

## Article

# Perceptions of Teachers in Training on Water Issues and Their Relationship to the SDGs

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**Abstract:** Water conservation is essential for any activity, as well as for the survival of both human and other living beings. It is commonly associated with access to clean water and sanitation, or even to unsustainable production and consumption, or sustainable cities and communities. However, there is increasing awareness of emerging issues related to water resources and their impact or relationship with other issues, such as climate change, access to food, health and well-being, or biodiversity (marine and terrestrial). Therefore, this study is aimed at understanding the perception of students of the Degrees in Early Childhood Education and Primary Education concerning water issues and their relationship Sustainable Development Goals (SDGs; number 2,3,6,11,12,13,14 and 15) in a coastal urban context. The study used a qualitative design, in which 59 student teachers were interviewed. The instrument was validated by 12 experts. The content analysis indicates that student teachers understand that there is an environmental problem in relation to water caused by human behaviour, and that its effects have an impact on other areas that are related to the SDGs included in the 2030 Agenda.



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## 1. Introduction

This study aims to show an approximation of the perception of teachers in training on the needs that exist in society in relation to water, human development and care for the planet, as set out in the 2030 Agenda. The intention is to find out how to reorient the training programmes in the field of Higher Education from the Universities, as one of the institutional responsibilities that must favour citizens and professionals who act under the approach of sustainable social responsibility [1].

This approach is due to the recent change in the meaning of sustainable development, giving way from the Millennium Development Goals to the Sustainable Development Goals (SDGs) in 2015. This new concept has had a greater openness, which is reflected in the 17 SDGs and their targets, as a result of the evolution that has taken place in the various forums that have debated the areas and problems to be resolved. Some of the new content includes the eradication of hunger, healthy living, quality education, access to water and sustainable economic growth. New challenges include sustainable consumption, peace and justice, climate change and economic equality [1]. Thus, the SDGs advocate an approach that favours human development while caring for the planet, thus ensuring quality of life for all. This more inclusive vision is centred on five main cores, which are the development of people (SDGs 1 to 5), prosperity (SDGs 7 to 11), the planet (SDGs 6 and 12 to 15), peace and justice (16) and partnerships such as those established with universities (SDG 17).

Universities must therefore assume an active role, incorporating the principles and values proposed by the SDGs in their policies, objectives and activities in the field of higher education. To this end, environmental management will include the promotion of cooperation and the environmentalisation of the university community, with the intention of responding to the challenges of sustainable development, and acting to improve SDG 4 [2].

However, in order to do this, it is necessary to know what level of knowledge the students have, which, in the case of this study, focuses on water.

Thus, water resources are essential for the survival of all living beings and for any activity we undertake [3]. Water is needed for consumption, either directly or through food, for sanitation or as a basic element in the use and production of goods. Human beings, through their actions, are largely responsible for the use, consumption and conservation of water resources worldwide. With the neoliberal model of consumption, with globalisation, these needs have increased due to mass production, which results in an excess supply of goods that people can buy and consume. Irresponsible production and consumption entails a greater use of resources, such as water, which leads to water pollution caused by the toxic substances that are released into water bodies [4] and an increased discharge of waste across the planet which, when in contact with the different natural environments, pollutes the water sources existing there [5].

As a result, the water potentially available for consumption by people and other living beings is reduced, biodiversity is lost due to changes in the environment (whether marine or terrestrial), and other natural, physical and chemical resources are affected by water pollution. The direct consequences for people are threefold: the access to clean water is decreasing, and health and well-being are being eroded [4]; therefore, there is less access to food.

These consequences are exacerbated by climate change and the increasing migration towards urban environments. Climate alterations lead to natural disasters and changes in natural conditions that make the development of natural resources more difficult. Increasingly, crowded cities are faced with limitations in the management of water distribution systems [3,6,7], which is currently aggravated by the pandemic caused by COVID-19, a virus that has had an impact on water [8,9]. A growing and substantial percentage of people live close to the coast or depend on the exploitation of the marine environment. Thus, they have a potentially negative impact on water [4,5]. As can be seen, the misuse that is made, directly or indirectly, of water resources is damaging the living conditions of the current and future generations. Although these actions are carried out locally, they will ultimately have an impact at the global level, as a result of the sum of all individual non-environmental behaviours.

Water sustainability is related to various problems derived from human behaviour, such as the quantity [3,10–14] and quality of water [6,11–18], waste [4,5,19–22], climate change [11,19,23–27], population growth [6,23,28,29] or marine and coastal ecosystems pollution [4,9,30].

To address this, governments, producers and consumers must actively participate in reducing water risks so that food security is guaranteed, thus creating a balance between human well-being and natural resources [31]. Social responsibility, whether individual or corporate, is a right and a duty that citizens must exercise to lessen their negative impact through actions aimed at tackling and reducing problems [32,33]. Therefore, there is a need for society to be aware and act responsibly through pro-environmental behaviours. Several studies highlight the importance of raising awareness among the population, with education being a relevant factor in the demand management and proper use of water [10,23,32–39]. In fact, it seems that the higher the educational level of people, the greater their awareness about the quality of water and the damages caused by pollution [10], although it has no correlation with conservation behaviours [6].

Schools and universities are key elements for promoting this through the implementation of educational strategies which, by raising awareness of water issues, are able to develop sustainable attitudes, skills and competences in the members of society that promote their social responsibility [32,33,38,40]. The sociocultural context is related to the social representations about the causes, consequences and solutions to the water problem [24], so educational institutions are essential for raising awareness about water. Moreover, because it has not yet been adequately included in the current educational curriculum [35], the role of teachers as managers of this knowledge and awareness is very important [32,33].

