Eco-schools in Portugal and the factors that most influence the environmental performance of schools

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Abstract

United Nations defined sustainable development as a "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". With the aim to produce generation after generation of sustainably minded, eco-thinking and environmentally conscious people, Eco-Schools program was created and funded in 1992, being nowadays worldwide spread crossing the five continents. Eco-Schools act in two areas: 1) in the building infrastructure and operation; and 2) in the target public behavior and eco-consciousness and environmental values. The aim of this study is to evaluate the Eco-Schools' environmental and behavior performance through audits results analysis from Portugal.

The Interreg Sudoe project ClimACT intends to promote the transition to a low carbon economy in schools and some educational institutions enrolled in the Eco-Schools program during 2015/2016 were considered, as a previous diagnosis to ClimACT. The following inclusion criteria were defined: (i) application of the environmental audit model used in the Eco-Schools program; (ii) available data regarding the mandatory topics. The database of the Eco-Schools platform was used to gather information on environmental audits. For the sociodemographic characterization, the information provided by the schools in the enrolment form in the Eco-Schools program was also considered.

The environmental audits consider topics such as: waste, water, energy, outdoor spaces, biodiversity, organic farming, food, forest, sea, mobility, noise and environmental management. According the analyses a total of 1439 educational institutions are in Eco-Schools program, including private and public schools, and social solidarity private institution, involving more than 432000 students from different ages, since kindergarten, 1st cycle, 2nd cycle, 3rd cycle, high school, vocational education and higher education. Of those 1439 schools, 1132 performed the environmental audit according with the model used in the Eco-Schools program.

The participation of Portuguese schools differs according the region of the country and the educational level. The kindergarten and the 1st cycle are the educational levels with higher participation in the program, being the levels of education that were in the genesis of the Eco-Schools Program. The topics of energy, water and waste are the most significantly addressed in environmental audits because of their mandatory nature. These topics are also those that present a higher score, corresponding to an environmental performance more consistent with what is expected of a ClimACT' school.

1. Introduction

Climate change has had an impact on civilization throughout history. Droughts, floods, heat waves, cold spells and other extreme events have had implications both economically and socially. Survival, including some civilizations, has been called into question as a result of climate change (Heim, 2015).

The implementation of a Low Carbon-Economy (LCE) in cities, by incorporating complementary approaches such as energy efficiency, sustainable transportation, green procurement, resources conservation and behavioural change, conducts to important environmental, economic and social benefits and contributes for the greenhouse gas emission reduction and for the accomplishment of the 7th Environment Action Program objective "to safeguard the Union's citizens from environment-related pressures and risk to health and well-being" (European Union, 2013). Meanwhile, the Roadmap 2050 suggests that, by 2050, the EU should cut its greenhouse gas emissions to 80% below 1990 levels (European Climate Foundation, 2010).

United Nations defined, in 1987, sustainable development as a "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Buckler and Creech, 2014). In this way it is crucial to cultivate a more environmentally conscious approach in people lives, to promote sustainable business practices and the protection of our valuable natural resources (UNESCO, n.d.). To achieve this purpose, Education for Sustainable Development (EDS) becomes crucial as a catalyst for a transition in education, teaching, learning and professional development towards more holistic, integrative and critical ways of tackling sustainability issues (Buckler and Creech, 2014). EDS is internationally recognized as a fundamental education strategy to prepare citizens with the values and principles of sustainable development, the knowledge of sustainability issues, and the skills and motivation to apply this knowledge to their own actions at local, national, regional and global levels (Mathar, 2015; UNESCO, n.d.).

With the aim to produce generation after generation of sustainably minded, eco-thinking and environmentally conscious people, Eco-Schools program was created in 1992, being nowadays worldwide spread crossing the five continents. Eco-Schools act in two areas: 1) in the building infrastructure and operation (e.g.: energy and water consumptions); and 2) in the target public behavior and eco-consciousness and environmental values (Hens et al., 2010; Pauw and Petegem, 2013).

To summarize the importance of Eco-Schools role, according to Foundation for Environmental Education (FEE), this program is developed in order to "ensure young people have power to be the change for sustainability that our world needs by engaging them in fun, action-orientated and socially responsible learning" (Foundation for Environmental Education, 2016a).

The conditions of a school's building and classrooms, as well as existing resources, and desired in the context of sustainable development, can be an important area of action and reflection for students. Through the development of concepts such as the management and sustainable use of resources and incorporating dialogue on these matters with the governing bodies of schools and academic communities, students can develop relevant skills to make their own lifestyle sustainable and replicable in school context (Mathar, 2015).

Considering the previous approach, ClimACT project (www.climact.net) aims to promote the transition to a LCE in schools by developing and implementing methodologies to support school's managers, energy and environment players and students in the identification of smart solutions for schools management. The novelty of this project is the global approach of the methodology considering collaboration with scientific, technology and business initiatives, the development of integrated decision support tools, the design of new business models and the development of holistic, comprehensive and technology-assisted educational platform for active learning (Lage et al., 2017).

1.1. Eco-Schools

The Eco-Schools Program is a program dedicated to environmental education, sustainability and citizenship that FEE has implemented in several countries since 1994 (Cincera and Krajhanzl, 2013; Hens et al., 2010). The principle of Eco-Schools program is to encourage newer age group, extendable to kindergartens to universities, to engage in their environment by allowing them to actively protect it, at school and at the community, attributing them decision-making capabilities for environmental management policies of their schools, steering them towards certification with being awarded a Green Flag. Besides the known life-long positive impact on the lives of young people, this program influence their families, school staff and local authorities transferring to them eco-values and knowledge (Foundation for Environmental Education, 2017, 2016a; UNESCO, n.d.).

