where less than 40% of the teachers stated they use them regularly.

Finally, regarding the teachers' experience in playing and developing Location Based Games, 66% of the teachers stated they have never played LBGs, while 76% stated they have never developed a Location Based Game. The experience of a few teachers in playing (5 teachers) and developing (3 teachers) Location Based Games is valuable in order to provide guidance and further develop the skills of students in this topic.

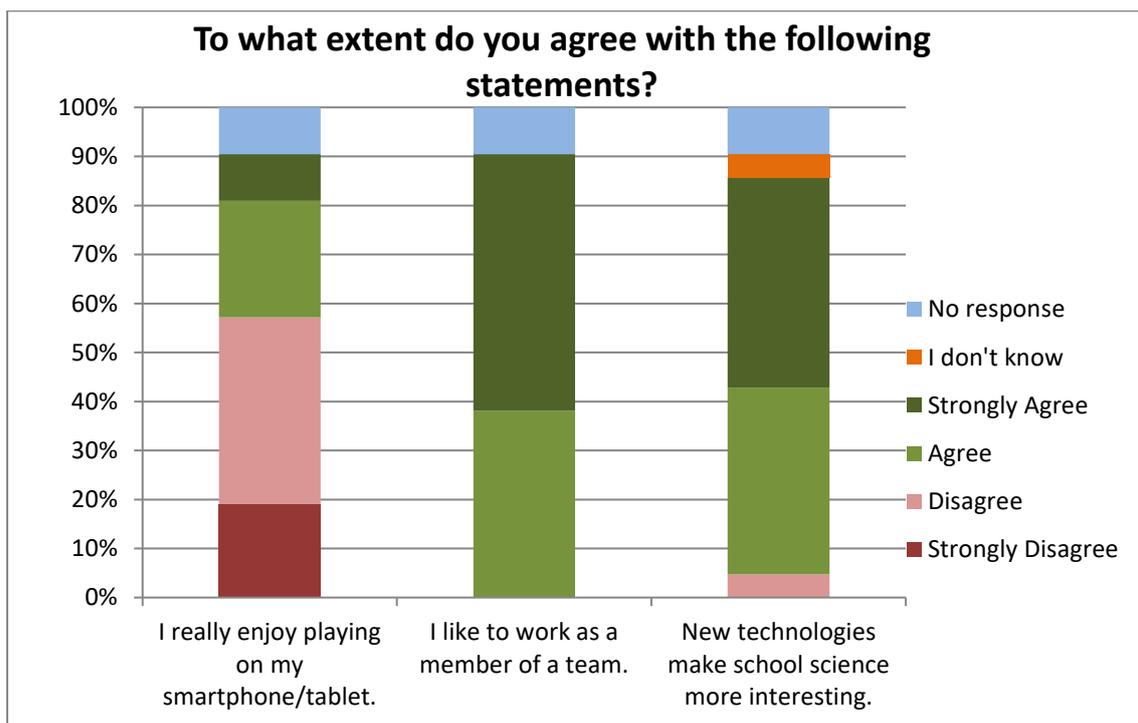


The majority of the participating teachers declare moderately or very interested in acquiring new skills that would allow them to instruct their students in using GIS (Geographical Information Systems) software, and in developing and playing Location Based Games (see graph below). Taking into account that the majority of the participants do not have an Information technology specialisation and in fact have a theoretical background, in connection to the results of previous sections of the survey revealing a very limited knowledge and experience in these technologies, this level of interest is indicative of the positive attitude of teachers in taking up new skills and integrating ICT tools into their educational practice.

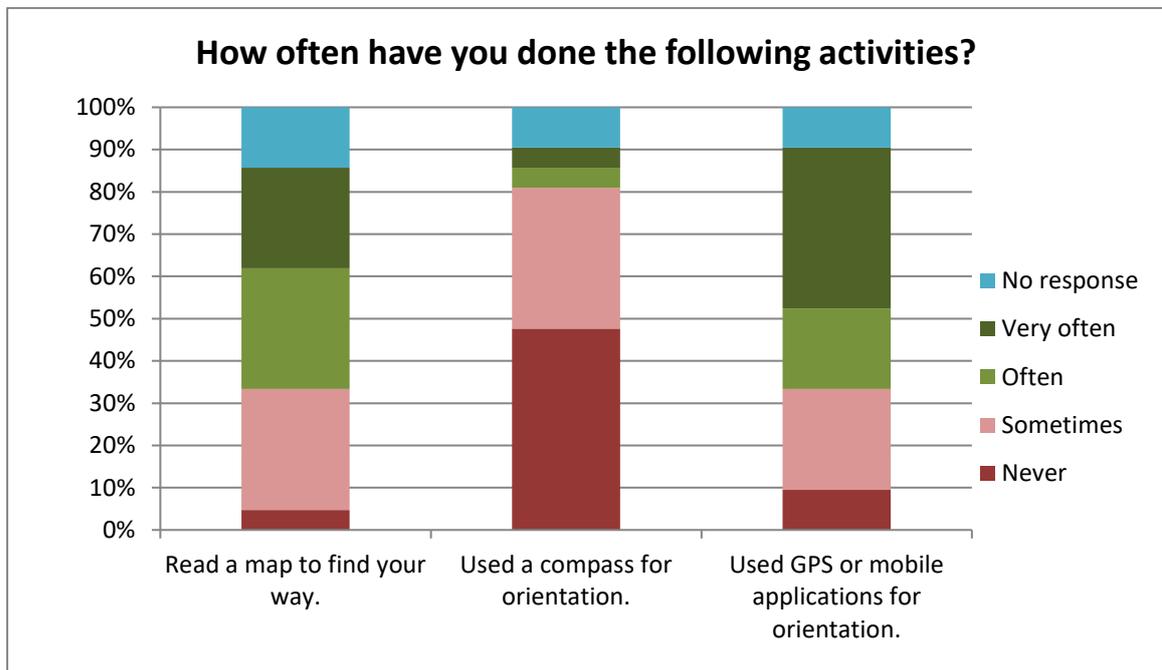
It is also worth to note that all teachers have declared a strong interest in supporting their students to communicate their findings to a wider audience.