The 2030 Agenda proposes 169 targets to be achieved globally through 17 sustainable development goals (SDGs), so that societies are able to respond to the current situation. Sustainable water management is related to various SDGs, among which it is worth highlighting global access to food and the eradication of hunger (SDG 2) [11–13,16,28], good health and well-being (SDG 3) [8,9,11,13,15,17,18,22,26,41–50], quality education (SDG 4) [32,33,38,39], clean water and sanitation (SDG 6) [7,13–15,27,42–44,46,47,51], sustainable cities and communities (SDG 11) [6,8,12,13,17,26–28,42,46,47,51–53], responsible consumption and production (SDG 12) [6–8,17–20,22,49,54–56], climate action (SDG 13) [11,19,23–27,57], life below water (SDG 14) [7,9,12,26,30,45] and life on terrestrial ecosystems (SDG 15) [6,15,28]. According to the scientific literature, some of these SDGs are simultaneously interrelated [11–13,16–18,26–29,44–48,58].

In general, regarding the SDGs in relation to the water problem, it can be said that an inadequate production and an irresponsible consumption of water or other resources have an impact on water pollution (SDG 12). As water is essential for the survival of all living beings, it may have various negative consequences for the planet. The consumption of polluted water affects the health of organisms at all trophic levels, and in turn, that of those who consume them, in either a water or land environment (SDG 14 and 15), among them human beings (SDG 3). Being a basic element for the production of food, it limits the access to it, which does not facilitate the alleviation of hunger in the world (SDG 2). Food access is also influenced by droughts and other natural disasters caused by climate change (SDG 13). Pollution, wastes and the discharge of chemical products and hazardous materials into water environments, in addition to practices such as not recycling or reusing water safely, make it difficult to manage the access to drinking water and adequate sanitation (SDG 6). In the case of urban environments, the increasing migration to cities hinders the proper functioning of water and sanitation systems, limiting the access to these resources (SDG 11).

The problems listed above are some of the issues student teachers should be aware of as future educators who influence society. They are responsible for teaching during a very important period of influence, such as the early stages of schooling, in which the foundations of many later interests are laid. The change in the beliefs, knowledge, attitudes, habits, and ultimately, responsible behaviours towards the environment, is triggered by education (formal, non-formal and informal), training and information [17–20,31–33,39–41,45,50,55,59]. These tools enable the adoption of sustainable development skills and lifestyles, through access to theoretical and practical knowledge that favours the development of three domains: knowing, doing and being (SDG 4). For this, competent professionals are required to access schools and develop such learning outcomes in their students, based on both individual and collective social responsibility [32,33]. There is, hence, the need to understand the perceptions of student teachers regarding water issues. Then, university professors will be able to plan strategies aimed at increasing awareness and knowledge so that their future student teachers are more knowledgeable in environmental matters and thus, more appropriately educated.

There are few studies in the scientific literature addressing the perception of university students, as they usually deal with climate change and water [57], water reuse [50], the perception of the management of water resources [59], water consumption habits [60–62], the perception of the concept of water and its pollution [63], the attitude towards saving water [64] or the awareness of water pollution caused by dairy products waste [65]. Such studies are even scarcer when considering student teachers [57] and, in general, indicate a superficial knowledge about the problem under study [65].

In other studies, it has been found that trainee teachers perceive the scarcity of natural resources as the biggest global problem, and at the national level, urbanisation; but water pollution is hardly perceived as a problem [66]. When it comes to establishing relationships between water use and the negative impact it has on the environment, they seem not to be able to do so [67,68], although this is one of the fundamental skills in SDG. However, other studies indicate that one of the environmental problems they are most concerned about is water pollution, along with deforestation, illegal waste and climate change [69]. In relation

to the information they have about their water footprint, it was found that just over a third of students indicate that they are not aware of their water footprint [69]. In line with one of the SD principles, trainee teachers seem to agree that it is everyone's right to enjoy natural resources, including water [70].

In addition, the SDGs proposed in the 2030 Agenda have only recently been implemented, in 2015, so the relationship that may exist between water issues and the various SDGs is still in its infancy. However, the work of Solis [1] stands out, who shows the concept that educators in training have of sustainable development and the global problems that most concern them, analysing them from the perspective of the SDGs. The author indicates that future postgraduate educators perceive a great diversity of problems related to the SDGs, so that there is a broad perception of the aspects to work on from SD. There are only a few that are not mentioned, such as SDGs 5, 14 and 17 [1]. Among these, we highlight the one related to the conservation and sustainable use of oceans, seas and marine resources, which the study intends to study.

In the case of the present study, the sample is located in a coastal urban area with high migration. For this reason, the aim of the study is to understand the perception of students of the Degrees in Early Childhood Education and Primary Education concerning water issues and their relationship with SDGs in a coastal urban context (SDG 2, 3, 6, 11, 12, 13, 14 and 15). The interview questions were structured around two themes (water and the coastal marine environment). The intention was to avoid influencing their opinions, so that the participants could themselves deduce the SDGs outlined in the objective.

## 2. Methods

### 2.1. Participants

Sampling was intentional or causal, and focused on the information and training needs of the participants. Therefore, the sample consisted of students in the last academic year (fourth year, just before graduation) of two degrees in teacher training of the Faculty of Education of the Campus of Melilla at the University of Granada. All participants gave their informed consent before participating in the study. Thus, the research was performed in compliance with the Declaration of Helsinki. The size of the sample equals the total sample of students enrolled in the academic year 2020/21:  $n = 18$  students enrolled in an Early Childhood Education degree (30.5%) and  $n = 41$  students enrolled in a Primary Education degree (69.5%). This provided a total sample of 59 student teachers from Andalusia (Spain). Participants had a mean age of 21 years ( $SD = 20.3$ ). With respect to gender, 30.6% were male and 69.4% were female.