To ensure the success of the implementation of this program in educational institutions, in each institution an Eco-team is created having the mission to analyse the school environmental management, plan, design and

monitor changes, and share their experiences with the local community (Foundation for Environmental Education, 2017). The process implies the adoption of seven steps, a methodology with a series of carefully engineered measures to help schools maximize the success of their Eco-Schools ambitions. The method should involve all individuals from the school community, with students playing a primary role in the process and includes: (i) an Eco Committee, which is the driving force behind the Eco-Schools process and will represent the ideas of the whole school; (ii) an Environmental Audit, that will help the school to identify its current environmental impact and highlights the better and the worst; (iii) the Action Plan, that is the core of Eco-Schools work and should be developed using the results of Environmental Audit; (iv) Monitoring and Evaluating, to find out if targets set out in the Action Plan are being, or not, successfully achieved; (v) Curriculum Work, because increase the status of the program and linking Eco-Schools activities to the curriculum ensures that Eco-Schools is truly integrated within the school community; (vi) Inform and Involve, because actions should not just be confined to the school; (vii) Produce an Eco Code, which is a statement that represents the school's commitment to the environment (Foundation for Environmental Education, 2016b; Keep Northern Ireland Beautiful, 2016). During the process, educational institutions should apply a checklist form where environmental and behavioural aspects are questioned allowing to obtain an initial characterization of the institution regarding this issues in the moment of accession to the program and its desired evolution (Foundation for Environmental Education, 2016b).

According to Cincera and Krajhanzl (2013) this program brings a positive effect in three areas: 1) positively influences school management and status, 2) helps to develop selected proenvironmental competences, 3) improves the quality of the school curriculum, teacher's competence and effectiveness of the school management.

1.2. Characterization of the Eco-Schools program

In 2016, Eco-Schools program crossed worldwide covering 64 countries from the five continents, where, according to FEE (2016), is registered a total of 49000 schools, 1300000 teachers, 17000000 students involved and 83 eco-campuses. Figure 1 shows the worldwide distribution of the previously mentioned categories:

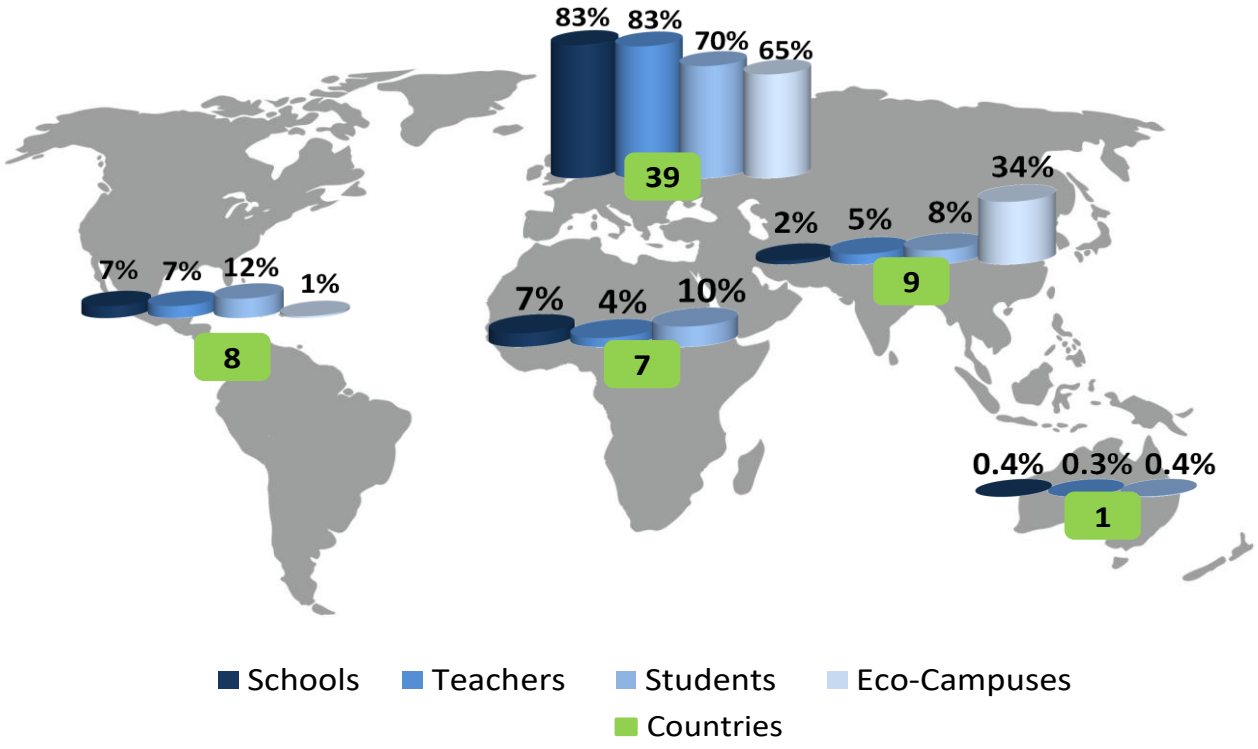

Figure 1. Eco-Schools program influence worldwide.

According to the available data, Denmark, Germany, Greece and the United Kingdom with the support of the European Commission, were the firsts European countries (and worldwide) to join to Eco-Schools program, in 1994. Following, the other first countries and dates of accession in other continents were Tanzania and Kenya (Africa) in 2003, Puerto Rico (America) in 2006, Japan (Asia) in 2008, and Australia (Oceania) in 2014. At the end

of 2016, Europe, Asia America, Africa and Oceania have a total of 39, 9, 8, 7 and 1 countries respectively involved in Eco-Schools program (Foundation for Environmental Education, 2016a).