The positive attitude of the participating teachers regarding the role of new technologies in making school science more interesting is evident (see following graph). A very positive attitude is also recorded regarding working as a member of a team. However, a rather negative attitude is recorded for most of the participating teachers regarding playing on a smartphone/tablet; in connection to the results regarding the poor experience in using these mobile devices, this finding reveals an important issue regarding the attitude and skills of teachers in using mobile devices.



Finally, regarding the teachers' personal connection to maps and orientation, most of the teachers often use a map and GPS/mobile applications for orientation, however the majority has never used a compass.



## Summary of findings for schools

The main findings of the surveys targeting students and teachers of secondary education in Greece are summarised below, drawing conclusions through a comparative analysis of the findings in an effort to guide the development of the WaterSTEAM methodology.

### Concept of landscape

Overall, the participating students seem to carry a common misconception of mainly relating the concept of “landscape” as an asset to the notion of the natural, the unspoiled, the authentic, the scenic. They also relate the concept of landscape to the beautiful, the aesthetically pleasing. On the other hand, although the teachers in general demonstrate a better understanding of the concept of landscape, closer to the definition of the ELC, a 25% of the participants do not relate landscape to environments where the human intervention has been more intensive (e.g. the urban environment, industry) and do not consider man-made elements as part of a landscape.

The European Landscape Convention (2000), accompanied by the Recommendation CM/Rec(2008) adopted by the Committee of Ministers of the Council of Europe on 6 February 2008, is based on a more holistic definition of the landscape, stating that *“The convention applies to the entire territory and covers natural, rural, urban and peri-urban areas. It includes land, inland water and marine areas. It concerns landscapes that may be considered outstanding as well as everyday and degraded landscapes”*.

The Recommendation further clarifies the definition of the landscape concept thus:

*The concept of landscape in the convention differs from the one that may be found in certain documents, which sees in landscape an “asset” (heritage concept of landscape) and assesses it (as “cultural”, “natural” etc. landscape) by considering it as a part of physical space. This **new concept** expresses, on the contrary, the desire to confront, head-on and in a comprehensive way, **the theme of the quality of the surroundings where people live**; this is recognised as a precondition for **individual and social well-being** (understood in the physical, physiological, psychological and intellectual sense) and for sustainable development, as well as a resource conducive to economic activity.*

The findings above call for the need to introduce the participating students and teachers to the wider concept of landscape introduced by the European Landscape Convention (ratified by all EU member states), encompassing urban, rural and natural landscapes, as well as outstanding, everyday and degraded landscapes, and linking it to the individual and social well-being of people and sustainable development.

### Current knowledge on project topics

Both the students and teachers who participated in the survey stated they have sufficient knowledge on issues like the human intervention on landscapes and the pollution of water surfaces, however they stated they know less about the historical aspects of water elements in their region. Moreover, the students overall claim to possess more knowledge on the issue of the impact of climate change on the landscapes than teachers – it is evident that the students' interest focuses on the theme of climate change. It should also be taken into account that the majority of the teachers who participated in the survey have a theoretical specialisation not directly linked to the issues proposed in the survey.

With regard to the terminology, the terms blue infrastructure and green infrastructure are not widely used in Greece (apart from experts in the fields of urban planning and landscape architecture) and therefore the lack of knowledge of both students and teachers is expected. On the contrary, the term “sustainable development” has been widely used for decades; yet only 64% of the students is familiar with the term.

The findings above conclude to the need for including in the WaterSTEAM methodology content the study of the history of local landscapes and water elements, including irrigation systems and water management. It is also necessary to include a definition of basic terms to be used.

### Interest in the project topics and positive attitudes

It is evident that there is great interest among students and teachers to work on the project topics. Students' interest focuses mainly in learning about the impact of climate change to landscapes, as well as problems of landscapes in their region; teachers, on the other hand, demonstrate a remarkable interest in teaching about all proposed project topics although most of them do not have a science specialisation. The lower levels of interest of students for topics like landscape management and landscape planning may relate to the students' lack of understanding of the terms.

In addition to the high levels of interest, the present survey recorded very positive attitudes of students and teachers on the issues proposed by WaterSTEAM; both students and teachers recognise to a great extent the need for awareness raising and action regarding the landscape protection and management, and show great interest in improving their knowledge about landscapes and global environmental issues like climate change and water pollution. Furthermore, students and teachers recognise the importance of landscapes for our culture, the environment and human wellbeing.

The WaterSTEAM methodology should build on the positive attitudes and high levels of interest of both teachers and students for the project topics; a focus on the phenomenon of climate change and its impacts on local landscapes, including the

study of problems and devising solutions or measures for their mitigation would maximise interest among the students.

### Connection of project topics to school subjects

The connection of proposed project topics to school subjects does not present great differences between students and teachers.

Regarding the attributes of landscapes, students and teachers put similar weight on Biology and Geography, and include Art, Physics and Literature (the students also relate the topic to history – very rightly so).

The issue of landscape protection is related by teachers mostly to Biology, while students see a closer relation to Geography; Physics, Art and Literature are included by both target groups.

The issue of climate change is recognized by both students and teachers as the most interdisciplinary in terms of science among the proposed topics, as it was substantially related to Biology, Physics, Geography and Chemistry.

Finally, the topic of water elements was mainly related to Geography and Biology, and also to Physics and Chemistry.

The above findings on the perceptions of students and teachers indicate that, although the strongest connections of the proposed topics lie with science subjects (i.e. Geography, Biology, Physics, Chemistry), some students and teachers clearly perceive relations to Art, Literature, History and Information Technology. It is these perceived relations that the WaterSTEAM methodology will aim to strengthen, also connecting the learning content to the school's surroundings (e.g. local water elements, landscapes).

### Experience and interest in aspects of the proposed learning methodology

The students appear to have adequate experience in working in teams and somewhat less experience in doing fieldwork. They show great interest in all aspects of the learning methodology proposed (i.e. project work, teamwork, selecting themselves the topics to work on), and most of all going out of the classroom and doing fieldwork. It should also be taken into account that a significant percentage of students (36%) find science subjects at school to be very difficult, while 40% stated they would hesitate to communicate their findings to a wider audience.