### 2.2. Instrument

The information obtained from student teachers was gathered using a semi-structured interview designed for the purpose of this study. Due to the fact that the sample is located in a coastal urban environment, the questions focused specifically on water and marine issues (see in Table 1 for the interview questions). That is, they were adapted to the participants' environment, thus meeting one of the principles of education on sustainable development: act locally, affect globally. The answers were evaluated according to the data obtained, in order to gain a better understanding of reality [71,72], on the basis of questions about water in general and the coastal marine environment. The concepts presented were easy to identify, as participants could have limited environmental literacy. Furthermore, our intention was not to influence their opinions, so that participants could, by themselves, deduce the different SDGs defined in the objective. Once the interview responses were collected, they were manually transcribed. Then, an initial coding was generated and applied to the data (see Table 1), which were extracted from the 12 questions posed to the sample group during a semi-structured interview.

**Table 1.** Categorisation system, description and interview questions.

Categories:	Category Description	Interview Questions
Sociodemographic variables	Sociodemographic data providing information about participants' characteristics related to education for sustainable development and water conservation.	1. Gender
		2. Please, tell me the university degree you are currently enrolled in.
		3. Please, tell me your area of specialisation (in case you are studying the Degree in Primary Education)
		4. Are you interested in sustainable development?
		5. In the future, do you intend to provide education for sustainable development to your students?
		6. What about water and the coastal marine environment?
Impact on water	Participants' perception in relation to the habits of people with an impact on water	1. In your opinion, what kind of regular consumption habits could further worsen the water problem? Please, explain how. Could you give examples of social behaviours or consumption patterns that affect water resources?
		3. Do you think everyone is responsible for protecting water resources? Please, explain why. Could you give examples?
		4. How does water quality affect our health?
		6. Do you think we should protect water resources? Should we be motivated by selfish reasons or altruistic reasons? Please, explain why.
Impact in the marine environment	Participants' perception of the habits of people that they believe can generate a negative impact on the marine environment (water environment and marine biodiversity)	2. In your opinion, what kind of regular consumption habits do you consider to be more damaging to the seas and the marine biodiversity? Could you justify it? Could you give us examples?
		5. How does the environmental quality of seas and oceans affect our health?

Note. Understanding the attitudes and beliefs of the students of the Degrees in Early Childhood and Primary Education about water issues and the different SDGs related to the educational field in a coastal context.

The first six questions were about sociodemographic characteristics. The remaining six questions were grouped into two categories. The first one is the negative impact on water, which was used to determine participants' perception in relation to the habits of people with a negative impact on water (questions 1, 3, 4 and 6). The second category is referred to as the negative impact on the coastal marine environment, which focuses on the perception of participants regarding the habits of people that they believe can generate a negative impact on the coastal marine environment (water environment and marine biodiversity) (questions 2 and 5). A sample of the interview can be found in Table 1.

During the interview validation process, information sources were triangulated to establish credibility. Through the consensus and supervision of the reports by the interviewees, the saturation of the data was ensured. Transferability was achieved by interviewing all students who make up the last academic year of the degrees under study. Moreover, the dependency and confirmability criteria pointed out by Olabuénaga [73] have been reviewed by external auditors who have examined the decisions made in the collection and interpretation of the data in order to detect error or biases, thus avoiding distracting elements in the study. The auditors were 12 experts—eight experts in sustainable educational research and four experts in sea, coast and water research—whose responses were used to evaluate the content validity index of the interview and who assessed the relevance, coherence, adequacy and consistency of each interview question designed to measure the opinions of the interviewees about the importance of water and the coastal marine environment [74]. To this end, a four-point Likert scale was used (1 = inadequate,



2 = barely adequate, 3 = adequate and 4 = very adequate). Only the elements that received a response rate higher than 80% from the panel of experts after three rounds of evaluation for (3) adequate or (4) very adequate were considered. Finally, the percentage of agreement was 92%.

### 2.3. Process

#### 2.3.1. Data Collection

The interviews were performed in accordance with the ethical principles of the Declaration of Helsinki and with the consent of the participants, guaranteeing their anonymity. Each interview lasted from 25 to 35 min. Prior to the initiation of the interview, the researchers provided an explanation of the objectives and purpose of the study and clarified the terms when needed. Using a semi-structured interview guide called a protocol, the interviewer asks the respondent questions in face-to-face meetings. The interviews were conducted during the months of September and October of the 2020/21 academic year.

#### 2.3.2. Data Analysis

A content analysis has been carried out using a posteriori system of categories for the coding of the data which were derived inductively from the reading of the interview transcripts. There were four categories and five codes extracted (see Table 2). This enabled us to understand the perception of student teachers about the water problem based on the social habits that affect this natural resource, the consequences for the marine environment as a result of these habits, the general awareness about water conservation, and the impact of unsustainable habits on people's health and economy.

**Table 2.** Categorisation system and coding.

Categories	Category Description	Coding	Frequency
1.Unsustainable habits related to water	Habits of people that impact water resources, polluting them.	Habits with impacts on water	241
2.Impact on water	Effects on water caused by the unsustainable habits of people.	Water-related issues	100
3.Awareness-raising	Perception of student teachers about the need to raise awareness about water conservation.	Awareness-raising	153
4.Impact on health and economy	Impact on people's health and economy due to their own unsustainable habits	Health	68
		Economy	68

On the basis of the ideas obtained in the four categories which are found in the results, it has been possible to identify information on 8 of the 17 SDGs that serve as an international reference for the implementation of the 2030 Agenda. To do this, they were given a nomenclature, which can be seen in Table A1, Appendix A, apart from the coding of the qualitative data during the analysis performed.

The interviews were conducted in Spanish and were transcribed in this language using NVivo qualitative data analysis computer software, developed by Qualitative Software Research International (QSR International) in Melbourne (Australia, 2020). The analysis of the data was performed with the latest version of the program. The results were later translated into English by a professional translator.

Reliability was ensured by temporal triangulation of the data, contrasting the information obtained at different times—specifically, with diachronic reliability carried out by repeating the measurements, considering that it is only useful in unalterable aspects of a certain period of time with a percentage of agreement among three experts in the field of 91% [75–77].