In Portugal the Eco-Schools program is coordinated by a non-profit organization, the Associação Bandeira Azul da Europa (ABAE), dedicated to Education for Sustainable Development and to the management and recognition of good environmental practices, acting at international, national, regional and school level, and its implementation has already twenty years of history (Associação Bandeira Azul da Europa, 2016).

The main goal of this study is to identify and analyse the main factors that contribute to the environmental performance of Eco-Schools in Portugal, considering the topics in the checklist form used in the audit, in order to evaluate the institutions eco-behaviour along the period of accession to the program.

2. Methodology

To achieve the main goal defined in the present study, educational institutions enrolled in the Eco-Schools program during the 2015/2016 school year were considered. The following inclusion criteria were defined: (i) application of the environmental audit model proposed by ABAE and used in the Eco-Schools program; and (ii) available data regarding, at least, mandatory topics (waste, water and energy).

The database of the Eco-Escolas platform, managed by ABAE, was used to gather information regarding environmental audits. For the sociodemographic characterization of the sample, the information provided by the schools in the enrolment form in the Eco-Schools Program was also considered.

The environmental audit model proposed by the ABAE, as already mentioned, evaluates twelve dimensions or topics, namely: waste, water and energy, outdoor spaces, biodiversity, organic farming, forest, sea, mobility, noise, food and environmental management. Each of these dimensions, whose score can vary between 0 (worst case scenario) and 65 (ideal scenario for the topic "food"), is composed of a different number of variables that presupposes its observation and evidence during the audit (Table 1). For each of the dimensions are also included variables that result from the application to the entire academic community of a behavioural questionnaire. To determine the environmental performance of schools, and for each of the dimensions, the observed compliance rate was calculated, and values vary from 0 (0%) for the worst score verified (0) and 1 (100%) for the ideal score (depending on topic).

TOPICS	NUMBER OF VARIABLES	MAXIMUM SCORE
Waste	19	51
Water	12	40
Energy	16	40
Outdoor spaces	14	35
Biodiversity	12	33
Organic farming	12	31
Forest	11	38
Sea	11	35
Mobility	14	40
Noise	7	23
Food	19	65
Environmental management	10	23
TOTAL	157	454

Table 1. Number of items and maximum score per topic.

3. Results and discussion

Along the school year of 2015/2016, all across the country, 20 districts participated in the Eco-Schools Program, with a total of 1439 educational institutions, including private and public schools, and private institution

of social solidarity, representing over 17% of Portuguese schools, involving more than 432000 students from different ages, since kindergarten, 1st cycle, 2nd cycle, 3rd cycle, high school, vocational education to higher education, distributed by 7 administrative regions of the Ministry of Education (Associação Bandeira Azul da Europa, 2016).

The participation of Portuguese schools differs according the region of the country. In the Center region is registered a higher adhesion, followed by the North and Lisbon and Tagus Valley (LTV) regions. The educational level is also unequal in all geographic area. For almost all the regions the kindergarten and the 1st cycle are the educational levels with higher participation in the Eco-Schools program.

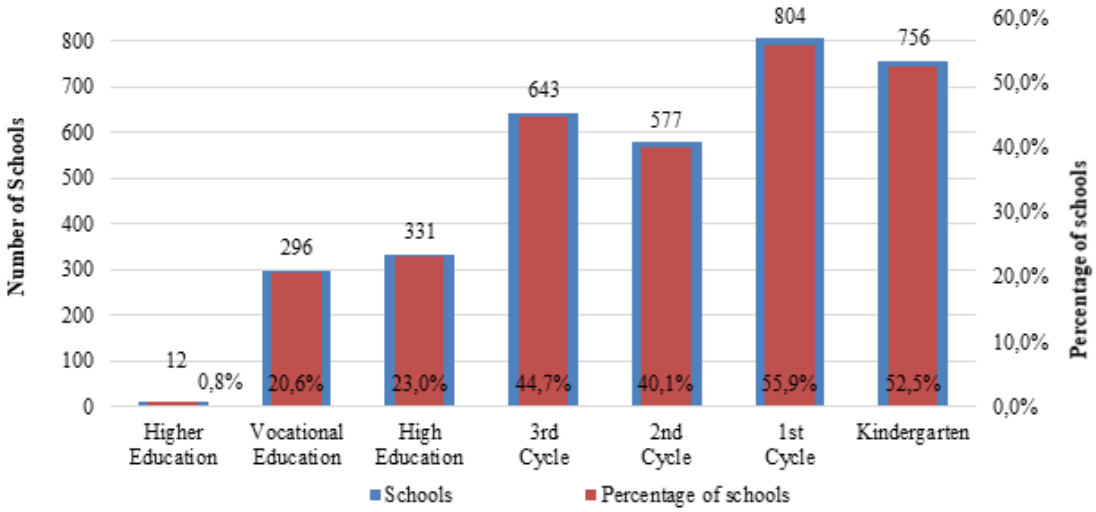

Figure 2. Number and percentage of schools with each levels of education.

Considering that each school can contemplate several levels of education, it is understandable the reason why more than 50% of the 1439 schools have kindergarten and 1st cycle. These are, in fact, "integrated" schools. The same situation can be observed in schools that teach 1st, 2nd and 3rd cycles, schools that teach the 2nd and 3rd, schools that teach the 3rd cycle and the high education and, finally, high schools that cumulatively have vocational courses.