On the other hand, teachers also show experience in guiding their students to work in teams and in doing fieldwork. However, and keeping in mind that most of the teachers who participated have a theoretical background, a 42% of the teachers appear to have no or limited experience in project-based teaching. Although most of the teachers state they often work together with other teachers of curriculum

subjects on a common topic, they believe they should be better prepared for collaboration among them and in implementing project-based learning activities. Furthermore, only 57% of the teachers know the meaning and application of STEAM and even fewer have had experience in STEAM teaching – only 38% feels adequately prepared to implement STEAM teaching in class. In fact, the lack of knowledge on STEAM and project-work by teachers, together with difficulties in integrating the STEAM approach in the school curriculum (lack of time, strict national framework leaving no flexibility to schools to integrate project learning in the curriculum), are recognised by teachers as the main obstacles to integrate STEAM at school. Despite that, the participating teachers show great interest in learning more about STEAM and project-based learning, and engaging in project-based work, collaborating between them and with outside experts, and implementing the STEAM and IBL approaches. They also show a great interest in supporting their students to communicate their findings to a wider audience.

The above findings strongly support the need for the development and integration of the WaterSTEAM methodology that aims at connecting the detached science content taught at school to the real global and local issues, thus linking it to the students' own experience and interests, making it relatable and understandable. The teachers, having a central role in the learning methodology, should be strongly supported in terms of the necessary theoretical background on STEAM, IBL, and project-based learning, as well as in terms of providing them with an effective collaborative framework including a step by step guide on building a WaterSTEAM project at school.

#### Use of ICT tools

Regarding the use of office software, the students show a lack of skills in using spreadsheet software like Microsoft Excel (only 20% use it regularly) while the teachers appear to possess these skills. The opposite applies regarding the use of mobile devices and the use of widely used map-based applications like Google Earth, where students appear to be more fluent than teachers. In fact, a rather negative attitude is recorded for most of the participating teachers regarding the use of mobile devices.

As expected, most of the students and teachers do not have experience in using specialised mapping and GIS applications, or playing and developing Location-Based Games; however, a few students and teachers claim to have good experience, using the above tools often.

Despite their limited experience in using the above ICT tools, both the students and teachers who participated in the survey show great interest in acquiring these new digital skills.

The above findings, related to the use of the foreseen ICT tools in the proposed WaterSTEAM methodology, call for the need to encourage a change of attitude of teachers in favour of the use of mobile devices as learning tools; through the learning methodology, the teachers should be in a position to support the students in the use of certain software (e.g. Excel), and at the same time be encouraged to collaborate with students skilled in other foreseen ICT tools, making use of these skills and transferring them to the class.

## Stakeholder organisations Survey

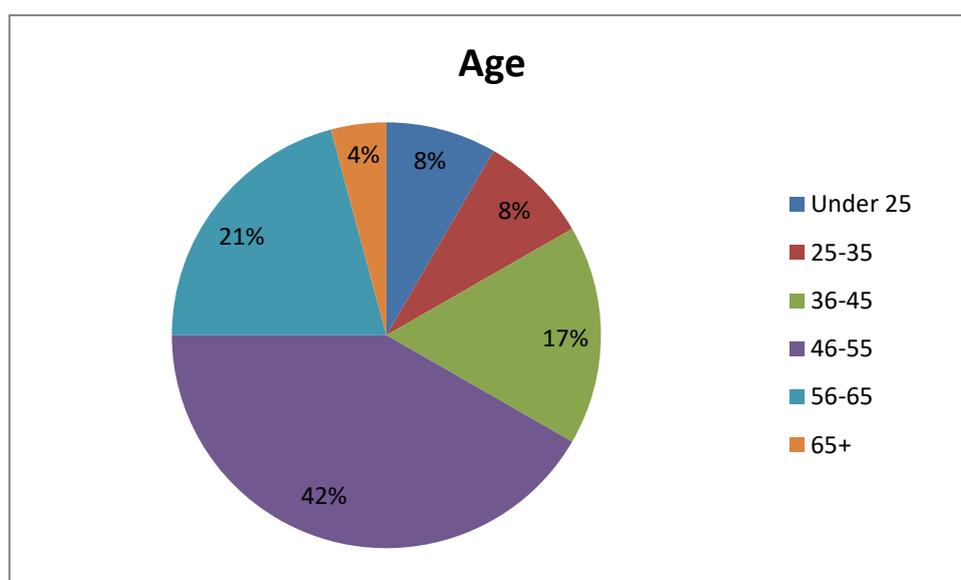
### I) Profile of participating stakeholder organisations