### 3. Results

#### 3.1. Unsustainable Habits of People That Impact Water Resources

##### Habits of People that Impact Water Resources

Student teachers perceive that, nowadays, there are many factors that affect water resources, especially the marine environment (SDG14), as they live in a coastal town. They acknowledge that water is the source of life, but people are not aware of the importance of protecting it, with human beings causing the greatest negative impact as a result of their habits.

*“We are not aware that we are heavily polluting our greatest source of life. We throw batteries or any other thing to be washed away by the sea and even into the sea itself”.* (ECES3\_SDG14)

*“Human beings are guilty both of ignoring how to manage their habits or customs and, despite being aware of them, of not offering a solution or working together for the good of our planet.”* (ECES4\_SDG14)

Among the least pro-environmental habits that they listed, the unsustainable use of water was considered as the one with the greatest impact on water, both privately at home (individual social irresponsibility for sustainable development) and for production at an industrial level (corporate social irresponsibility for sustainable development) (SDG12). They made reference to the simplest habits of personal hygiene, leaving the tap running when not in use, the use of household appliances such as washing machines or dishwashers when they are not full, or the water consumption for production activities in the agricultural sector. There is also a habit of dumping waste in places where they can reach the marine environment, degrading and polluting it (SDG14).

*“... the massive waste of water at home, unknowingly, in routines of our daily life, in personal and household tasks as simple as washing your hands and leaving the tap running without controlling the amount of water that is thoughtlessly wasted, brushing your teeth, baths, showers...”* (EPES2\_SDG12)

*“... in agricultural activities, the generation of hydropower; and that water is not allowed time to regenerate naturally.”* (ECES6\_SDG14)

Regarding water quality, the unsustainable habits with the greatest impact on water are those related to the use of chemical products (toxic or dangerous) or the amount of waste generation both in private life and in the industrial sector (SDG12). In the case of the private sphere, the consumption of toxic products leads to severe water pollution, as they are discharged from houses into the sewage system to end up in the city's wastewater system (SDG6, SDG11, SDG12). Thus, an increasing volume of abrasive personal care or home cleaning products are flushed down the toilet, which contain various water polluting substances, such as colourants or additives from the petrochemical industry.

*“... when we have to clean the house and we use different chemical products to clean the household surfaces, sometimes pouring them down sinks, WCs...”* (EPES1\_SDG11)

*“... the use of personal hygiene products that are not natural can also pollute water quality, since their components come from the petrochemical industry, containing colorants, additives and others.”* (ECES5\_SDG6)

*“Also, the use of many chemicals in our day-to-day life that end up in the sea, such as shower gels, scrubs, shampoos, which contain microplastic.”* (ECES7\_SDG12)

Concerning the generation of solid or liquid water pollutants, there are products made of cellulose (paper) or oil that are flushed down the toilet, which is used as a rubbish bin (SDG6, SDG11, SDG12). All of them end up in the sea (SDG14), and, in addition, make it difficult to completely purify the water used in the urban environment (SDG6, SDG11). The most common example is the use of batteries in all households (SDG12), which end up in rivers or seas (SDG14, SDG15). Nevertheless, they also take into account outdoor activities, such as going to the beach.

*“... The act of putting old batteries in the wrong bin; when the batteries come into contact with sea, they can pollute hundreds of litres of water”.* (EPES8\_SDG14)

*“Pouring used oil down the sink or the toilet.”* (ECES9\_SDG11)

*“Our habits are causing the shortage and pollution of water; we dump waste of all kinds into the sea, either personal, when we are on the beach or the boat that discharges sewage, etc.”* (EPES7\_SDG15)

*“... wet wipes or even sanitary towels are flushed down the toilet.”* (ECES8\_SDG6)

*“... waste is flushed down the toilet drain.”* (ECES3\_SDG12)

In the case of industries, the use of chemical products and the generation of waste (either toxic or dangerous) were noted (SDG12). Their actions also have an impact on the poor quality of water, given that they manufacture chemical products, such as pesticides and fertilisers that will be used in pisciculture for the cultivation of fish (SDG14), or in agriculture (SDG15). In transportation, they talked about the spillage of oil and other harmful substances from leaking ships or boats in poor condition (SDG14).

*“... one of the habits with a negative impact on sea water would be, for example, the use of fertilisers and pesticides that are applied in agriculture to spray crops, to get rid of pests, in the cultivation of aquatic animals for commercial purposes, for forestry uses, for industrial purposes, where the raw material is manufactured into products, the use of chemicals for leather tanning.”* (EPES9\_SDG14)

*“The discharge of toxic substances into water, both petroleum and other oils. These spillages are due to the inadequate transportation of oil and the leakage of products such as petrol, which is generally stored in underground tanks; in many cases, the tanks leak and the substance seeps into the surrounding water bodies, including sources of water suitable for human consumption.”* (ECES3\_SDG14)

### 3.2. Impact on Water Caused by Human Behaviour

Our interviewees consider that individual habits have a global environmental impact. Although that impact is relatively low, when multiplied by the millions of people who inhabit the planet, it can have devastating consequences for the entire planetary ecosystem (SDG14, SDG15). The amount of waste that we generate, which is not being sorted and placed into the correct bin (SDG11, SDG12), is condemning us to live in a world that has been turned into a rubbish dump, where marine life is disappearing to make room for waste as a result of a slow decomposition process that gradually pollutes the environment (SDG14).