In Portugal, schools participating in the Eco-Schools Program must work on three themes, common to all of them, namely: waste, water and energy. These themes, in addition to outdoor spaces, biodiversity, organic farming, food, forest, sea, mobility, noise and environmental management, are also addressed in environmental auditing (Associação Bandeira Azul da Europa, 2013, n.d.).

The environmental audit at the beginning of the school year (for diagnostic purposes) is mandatory, and many schools carry out a new audit at the end of the school year to evaluate the effectiveness of the measures implemented and contemplated in the Action Plan. Other schools make this assessment when conducting the environmental audit at the beginning of the next school year. Schools, after the environmental audit, should upload the information to the online platform managed by ABAE (Associação Bandeira Azul da Europa, n.d.).

From the application of the previously presented methodology, and taking into account all the defined inclusion criteria, 1132 of the 1439 schools performed the Environmental Review according to the model proposed by ABAE.

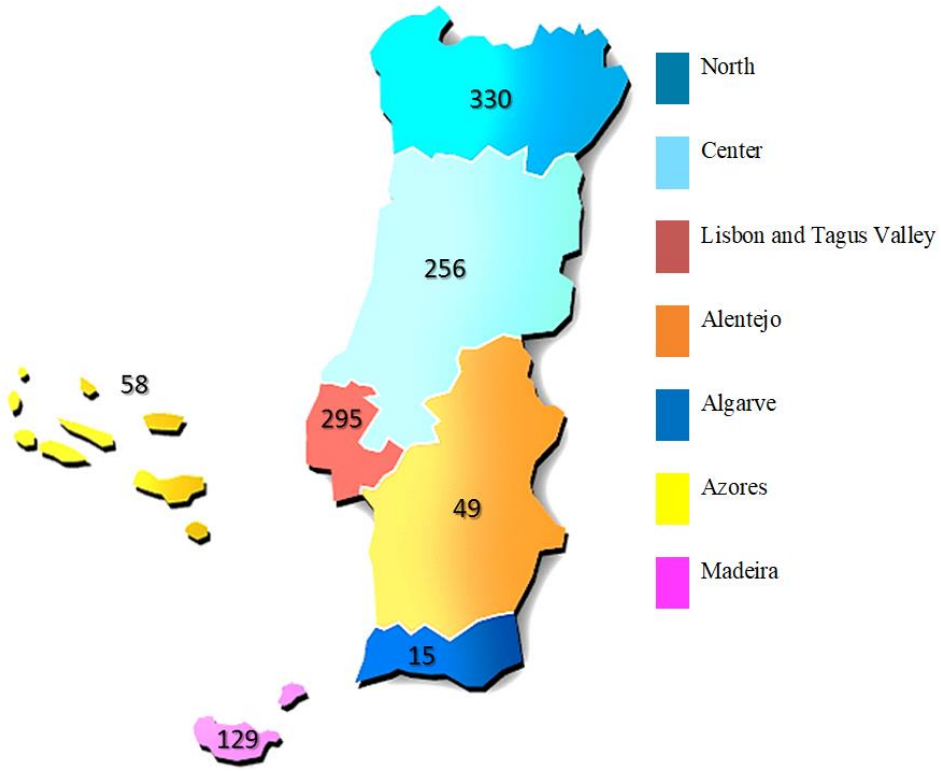

Figure 3. Educational institutions under study, distributed by region. Adapted from (Associação Bandeira Azul da Europa, 2016).

With a higher participation rate, the district of Porto, in the Northern Region, stands out with 15.5% (n=175), the district of Lisbon, in the Region of Lisbon and Tagus Valley, with 14.4% (n=163), the Autonomous Region of Madeira with 11.4% (n = 129) and the District of Aveiro, in Central Region, with 10.2% (n=116).

Pre-school education (n=753) and basic education, including the 1st, 2nd and 3rd cycles (n=742, n=489 and n=515, respectively) are the levels of education more participate in the Program. However, for the proper interpretation of these results, it is important to bear in mind that in Portugal many of the educational establishments are integrated, which means that the same school may have different levels of teaching associated. It should be noted that all pre-school institutions have adopted the environmental auditing model proposed by ABAE. However, given the large number of pre-school establishments registered on the platform, there are likely to be many misunderstandings in the submission of data, with many schools declaring all levels of teaching under the same administration (in Portugal, the same governing board is responsible for the administration of several schools of different levels) and not just the existing levels of education in schools enrolled in the Eco-Schools program.

Regarding the type of funding of the schools under study, the great majority are public schools, receiving funding directly from the state budget (Figure 4).

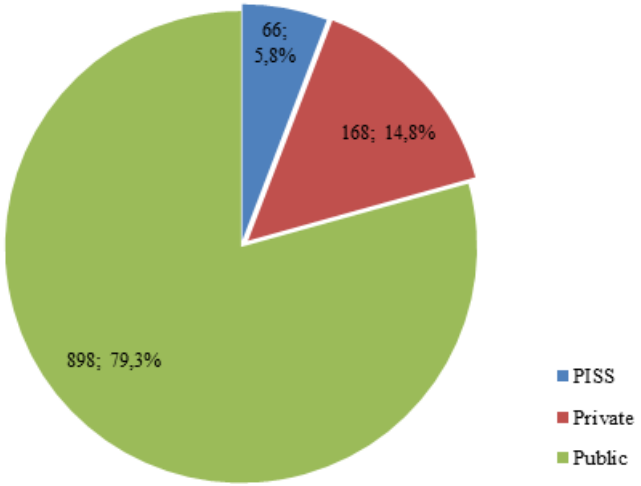

Figure 4. Distribution of schools per type of financing support.