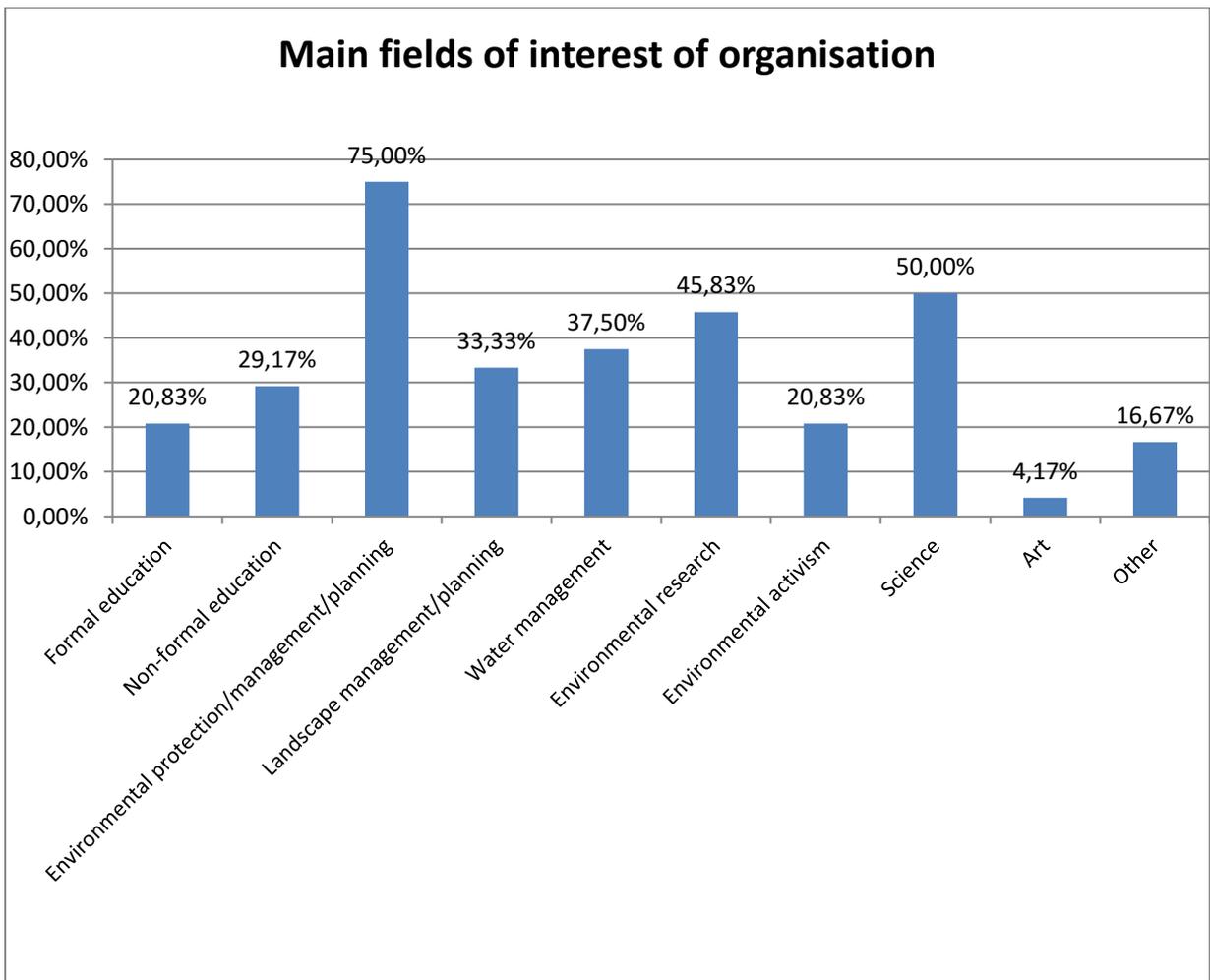
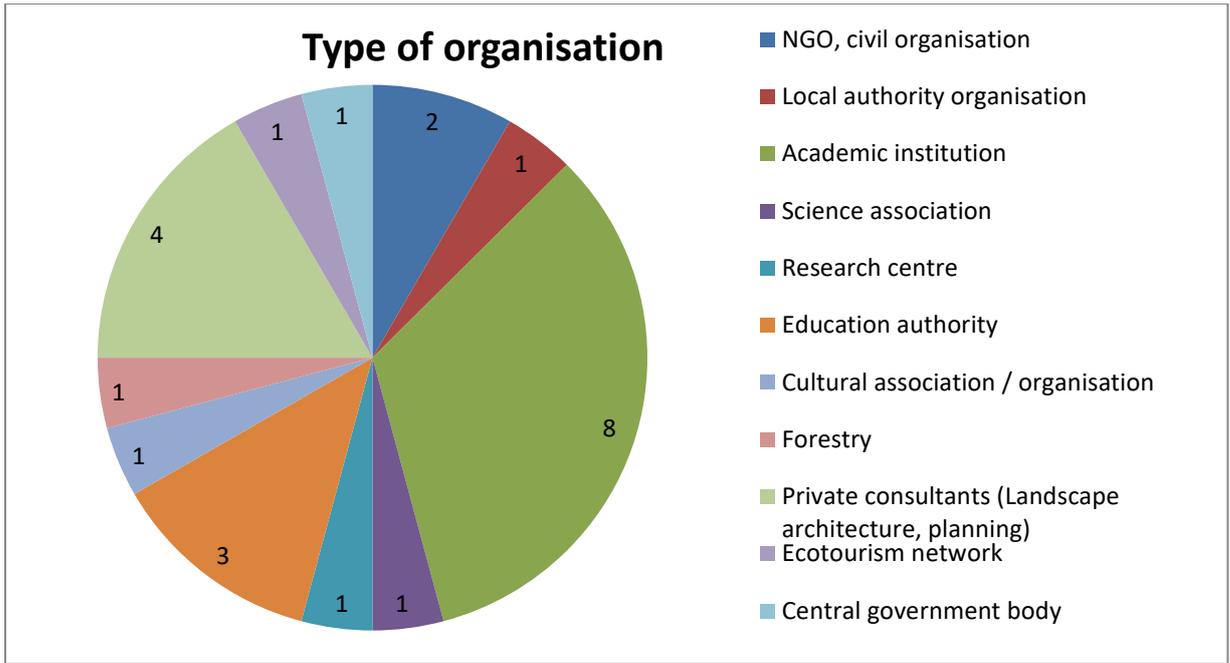
Most of the participating 24 representatives of stakeholder organisations that took part in the survey belong in the age group 46-55 years old, while all proposed age groups are represented in the sample. The participants represent a wide range of organisation types, including academic institutions, NGOs, a local authority, a science association, a research centre, education authorities, a cultural association, a forestry authority, private consultants' firms, an ecotourism network and a central government body; most come from academic institutions (8 participants), while private consultants' firms and education authorities are represented by 4 and 3 participants respectively.

The main fields of interest of the participating organisations range from education (formal and non-formal), to environmental and landscape protection, management and planning, water management, environmental research and activism, science and art; most of the organisations' interests lie within the field of environmental protection/management/planning (75%), science (50%) and environmental research (45.8%).

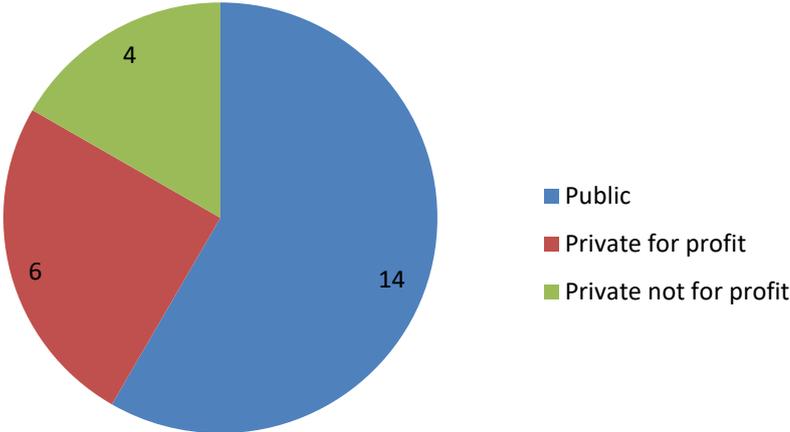
Most of the participating organisations are public institutions (14 out of 24), 6 are private for profit organisations and 4 are private non profit organisations.