*“If we are constantly misbehaving, as in the case of throwing rubbish on the ground, we will only have a dirty world full of plastics, which will give rise to more and more problems, so it is important to avoid living in a world full of rubbish and seas turned into bins.”* (EPES3\_SDG15)

*“Mismanagement of waste affects too much our seas and oceans because most of this waste ends up under great depths of water. Especially plastic waste, which is very durable and inorganic, decomposes slowly, and causes damage to the seabed and its inhabitants.”* (ECES3\_SDG14)

Therefore, our actions have an effect on water quality, as well as the economic, social and environmental factors directly. Given the increasing pollution of water resources, it is necessary to invest in more products or mechanisms needed to clean and purify water (SDG3, SDG6, SDG11, SDG12). Moreover, the variety of life in the oceans and seas that exists thanks to sea water is a key aspect of the economy. This is due to the fact it provides human beings with necessary benefits, such as health and humanity's well-being (SDG3), apart from supporting the healthy functioning of the planet (SDG14, SDG15). However, our habits and customs have a harmful impact that leads to scarce marine life



(SDG14), contamination of the food that comes from the sea (SDG14), economical effects on fishermen, and health issues when there is direct contact with the sea (SDG3).

*“The more polluted the water, the more it costs to clean it.” (EPES2\_SDG14)*

*“The fact that sea water is dirty implies the contamination of the fish and that the people who make a living from fishing cannot earn a living wage. And the few fish we still have will cost a fortune. It is quite an economic problem too.” (ECES9\_SDG14)*

One of the biggest problems is the generation of undisposed solid waste, especially plastic (SDG12). It is the cause of toxic effects on the organisms that live in the sea, which is causing the disruption of trophic chains that maintain the balance in seas and oceans (SDG14). This problem has also affected the water cycle. The water in the oceans (SDG14), as well as that in clouds, rivers or mountains (SDG15), is polluted to a greater or lesser degree which, in turn, is also polluting the water we drink (SDG3, SDG6, SDG11, SDG12). The excessive consumption of plastics in our daily lives, which always end up entering the sea, either by human action or by the wind that blows improperly disposed waste (SDG12), causes a strong environmental impact on sea water, as plastic waste decomposes slowly, and thus pollutes marine waters (SDG14). Besides, it is dangerous in the sense that it can be ingested by birds or marine animals, resulting in serious injuries, or even death (SDG14).

*“... waste is thrown overboard and that should not be allowed as it is important to be aware of the marine life that inhabits the waters around us.” (ECES7\_SDG14)*

*“The excessive use of plastic products, water bottles, supermarket bags, etc... is one of the biggest threats to seas and biodiversity.” (EPES2\_SDG3)*

*“Many of the things that we use or buy that contain plastic and that we want to get rid of, end up floating in waterways, and end up entering the oceans sooner or later, the microplastic particles will make their way into the rainwater, the water we drink, etc.” (ECES5\_SDG11)*

*“Just by throwing away a can of soft drink, the marine diversity is being threatened, making it difficult for some species to survive as they have to fight our habits.” (EPES1\_SDG14)*

Poor water quality causes multiple species to become ill or die from feeding on polluted waters. It must be kept in mind that marine biodiversity comprises a vast number of living beings that, in some way, depend on the quality of the water (SDG14).

*“With the mismanagement of our water, not only are there consequences for the coastal marine environment, but we are also destroying the marine fauna that lives in this environment.” (ECES3\_SDG14)*

Another consequence of the poor quality of the water is that the species inhabiting these ecosystems, whether marine or terrestrial, are experiencing changes. Many species are migrating to places where water conditions are more favourable to avoid death. Moreover, there are species that are becoming extinct in places where the diversity of both flora and fauna is reduced due to the toxicity of water (SDG14, SDG15). However, the degradation of water quality, and therefore biodiversity, is also due to other environmental problems such as global warming (SDG13), the melting and retreat of glaciers (SDG15), water evaporation (SDG13) or air pollution.

*“The sad thing is that, in polluted lakes and rivers, animals and plants depend on the little water that remains, it means that these living beings have to migrate to other habitats or in the worst case, die.” (EPES5\_SDG13)*

*“... global warming, air pollution that leads to the degradation and poor quality of water, in addition to the disappearance of glaciers and the evaporation of water, which cause the destruction of the habitat of millions of animals and are one of the major causes of their extinction...” (ECES9\_SDG14)*

*“... whose seabed is being destroyed due to climate change.” (EPES5\_SDG15)*

Student teachers consider that excessive water consumption can seriously affect the ecosystem by reducing biodiversity (SDG12, SDG14, SDG15). Water scarcity is now one of the great challenges facing humanity in the future. Thus, poor water distribution is the main cause behind the depletion of a substantial proportion of the water available on the planet, and consequently, behind access to food (SDG2, SDG3, SDG12).

*“There are rivers and lakes that are drying up because we are using more water than can be replenished.”*

*“There are many areas where water can no longer be used even for irrigation because it is polluted. So how are they going to plant anything if there is no irrigation water?” (ECES3\_SDG12)*

### 3.3. Student Teachers' Perception about the Need for Social Awareness

All our informants affirm that humans, with their actions, are mainly responsible for protecting water and the coastal marine environment. They consider that it is necessary to raise awareness on this issue since water is a treasure that affects multiple aspects of both aquatic and terrestrial species. Among the reasons that justify this urgent need to keep water clean, they reported: risk of species extinction (SDG14, SDG15), seabed destruction (SDG14), the increasing demand for biodegradable products to maintain water cleanliness (SDG12), to avoid the waste of water that leads to its scarcity or absence (SDG12), or to keep water clean to avoid eating contaminated food (SDG2, SDG3, SDG12).