According to Figure 5, over the last 20 years of implementation of the Eco-Schools program in Portugal, only six schools, from the schools that meet the requirements for inclusion in the study, have received the Green

Flag throughout the years. In opposite situation are twenty-five schools that have not yet received any awards, which means they are participating for the first time in the Eco-Schools program. Of the 1132 schools, 41.87% (n=474) received five or fewer flags and only 3.00% (n=34) received fifteen or more Green Flags, which means that they have been implementing the methodology associated with Eco- Schools for 15 or more years.

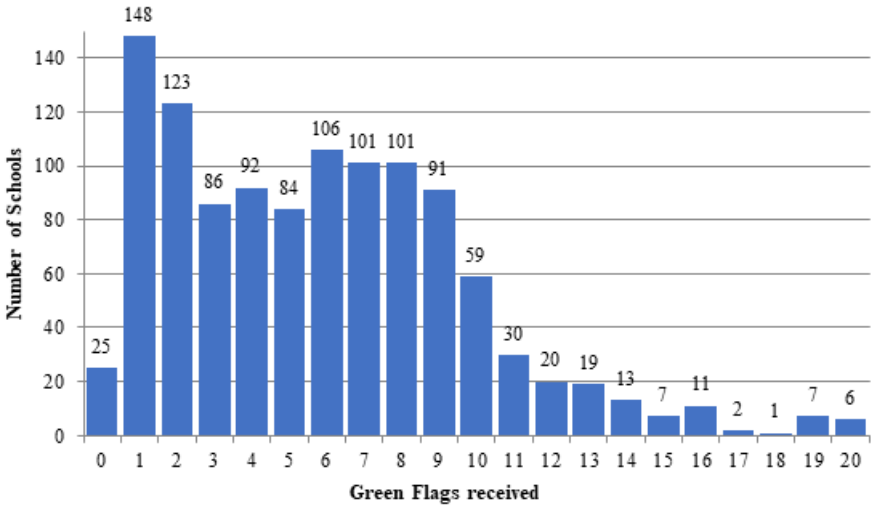

Figure 5. Distribution of schools per Green Flags received.

In relation to the success rate associated to each of the topics evaluated in the environmental audit model proposed by ABAE (Table 2), it is verified that the highest values, with a performance rate of over 60%, are associated with the topics "Water" (62.76%), "Waste" (67.54%) and "Energy" (69.21%). The lowest performing topics are, respectively, “Biodiversity” (34.29%), “Sea” (32.88%), and “Mobility” (30.517%). The overall success rate related to the environmental performance of schools has a low value (below 50%), which indicates a very significant improvement potential.

The positive result referring to the topics "Waste", "Water" and "Energy", may be associated to the fact that they are mandatory topics, with a more rigorous verification of the parameters to be evaluated. In the same way we may be faced with negligent verification (or an effective negative result) of the remaining topics.

		Waste	Water	Energy	Outdoor Spaces	Biodiversity	Organic Farming	Forest	Sea	Mobility	Noise	Food	Environmental Management	Total Rate of Success
Rate of Sucess	Mean	.6754	.6276	.6921	.5387	.3429	.4924	.4048	.3288	.3051	.4296	.4916	.4935	.4955
	N	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132
	Std. Deviation	.17091	.14776	.16405	.29100	.24758	.28449	.31733	.30910	.24207	.32382	.25632	.33617	.17586

Table 2. Rate of success in each topic assessed in the environmental audit proposed by ABAE.

In the topic "waste", about 65% of schools have an average of less than 25 students per undifferentiated waste bin and about 72% with an average of less than 50 students per selective collection bins. 59% of the participating schools say they have paper containers in all or almost all classrooms and 55% say they have bins for the selective collection of other types of waste (glass, plastic, etc.) in all or almost all other rooms or school spaces (direction, secretarial, stationery, library, bar, etc.), these being the variables that, with specific respect to schools, contributed more to the positive result of this topic.

Regarding "water", the fact is that schools with water losses in the building network are rare, either by faulty faucets or by malfunctioning cisterns, with approximately 85% of schools reporting having very few or no leaks (faucets, pipes and valves). On the other hand, about 73% of schools report that rainwater is not stored for later use, compensating this situation by irrigating green areas in the less hot periods (75%) and ensuring that there is no waste of water in irrigation (85%).

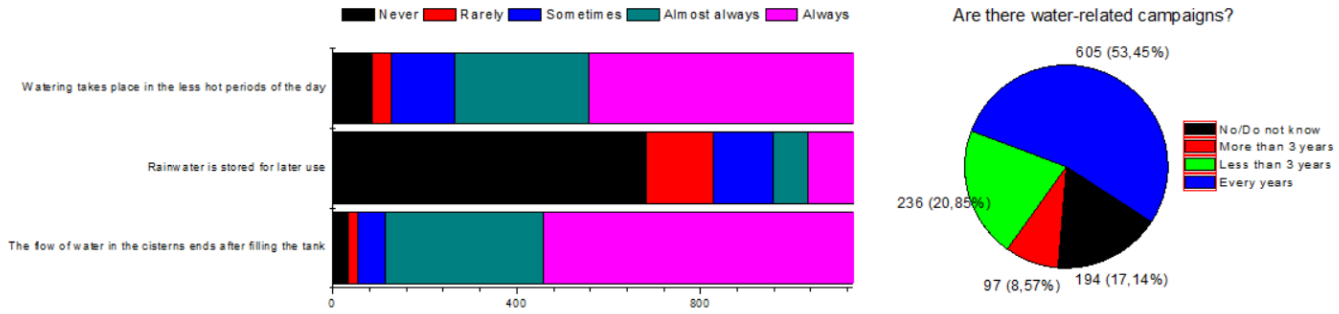

Figure 6. Results of some specific items of water topic

On the topic of "energy", 52% of schools make use of energy-saving light bulbs and 53% have well-caulked exterior windows and doors, thus reducing energy consumption due to thermal losses. Only 43% report having double glazing, thus contributing to the reduction of noise from outside, but also ensuring better thermal insulation, but about 77% say that the hot water tanks and their pipes are properly insulated. Only 23% of schools report using energy from alternative sources (solar, wind, or other).