The profile of the participating organisations presents a wide geographical spread; out of the 24 participants, 14 are located in the 2 most populated Greek cities (9 are located in Athens and 5 in Thessaloniki), while the rest are located in smaller towns and cities all over Greece (Gythio, Chania, Volos, Pikermi, etc.).





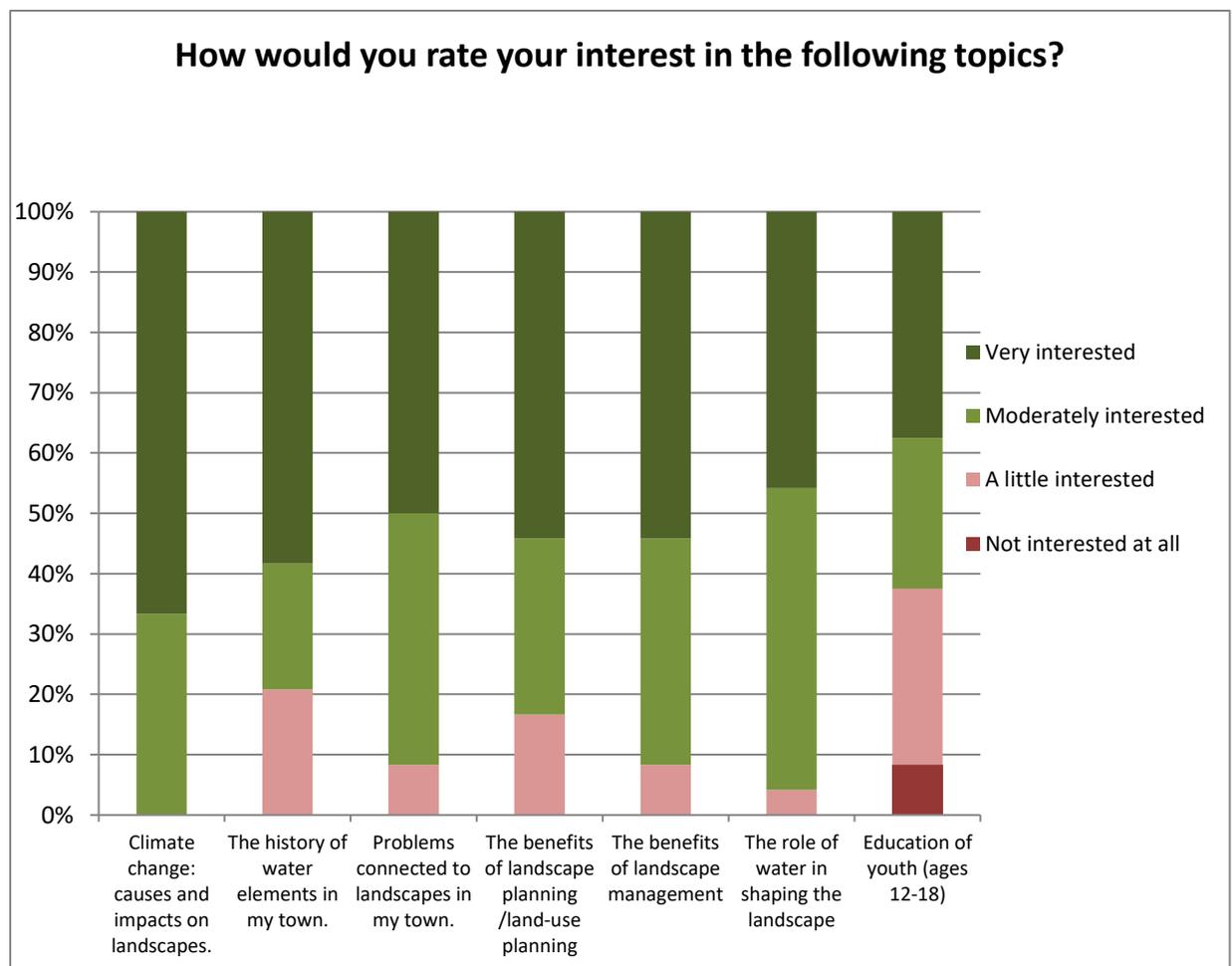
### Public or private organisation



## II) Interest towards the proposed theme of the project

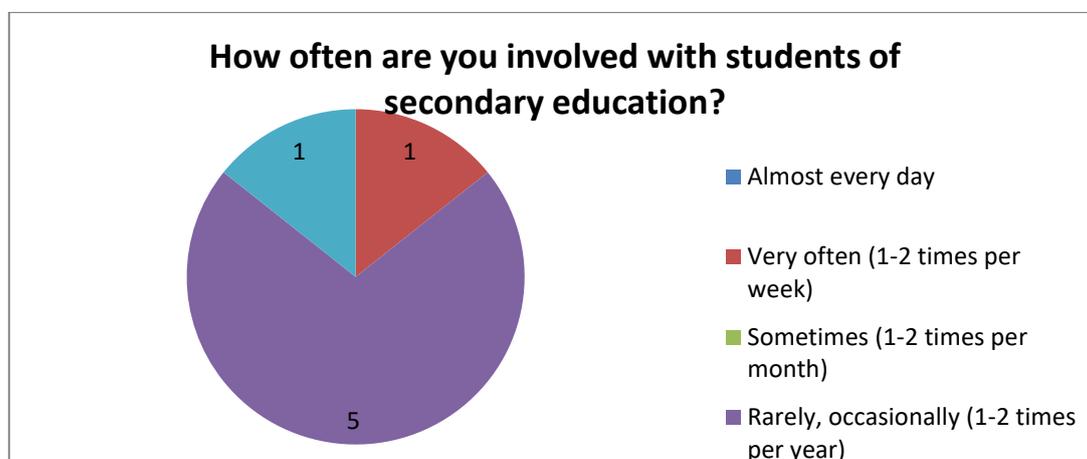
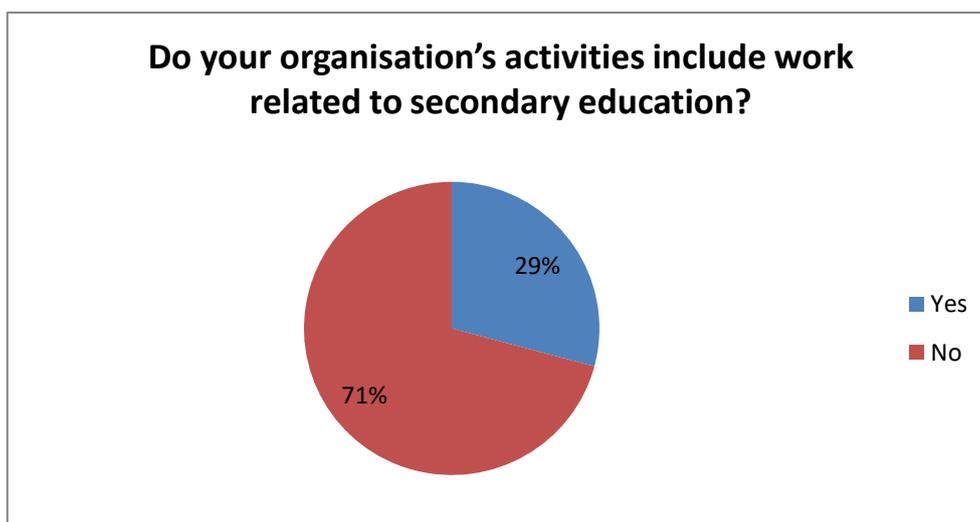
The survey participants from stakeholder organisations show great interest in the proposed project themes; the greatest interest was recorded regarding the topic of climate change, its' causes and impact on the landscapes, where all the participants stated they are very interested (66%) and moderately interested. The topics regarding the role of water in shaping the landscape, the benefits of landscape management, and the problems connected to landscapes in their region, also recorded strong interest from the participants.