*“... is currently leading to more and more endangered marine species, even leading to the disappearance of species such as the Pacific leatherback turtle, which could disappear in 30 years.” (ECES2\_SDG14)*

*“... we will cause a significant deterioration of the coastal marine environment to such an extent that, in the future, we will talk of a sea of plastic, like in the coast of Thailand, or damaged, like the Great Barrier Reef in Australia, whose seabed is being destroyed due to climate change.” (EPES1\_SDG14)*

*“We are responsible for the turtles getting stuck in plastic can rings, for some species death after eating plastics and for the substances thrown into the sea, we are responsible for the continuing use of materials that destroy our planet instead of changing or replacing them with others that benefit us and the planet itself, we are responsible for it.” (EPES3\_SDG12)*

*“We don't have to look that much further to figure it out, but we can start with ourselves, with simple things like turning off the tap while we brush our teeth, turning off the tap while washing the dishes and turning on the tap again when we are going to rinse them, because all that waste of water is our responsibility, because we just cannot imagine the amount of unnecessary litres that we are losing, litres that luckily still flow when you turn on the tap.” (ECES6\_SDG12)*

Student teachers consider that awareness should be raised regarding the protection of water so that marine species are less harmed, since they are dying because of the rubbish, dirt and toxicity in the water (SDG14). People must be aware of the fact that the life cycle of the marine fauna must be respected and that fishing products must be consumed responsibly (SDG14). Furthermore, public awareness on the protection of the quality of water should be enhanced, as polluted water is detrimental to people's health, given that it is used for the irrigation of crops for human consumption (SDG2, SDG3, SDG12, SDG15), especially young people, who should have a balanced and healthy diet (SDG3). That water is used to grow our food, which is then consumed by humans.

*“... in my opinion our customs and the habits that we often have pollute too much the quality of water; these activities have a very serious impact on our health; besides, we need good quality water, especially young people, since a good quality of water at that stage is like a balanced and healthy diet.” (EPES9\_SDG3)*

*“There are many areas where water can no longer be used, not even for irrigation, because it is polluted.” (ECES6\_SDG15)*

In the case of the marine environment, awareness should be raised on the importance of keeping the sea clean, so that human beings are able to supply themselves with the food available in this ecosystem (SDG2, SDG3, SDG12, SDG14).

*“We are seeing that many species are dying, because of us. We take marine animals out of the seas for our enjoyment, we see animals entangled in plastic, eating plastic, and that also affects us because if the fish eat plastic, then you eat that fish; there is a pollution chain.” (ECES7\_SDG14)*

Moreover, awareness should be raised on the need to control water consumption in terms of quantity, as it also affects people’s health and nutrition (SDG2, SDG3). That is, make people realise that our bad habits lead to the deterioration of the quality of crops, due to the fact that less water is diverted to them.

*“Then, how are they going to grow anything without water for irrigation?” (EPES3\_SDG2)*

The awareness of water conservation can be approached from the perspective of anthropocentrism (out of selfishness) or because of ecocentrism (altruism). The important thing is to take action, given that, without water, living beings cannot exist. They consider it important to create awareness in society about the current problems of water globally and to fight so that future generations will incorporate strategies for the protection and conservation of water and the environment in their daily routine (SDG2, SDG3, SDG6, SDG11, SDG12, SDG13, SDG14, SDG15).

*“I believe that a culture based on a commitment to the protection and conservation of our environment and, above all, of water, must be instilled in human beings. Under an explanation (to some extent, altruistic or selfish) based on the fact that without water in optimal conditions it will not be possible to enjoy a quality life as we know it today.” (EPES6\_SDG14)*

*“Water should be protected for altruistic reasons, so as not to endanger the animals that live in those ecosystems, not to pollute the water, not to contribute to accelerating climate change . . . However, human beings are selfish, at least a large number of them, so the best way to raise awareness is to make them see that they are a harm to themselves and the way in which everything they do affects them directly because not all of them think that what they are doing is somehow harmful or they think that, as they are the only ones who do it, there will be no consequences.” (ECES5\_SDG11)*

Student teachers affirm that the protection of the marine environment is a matter that concerns all of humanity. Therefore, it is not achieved individually, but collectively, which is referred to as global awareness (SDG14). People should be made aware that water regulates global warming (SDG13), provides us with a great source of vitamins (SDG3), keeps us hydrated (SDG3), gives life to plants (SDG14, SDG15) and thereby increases the amount of oxygen, which is essential to live (SDG3). That is, this planet is not only inhabited by humans; there are also other living beings on land or in the sea that need clean water to survive.

*“It is something that affects us all, and not only human beings, but also all species on the planet. Therefore, it is in everyone’s best interest to make good use of it, for our own good, because life would end, . . . ” (EPES5\_SDG14)*

*“We all need water because of the food chain, that is, if plants do not survive, herbivorous animals will die, and then carnivores and humans.” (ECES3\_SDG15)*

### 3.4. Impact of People’s Unsustainable Habits on Themselves: Health and Economy

#### 3.4.1. Impact of People’s Unsustainable Habits on Their Health

Student teachers perceive that water resources are necessary and vital for human life, since it hydrates, nourishes, removes impurities and toxins from the body, is a source of

food (essential for the development of biodiversity) and enables us to stay healthy (SDG2, SDG3, SDG12).

*“... water serves important purposes such as the following: removes toxic substances from the kidneys, keeps the mouth and eyes moist, regulates body temperature; transports, through the blood, oxygen and nutrients.” (EPES4\_SDG12)*

They believe that all water resources are polluted to some degree (oceans, rivers, clouds, etc.). Consequently, they perceive that water is unsafe because it is contaminated by the presence of living organisms that are harmful to our body, or elements that are toxic to humans (SDG3). Thus, the tap water we consume is not completely potable, as the bacteria, viruses or microplastic particles that it could contain would enter the body of the consumer (SDG3, SDG6). Therefore, just as the health of people can be adversely affected by drinking water, so too can the health of plants and animals (SDG14, SDG15). Then, when they are ingested as food, they may increase health problems (SDG 3, SDG6, SDG12). This is aggravated by the consumption, on a daily basis, of food products that require the use of water in their processing (SDG 3, SDG6, SDG12).