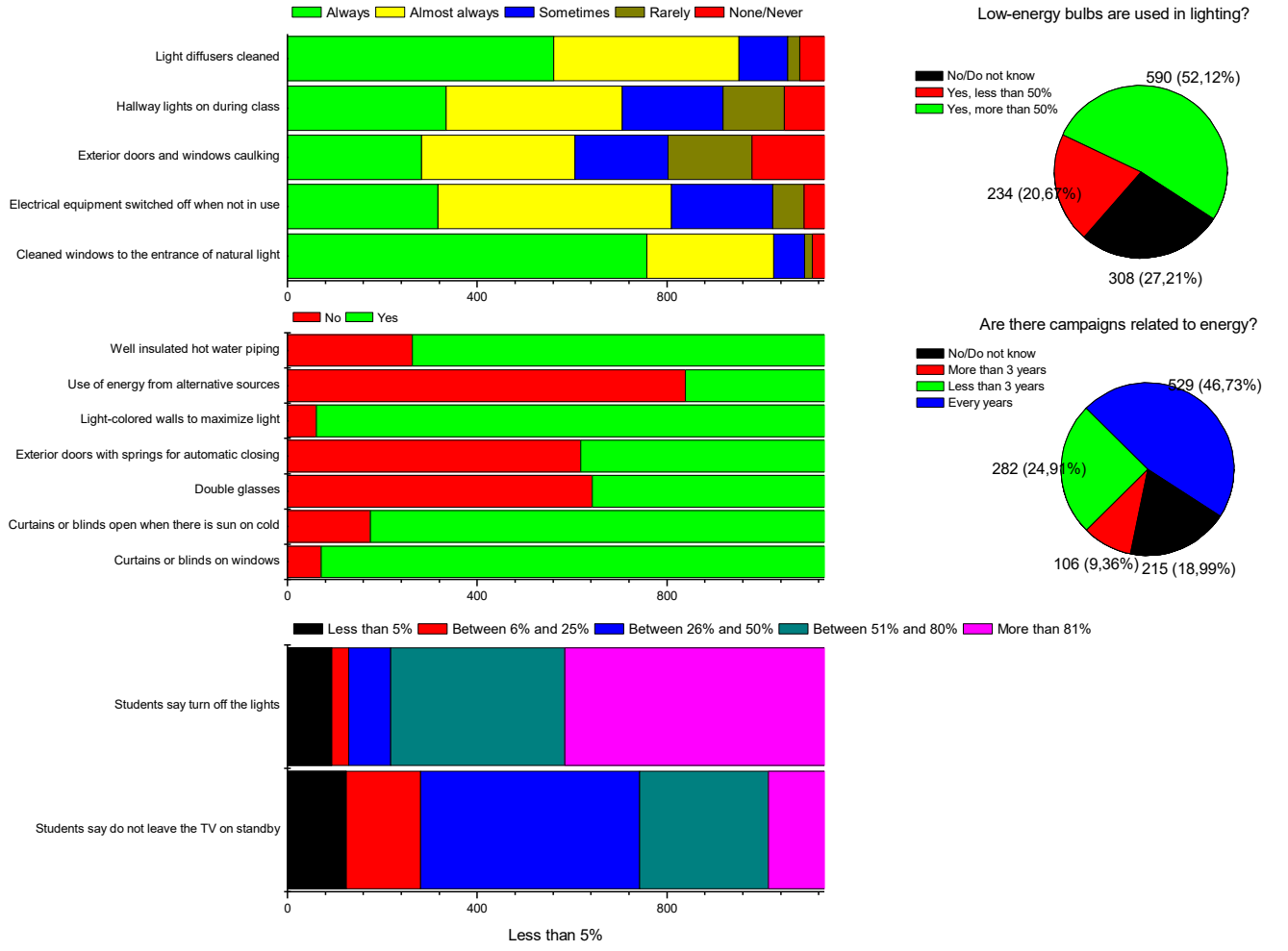

Figure 7. Results of some specific items of energy topic.

According to Table 3, Alentejo and Algarve are the regions with the best overall results (54.62% and 51.47%, respectively) compared to the other regions. The regions of the North and Lisbon and Tagus Valley have a negative performance, being also the regions with the largest number of participating schools, as already observed by the analysis of Figure 3.

Taking into account only the mandatory topics (waste, water and energy), the Algarve region is the one with the best performance, with the North region and the Lisbon and Tagus Valley regions as well, maintaining the lowest success rate. Looking more closely at the plot results, the Alentejo region, which has a lot of agricultural activity, has the best results associated with the topics "Biodiversity", "Organic Farming" and "Forest". The Algarve region, where tourism activity, with a strong connection to the sea is relevant, presents the best result for the topic "Sea", followed by Azores and Madeira.

An overall analysis of Table 3 allows us to observe that, as in the analysis of Table 2, the mandatory topics are those that present the best success rate in all regions of Portugal, thus contributing to the result associated with the total success rate.