Regarding the topic of the education of youth (ages 12-18), although not directly linked to the activities of the majority of the stakeholder organisations, the majority of participants declared their strong interest. This is key to the WaterSTEAM learning methodology, foreseeing the engagement and participation of outside experts in the school learning activities.

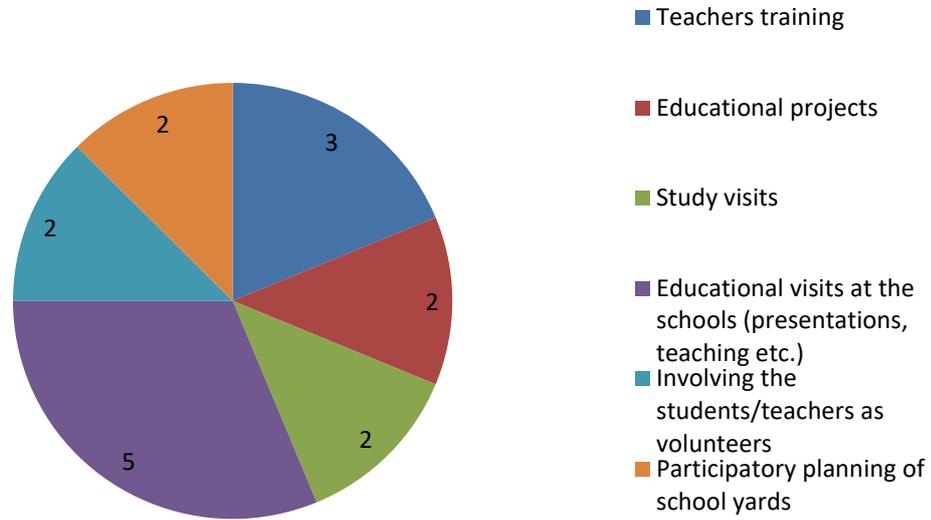


### III) Expertise in secondary education

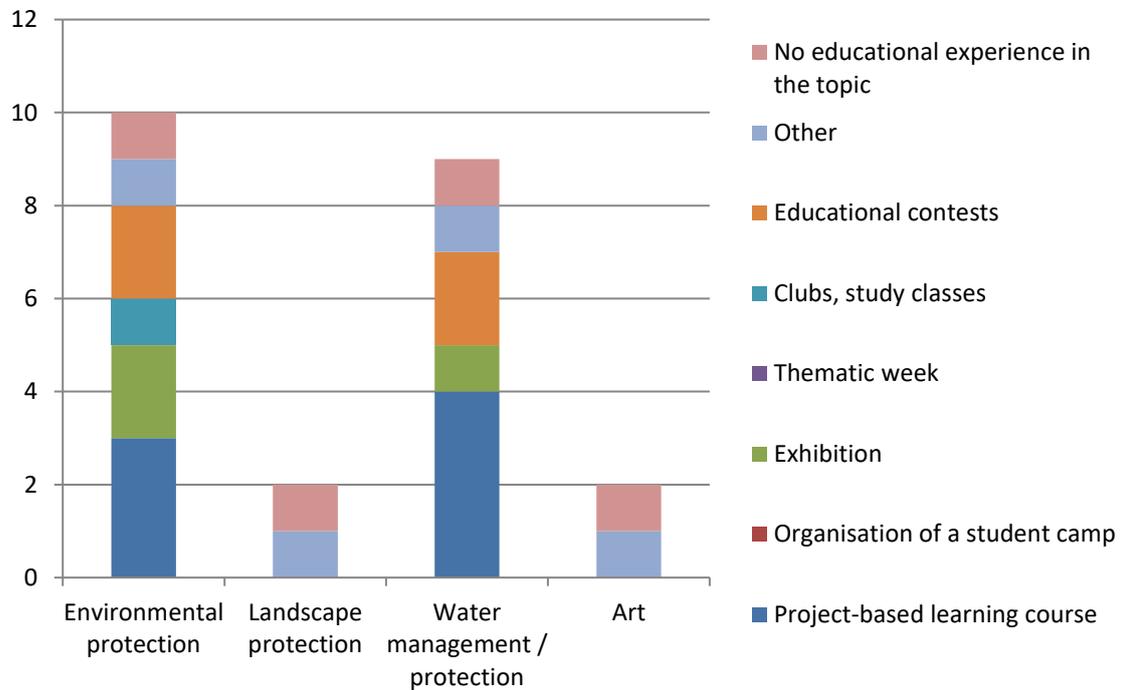
Most of the participating stakeholder organisations' work is not directly related to secondary education; only 29% of the organisations stated their work is linked to secondary education, and the vast majority of these organisations are only involved with students and teachers of secondary education only on occasion (once or twice a year). Regarding the ways that these organisations have worked with students/teachers of secondary education, most participants stated they took part in educational visits at the schools; other ways included teachers' training, educational projects, study visits, involving the students and teachers as volunteers, and taking part in the participatory planning of the school yard as experts. Regarding their experience in secondary education learning courses on specific topics related to the project, participants stated their experience relates to the topics of environmental protection and water management, mainly in the forms of project-based learning courses and educational contests; there was no substantial experience in the field of landscape protection or art.