*“Drinking unsafe water can pose a very serious risk to human health. It can cause diseases such as cholera, dysentery, typhoid fever or polio, among others.” (ECES7\_SDG3)*

*“... the excessive use of chemical substances that, due to natural causes, enter the waters and animals and people drink, cause chronic diseases and may even cause death in some cases.” (EPES3\_SDG11)*

*“... we are affected by the simple act of pouring us a glass of water, since in that minimum amount of water there is already a certain level pollution, and if we find it in the water it may already be present in the drinks and soft drinks we consume, in the bread, pasta, etc.” (EPES6\_SDG12)*

*“It is necessary to always preserve the pristine quality of water, since the animals that inhabit it are our food; we need them to live in the best possible conditions to ensure a healthy diet, free from elements that are toxic for our body.” (ECES3\_SDG12)*

In relation to access to food, it is found that as the quality of water decreases, the supply of certain marine foods is being prohibited due to their high toxicity (SDG2, SDG3, SDG12). Moreover, we are destroying the habitats and causing the death of many marine species due to the waste we generate. Due to this reduction of biodiversity, the variety of food available to us is constantly decreasing (SDG2, SDG12). Therefore, student teachers also highlight that bathing in beaches or rivers may be banned in the near future due to the toxicity of the waters and the danger it entails for human health (SDG3, SDG12).

*“Also, the waste that enters the sea is very harmful to it since marine animals eat it and can choke on it, so it causes that we lose marine species.” (ECES3\_SDG3)*

*“We are interested in protecting our seas because they are a necessary source of energy, as are other elements of nature.” (EPES3\_SDG12)*

*“If this continues, bathing in the beach will end up being prohibited. Actually, in summer we came out of the water several times because there were oil spills and people said that they were toxic to humans.” (ECES5\_SDG2)*

The coastal marine environment seems to be a matter of particular concern to student teachers (SDG14). They consider that some of the factors behind water pollution that adversely affect our health include the wastewater that is generated by urban homes or industries and enters the seas, or oil spills caused by accidents during transportation (SDG3, SDG6, SDG11, SDG12, SDG14). This waste is ingested by the marine life found in the aquatic environment, damaging the entire food chain until it reaches us and, therefore, affecting the food supply of most living beings on the planet. As a result, human beings are consuming the waste they generate themselves and discharge into the marine environment (SDG3, SDG6, SDG12, SDG14). In addition, the environment is being degraded due to a decrease in the well-being of marine and terrestrial species (SDG14, SDG15).

*“As well as ingesting some kind of marine animal; if it has consumed large amounts of the plastics or toxic substances that we dump into the sea, be it oil, large amounts of waste or even radioactive products, these will also enter people’s bodies.” (EPES4\_SDG12)*

*“... if we end up polluting all water, we will end not only with marine species of all kinds, but also with our own lives.” (ECES4\_SDG14)*

*“... disposing of products that contain industrial toxic wastewater.” (EPES6\_SDG15)*

*“Pesticides, which are also released into the water, are a risk to human health, since these toxic substances, in addition to accumulating in fish, remain as sediment coatings on sand, rocks, algae, etc.” (ECES3\_SDG6)*

*“The fish we eat can be contaminated with substances discharged into the sea; which is very dangerous, since we will later consume those fish.” (EPES2\_SDG6)*

### 3.4.2. Impact of People’s Unsustainable Habits on Their Economy

Our informants consider that the water problem affects the global economy, and vice versa. Water is a natural resource that is used as the raw material for many products (hygiene, beauty, etc.). Water access restrictions would make products more expensive, and that would have an impact on society. The moment this primary resource cannot be used, many economic sectors will go bankrupt or will raise prices exorbitantly. Therefore, they believe that water conservation implies a reduction in the investment of economic resources (e.g., water purification) (SDG11, SDG12), an improvement in water quality (SDG6), or greater access to it and other products or foods (SDG2, SDG3, SDG12). In the case of the five main economic sectors, it would provide economic stability and job security for the primary sector activities (such as agriculture or fishing) (SDG3, SDG12), which would have an impact on the secondary sector and, consequently, on the remaining sectors.

*“Water is also important for the construction of houses, for the cosmetic sector, such as in colognes, lotions, etc.” (ECES3\_SDG2)*

*“Water quality is very important; if the seas are polluted, you cannot fish or water the plants; then, how do people working in fishing or agriculture subsist? That sector will fall first. The economy will plummet.” (ECES9\_SDG3)*

*“If water is polluted, we will not be able to consume any kind of food that comes from the sea since animals ingest toxic waste, and this will lead to a decline in the economic condition of many fishermen.” (EPES9\_SDG11)*

Individually, water conservation not only affects our health, but also our domestic economy.

*“If water is unsafe, we will consume more water.... And not only will it benefit our health, but also our pockets by spending less money on water.” (ECES8\_SDG12)*

## 4. Discussion

Student teachers understand that there is an environmental problem in relation to water caused by human behaviour [4]. Contrary to what has been found in other studies, where trainee teachers show a lack of ability to relate water use to the negative impact on their environment [67,68], in the present study, our results show that they do have a relational ability. Thus, they think that people perform certain daily habits that affect water, in such a way that they are detrimental to it (negative impact). In order to avoid this, a number of measures can be taken to change these habits, among which an awareness of water issues stands out. This can be achieved from an altruistic perspective towards the environment, which includes the biodiversity or physical–chemical factors (for example, climate change or sea water). However, it can also be achieved from a selfish perspective, that is, for our own benefit.

It can be said, therefore, that they are aware that water conservation is essential, since it is necessary for any activity and for the survival of both human and other living beings [3]. Thus, a good water quality makes it possible for organisms such as phytoplankton to

generate oxygen, which is vital for our health or the protection of the ozone layer. Likewise, they understand that a balance must be sought between our well-being and that of natural resources in order to find equilibrium among all living beings [30].

On the basis of the perception that student teachers have concerning the unsustainable habits adopted by people, the negative impact that these habits have on water, and the aspects people should be aware of in order to improve their behaviour under a sustainability social responsibility, it has been confirmed that they do not limit water issues to water-related problems only. As in the Solis study [1], students seem to have a broad concept of sustainable development where aspects of human development as well as care for the planet are addressed. There are other aspects too, which, if we focus on the Sustainable Development Goals (SDGs), would be linked to the alleviation of hunger (SDG2), good health and well-being (SDG3), access to clean water and sanitation (SDG6), sustainable cities and communities (SDG11), responsible production and consumption (SDG12), an appropriate climate for the planet (SDG13), the marine ecosystem (SDG14) and the terrestrial ecosystem (SDG15). However, in contrast to what Solis [1] found, students do consider the conservation and sustainable use of oceans, seas and marine resources (SDG 14).