		Waste	Water	Energy	Outdoor Spaces	Biodiversity	Organic Farming	Forest	Sea	Mobility	Noise	Food	Environmental Management	Total Rate of Success
Alentejo	Mean	.6883	.6051	.6786	.6227	.4397	.6136	.4656	.2904	.4658	.5031	.5451	.5519	.5462
	N	49	49	49	49	49	49	49	49	49	49	49	49	49
	Std. Deviation	.23024	.20501	.22488	.27280	.26054	.24341	.30920	.30536	.24873	.32897	.21691	.32466	.19949
Algarve	Mean	.7059	.6683	.7533	.5105	.3232	.4624	.3947	.5486	.3950	.4957	.3600	.5710	.5147
	N	15	15	15	15	15	15	15	15	15	15	15	15	15
	Std. Deviation	.10637	.10414	.10127	.30138	.26160	.29931	.33686	.29539	.23265	.32194	.28687	.28787	.18503
Center	Mean	.6926	.6464	.7158	.5467	.3688	.4841	.4654	.2985	.3248	.4494	.5115	.4601	.5097
	N	256	256	256	256	256	256	256	256	256	256	256	256	256
	Std. Deviation	.19273	.15947	.17594	.29352	.25854	.28487	.33020	.30478	.24719	.33138	.26231	.34738	.18447
LTV	Mean	.6522	.6196	.6768	.5467	.3337	.4738	.3902	.3399	.3120	.4388	.5122	.5077	.4939
	N	295	295	295	295	295	295	295	295	295	295	295	295	295
	Std. Deviation	.14496	.14154	.15350	.26674	.22570	.28355	.29327	.30578	.23155	.30134	.22717	.30127	.16380
North	Mean	.6626	.6230	.6733	.5222	.3281	.4757	.3621	.2818	.2719	.3813	.4778	.4659	.4725
	N	330	330	330	330	330	330	330	330	330	330	330	330	330
	Std. Deviation	.17499	.14793	.16574	.29925	.24690	.28545	.31691	.29068	.24137	.32165	.25955	.34757	.17263
Azores	Mean	.6599	.6250	.7224	.5187	.3501	.5211	.4106	.4729	.2806	.4663	.4284	.5652	.5030
	N	58	58	58	58	58	58	58	58	58	58	58	58	58
	Std. Deviation	.17088	.11022	.15761	.27648	.24925	.28565	.32177	.30908	.21537	.32778	.26992	.32750	.16628
Madeira	Mean	.7256	.6252	.7126	.5269	.3129	.5389	.4031	.4084	.2748	.4412	.4637	.5345	.5048
	N	129	129	129	129	129	129	129	129	129	129	129	129	129
	Std. Deviation	.13394	.12772	.12782	.32713	.25977	.28474	.32942	.33215	.24003	.35100	.29105	.36350	.18265

Table 3. Rate of success in each topic assessed in the environmental audit proposed by ABAE per region.

Regarding the form of financing and management of educational establishments and their environmental performance, public schools perform negatively, while private schools, as well as PISS, show a positive result, albeit slightly higher than 50% (Table 4).

Attention is drawn to the fact that Portugal has been subject to a financial bailout, with all the economic and budgetary constraints that this situation entailed, thus justifying less investment in schools and in public schools in particular.

		Waste	Water	Energy	Outdoor Spaces	Biodiversity	Organic Farming	Forest	Sea	Mobility	Noise	Food	Environmental Management	Total Rate of Success
	Mean	.6848	.6746	.7367	.5481	.3558	.5352	.4350	.3823	.2667	.4684	.5347	.5020	.5210
PISS	N	66	66	66	66	66	66	66	66	66	66	66	66	66
	Std. Deviation	.18340	.12804	.14420	.31282	.25928	.29167	.30446	.32242	.23936	.33754	.26346	.33411	.18926
	Mean	.6856	.6519	.7321	.5656	.3817	.5123	.4695	.4340	.3472	.5318	.5181	.5352	.5369
Private	N	168	168	168	168	168	168	168	168	168	168	168	168	168
	Std. Deviation	.15022	.12718	.13908	.28685	.24154	.27225	.29158	.31783	.22883	.29805	.25291	.31208	.17441
	Mean	.6728	.6196	.6813	.5329	.3348	.4856	.3905	.3052	.3001	.4077	.4835	.4851	.4859
Public	N	898	898	898	898	898	898	898	898	898	898	898	898	898
	Std. Deviation	.17367	.15162	.16812	.29014	.24737	.28605	.32151	.30213	.24396	.32384	.25606	.34040	.17400

Table 4. Rate of success in each topic assessed in the environmental audit proposed by ABAE per type of financing support.

Equally interesting information concerns the overall success rate (and parceling) given the number of years that schools have implemented the Eco-Schools program (or the Green Flags received). For most topics, the lowest values were recorded by schools that are first in the program. The greater discrepancy between the average score of the schools that are first in the program and the average score of all schools was found in the topic of "Environmental Management" with the 25 schools with zero Green Flags showing a score of 25.04 % of success, against the 49.45% verified as mean value for all schools. For all topics, as well as for global success, these schools have always lower

results than the others, with negative success rates. The only topics where the success rate is not negative are the mandatory topics ("waste", "water" and "energy"). Institutions that have participated in the Eco-Schools program for more years are in the opposite situation, with higher success rates.

Looking at Table 5, where the correlation (Pearson's correlation) between the number of students directly involved in the Eco-Schools program is presented, either because they are part of the Eco-Schools Council or because they participated in the activities promoted by the schools, the number of Received greens, and the success rates related to the topics evaluated in the environmental audit proposed by ABAE, there is a positive and statistically significant correlation for most variables, except for the correlation determined between the number of students involved in the Eco- Schools in each of the schools, with the topics "waste", "water" and "energy", as well as the total success rate. This result indicates that there are better results in smaller schools with fewer students compared to larger schools and where more students are involved in activities and decision processes. On the other hand, and considering the results related to the obligatory topics, and taking into account this requirement, it may be the coordinating teachers to assume the entire environmental audit process, relegating the students to other activities.