### In what ways has your organisation worked with teachers/students of secondary organisation?



### Participation in a learning course in secondary education covering the below mentioned topics



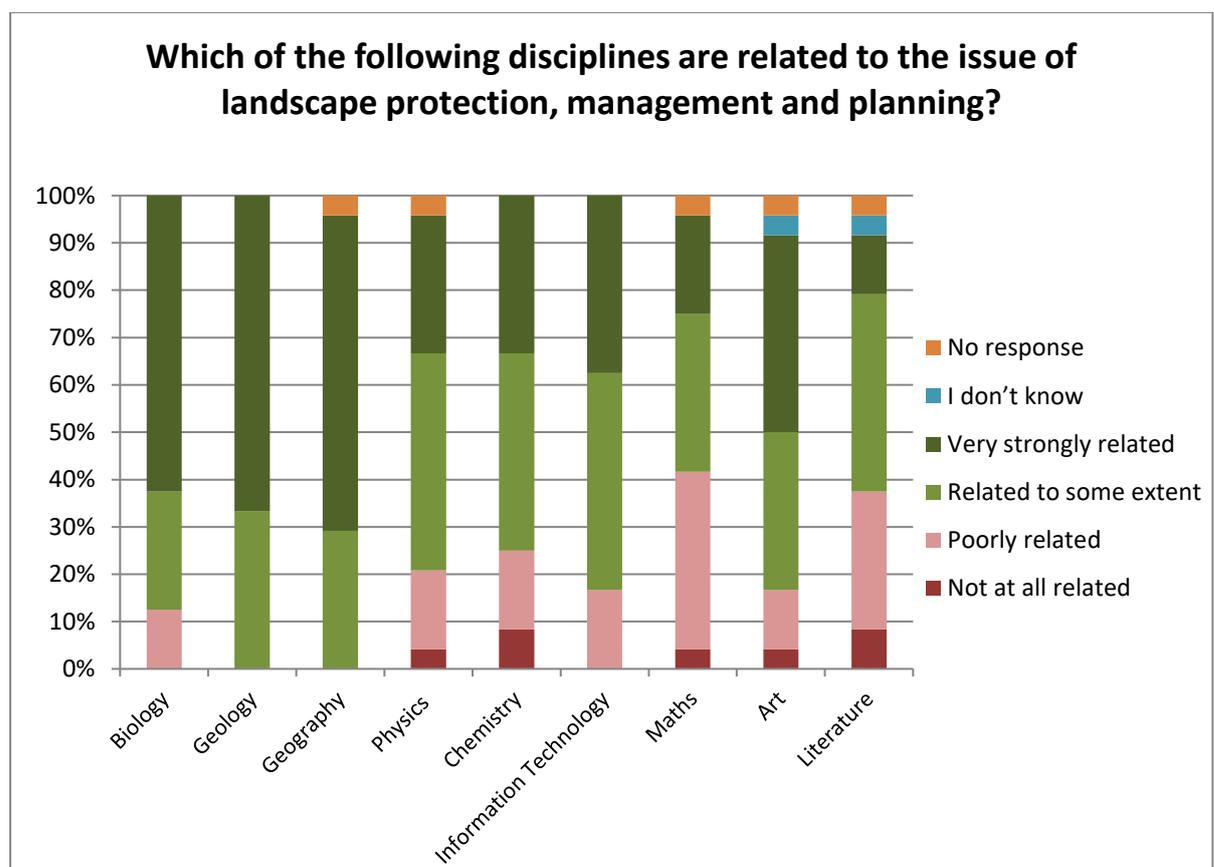
#### IV) Attitudes towards the learning aspects of the proposed methodology

##### Connection of landscape protection, management and planning to school disciplines

The participants from stakeholder organisations were invited to relate the topic of landscape protection, management and planning to school disciplines. Their responses underline the interdisciplinary character of the landscape theme, since the majority of participants consider the landscape theme to be substantially related not only to science subjects (the strongest relations are recorded with Geography, Geology and Biology, followed close by Physics, Chemistry and Math), but also to Information Technology (82% relate it to the landscape topic), Art (72%) and Literature (52%).

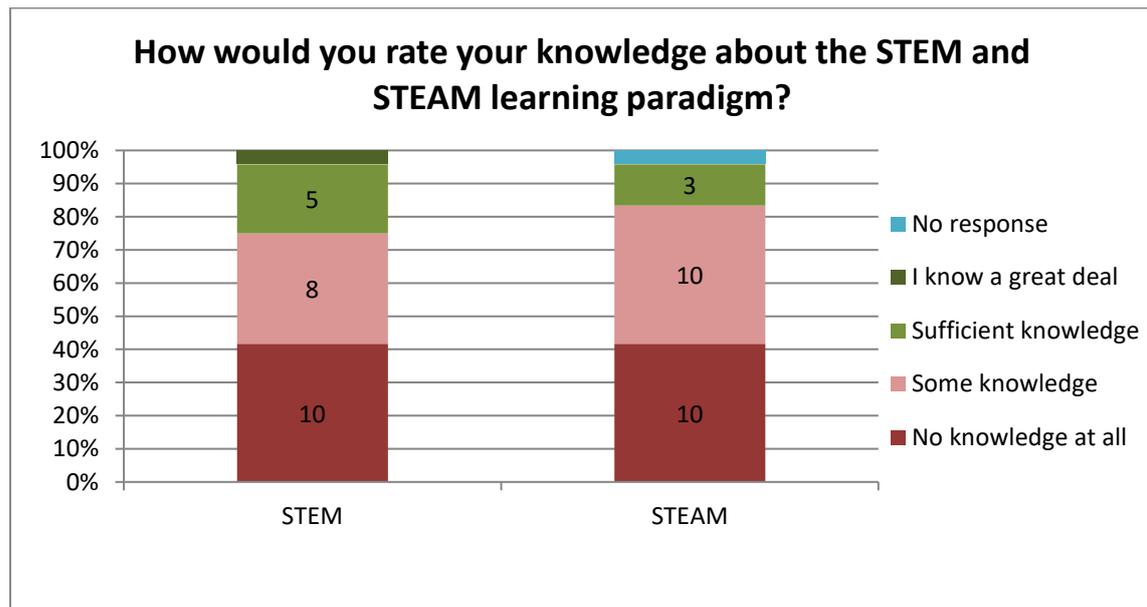
The participants were also invited to add more disciplines that relate to the topic of landscape protection, management and planning; participants added History, Sociology and Environmental education.