Among the habits with a negative impact on water, there is the excessive and unsustainable use of water, which is left running without being used while carrying out household chores (tooth brushing or improper use of household cleaning appliances). As in other studies, students do not usually have information about the water footprint, a useful tool to know how much water is consumed [71]. In another sense, as in other studies, water pollution is one of the environmental problems that most concerns them [33,71]. Moreover, waste is usually not properly sorted, and it is dumped in the wrong place (such as the sea or other environments) or thrown into objects that are connected to a sewage system that collect all the wastewater that will end up entering the sea (toilet paper, cleaning products or used cooking oil). As can be seen, as in other studies, waste is an environmental problem of great interest [32,71]. There is also an excessive consumption of products that generate waste that ends up in the marine environment, such as the widespread use of batteries. This also occurs as a result of industrial production, in which hazardous or polluting products and waste are generated and later used in other sectors (pesticides, transgenic seeds, etc.). However, in relation to water quality, the action that was most frequently mentioned in the responses provided by student teachers is the excessive consumption of plastic and its impact on the marine environment.

Studies show that trainee teachers perceive the scarcity of natural resources as one of the biggest problems worldwide, but water pollution is hardly considered as a problem [66]. However, in our study, regarding water quality management, as it is more and more degraded, it is necessary to invest a higher amount of resources, which makes it more expensive. Thus, access to water is becoming more restricted. Another water-related issue is caused by global warming, resulting from a greenhouse effect that is melting the polar ice caps, which are disappearing, while the water from the different water bodies is evaporating. This corresponds with other studies where climate change is considered one of the most worrying problems [71]. In the case of the marine environments, the salt concentration is increasing, which is changing the environment where certain species live, which forces them to migrate. Natural species, in general, are becoming extinct. All this is aggravated by an unequal distribution of water, which further limits access to food.

In the case of the sample under study, as they live in a coastal urban area with high migration, they attach special importance to the coastal marine environment that nourishes and is nourished by the urban environment. Apart from the above, some more examples specific to the marine environment will now be described. They are environmentally conscious, considering that they think that the generation of waste that is not properly sorted leads to the pollution of the sea, as it decomposes slowly in that environment. That reduces the marine diversity, which is our source of resources, and destroys the seabed, which adversely affects the access to the quantity and quality of the marine diversity. That is affecting our health and access to food, in addition to having a negative impact on marine



living beings; in contrast to other studies, students are concerned about marine biodiversity and its consequences [1].

Some of the aforementioned behaviours and impacts have been identified in other studies [50,57,59–64], although the number of research studies focusing on students, or other types of population, is limited. Unlike other studies [78], this work argues that students are not superficial, though their knowledge and perception of this situation could be improved.

## 5. Conclusions

The perception that our informants have of sustainable development, related to the subject of water, is related to human development and care for the planet, linking it to eight SDGs, being so diverse as to include aspects for the development of people (SDGs 2 and 3), prosperity (SDG 11) and the planet (SDGs 6, 12, 13, 14 and 15). From the University, their implementation in higher education is a commitment as an alliance such as those established with universities (SDG 17) [2].

Given that protecting the quantity and quality of water provides us with a basic resource in our lives that determines the economy and access to other resources, it would be of interest to study the relationship between water issues and the eradication of poverty (SDG1), decent work and economic growth (SDG8) or the reduction of inequalities (SDG10), and specially, how human behaviour influences all of them through water conservation. Due to the fact that the access to water resources is fundamental in our daily lives, a series of social and individual conflicts emerge that must be solved at the individual, collective or institutional level. It is also worth assessing the impact of water on peace, justice and strong institutions (SDG16). Nevertheless, it should be kept in mind that education is an essential pillar of sustainable development as a tool that favours the change towards pro-environmental behaviours, as repeatedly reported in the literature [16–19,30,32,33,38,39,44,49,54,78]. It should not be forgotten either that quality education on sustainable development can favour pro-environmental behaviours (SDG4). As in other studies and following one of the principles of sustainable development, natural resources are everyone's right, including water [70].

According to our view, it is essential to conduct further research that involves professionals working in education, whether formal, non-formal or informal, especially teachers or social educators, since they are agents of social change in terms of sustainable development who provide the knowledge and awareness that people require to become more pro-environmental [11,33,34]. Furthermore, in the case of teachers within governments where education is compulsory, they are professionals who can reach out to society as a whole during a large part of their lives, which is decisive for the rest of it.

We believe that it is not only the unconscious identification of the SDGs by the interviewees that is important for the knowledge and development of the importance of water, but also that they form part of the curriculum in a conscious way and that they are promoted from the disciplines taught in higher education at the infant and primary education levels, both at a conceptual and procedural and attitudinal level through innovations such as seminars, workshops, talks, excursions and awareness-raising through intervention projects, in both curricular and extracurricular practices [1,32,33,79].

This work is only the beginning of an identification of the SDGs and the water issue. However, the link with the SDGs should be extrapolated to other environmental issues and socio-environmental conflicts. In this way, their inclusion as a teaching subject should be promoted in the training of future teachers, so that they, in turn, train the minds of the future in schools.

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## Appendix A

**Table A1.** Identification of the Sustainable Development Goals (SDGs).

SDG Designation	Description
SDG2	Zero Hunger
SDG3	Good Health and Well-Being
SDG6	Clean water and Sanitation
SDG11	Sustainable cities and communities
SDG12	Responsible consumption and production
SDG13	Climate action
SDG14	Life below water
SDG15	Life of land

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