This finding also confirms the core hypothesis of the WaterSTEAM methodology that the topic of landscape should be approached in an interdisciplinary manner, through a balanced STEAM approach where A for Art is not limited to the visual or performing arts, but also encompasses the Humanities and namely History, Philosophy, Languages, Literature and Sociology.



### Knowledge on STEM and STEAM approaches

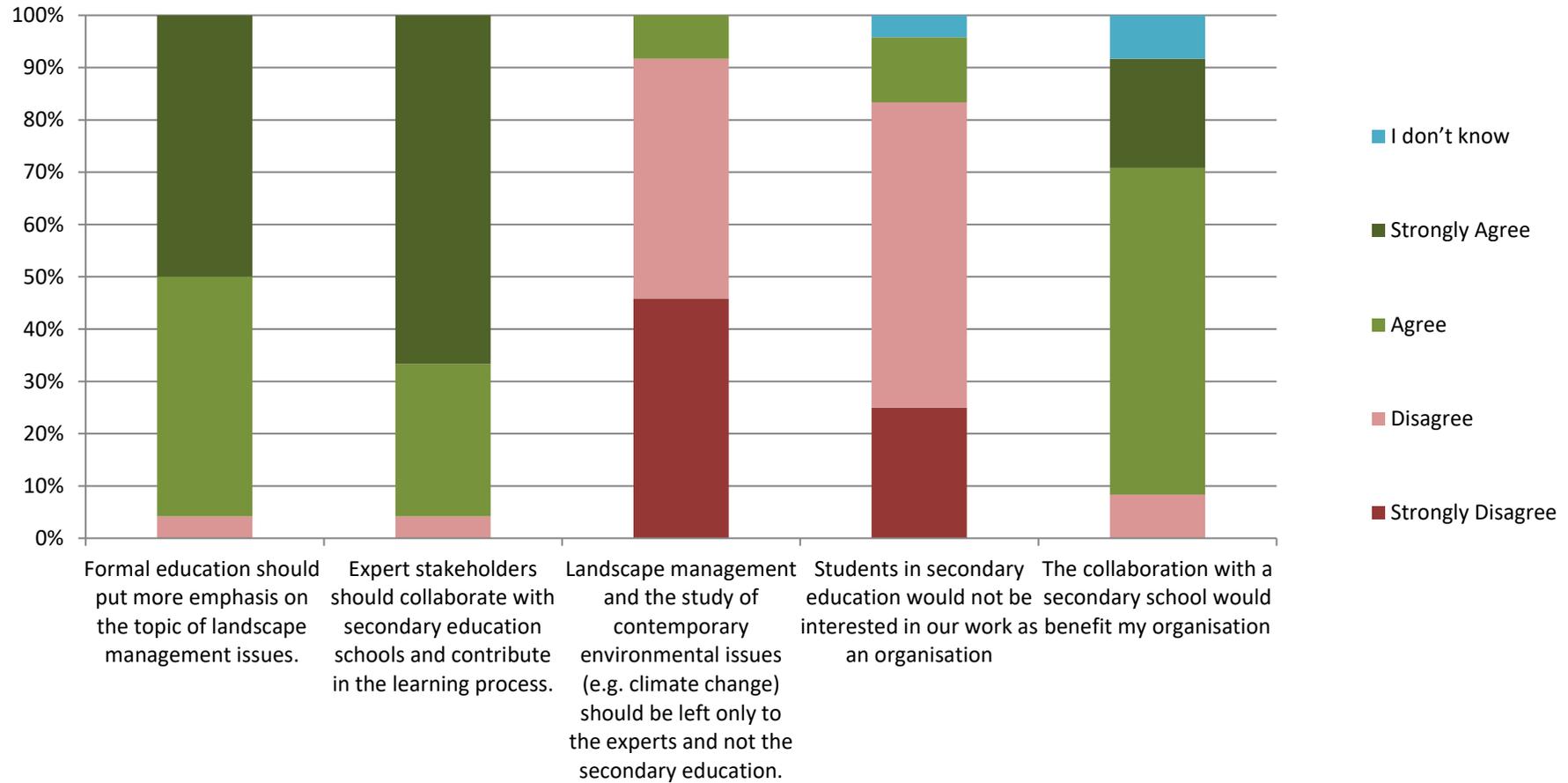
The participants in general do not possess sufficient knowledge of the STEM and STEAM learning approaches; this is expected, taking into account that most of the participants represent stakeholder organisations not directly active in education. The few participants who declared they have sufficient knowledge of the STEM (5 participants) and STEAM (3 participants) approaches represent academic institutions and NGOs.



### Attitudes in relation to key aspects of the WaterSTEAM methodology

The participants from stakeholder organisations demonstrate very positive attitudes in relation to key aspects of the project methodology. They recognise the need to integrate the issue of landscape management in formal education, as well as the need for expert stakeholders to collaborate with schools of secondary education and contribute to the learning process. In addition, the vast majority of participants believe that a the collaboration of their organisation with a secondary school would benefit their organisation, and that the students of secondary education would be interested in their work as an organisation.

### To what extent do you agree with the following statements?



### Interest in contributing to a WaterSTEAM school project as an external expert

Finally, most of the participants from stakeholder organisations (75%) declared their interest in contributing as an external expert in a school project in the theme of landscape protection and management, confirming the positive attitudes of participants for collaborating with schools and contributing as experts to the learning activities.