Another equally important issue concerns the correlation between the different topics and the total success rate, which shows that the obligatory topics, although they had better results (Table 1), have a weaker positive correlation than the others, indicating that there is a strong contribution of the "secondary" topics in the total success rate.

Table 5. Pearson's correlation between students involved, green flag won (number of years involved in the Programme), and all the success rates related to the topics evaluated.

		Students involved	Green Flag	Waste	Water	Energy	Outdoor Spaces	Biodiversity	Organic Farming	Forest	Sea	Mobility	Noise	Food	Environmental Management	Total Rate of Success
Students Involved	Pearson Correlation	1	.160**	-.054	-.028	-.017	.041	.097**	.024	.080**	.086**	.119**	.039	.050	.056	.066*
	Sig. (2-tailed)		.000	.068	.353	.579	.172	.001	.428	.007	.004	.000	.195	.094	.061	.027
	N	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132
Green Flags Received	Pearson Correlation	.160**	1	.209**	.179**	.163**	.189**	.207**	.167**	.190**	.163**	.156**	.126**	.058	.278**	.234**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.053	.000	.000
	N	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132
Waste	Pearson Correlation	-.054	.209**	1	.657**	.678**	.351**	.341**	.466**	.334**	.250**	.218**	.218**	.273**	.359**	.567**
	Sig. (2-tailed)	.068	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132
Water	Pearson Correlation	-.028	.179**	.657**	1	.703**	.308**	.334**	.388**	.339**	.273**	.198**	.214**	.247**	.327**	.535**
	Sig. (2-tailed)	.353	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132
Energy	Pearson Correlation	-.017	.163**	.678**	.703**	1	.345**	.322**	.387**	.341**	.280**	.264**	.279**	.314**	.360**	.576**
	Sig. (2-tailed)	.579	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132
Outdoor Spaces	Pearson Correlation	.041	.189**	.351**	.308**	.345**	1	.612**	.518**	.593**	.455**	.552**	.616**	.451**	.644**	.769**
	Sig. (2-tailed)	.172	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132
Biodiversity	Pearson Correlation	.097**	.207**	.341**	.334**	.322**	.612**	1	.518**	.721**	.548**	.619**	.630**	.462**	.574**	.795**
	Sig. (2-tailed)	.001	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000
	N	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132
Organic Farming	Pearson Correlation	.024	.167**	.466**	.388**	.387**	.518**	.518**	1	.474**	.344**	.417**	.411**	.274**	.493**	.653**
	Sig. (2-tailed)	.428	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000
	N	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132
Forest	Pearson Correlation	.080**	.190**	.334**	.339**	.341**	.593**	.721**	.474**	1	.598**	.599**	.638**	.442**	.625**	.808**
	Sig. (2-tailed)	.007	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000
	N	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132
Sea	Pearson Correlation	.086**	.163**	.250**	.273**	.280**	.455**	.548**	.344**	.598**	1	.560**	.624**	.402**	.526**	.709**
	Sig. (2-tailed)	.004	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000
	N	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132
Mobility	Pearson Correlation	.119**	.156**	.218**	.198**	.264**	.552**	.619**	.417**	.599**	.560**	1	.724**	.469**	.590**	.750**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000
	N	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132
Noise	Pearson Correlation	.039	.126**	.218**	.214**	.279**	.616**	.630**	.411**	.638**	.624**	.724**	1	.486**	.634**	.776**
	Sig. (2-tailed)	.195	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000
	N	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132
Food	Pearson Correlation	.050	.058	.273**	.247**	.314**	.451**	.462**	.274**	.442**	.402**	.469**	.486**	1	.448**	.685**
	Sig. (2-tailed)	.094	.053	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000
	N	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132
Environmental Management	Pearson Correlation	.056	.278**	.359**	.327**	.360**	.644**	.574**	.493**	.625**	.526**	.590**	.634**	.448**	1	.775**
	Sig. (2-tailed)	.061	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000
	N	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132
Total Rate of Success	Pearson Correlation	.066*	.234**	.567**	.535**	.576**	.769**	.795**	.653**	.808**	.709**	.750**	.776**	.685**	.775**	1
	Sig. (2-tailed)	.027	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	
	N	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132	1132

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

4. Conclusion

Regarding the study in analyses, the participation of schools differs according the region and the educational level. The kindergarten and the 1st cycle (primary school) are the educational levels with higher participation in the Programme (levels of education that were in the genesis of the Eco-Schools Programme).

The topics of energy, water and waste are the most significantly addressed in environmental audits and these topics are also those that present a higher score, corresponding to an environmental performance more consistent with what is expected of a ClimACT' school.

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References

Associação Bandeira Azul da Europa, 2016. Programa Eco-Escolas: relatório 2016. Lisbon.

Associação Bandeira Azul da Europa, 2013. Guia de Auditoria Ambiental. ABAE, Lisbon.

Associação Bandeira Azul da Europa, n.d. Guia Eco-Escolas. ABAE, Lisbon.

Buckler, C., Creech, H., 2014. Shaping the future we want: UN Decade of Education for Sustainable Development (2005-2014): final report. Paris.

Cincera, J., Krajhanzl, J., 2013. Eco-Schools: What factors influence pupils' action competence for pro-environmental behaviour? J. Clean. Prod. 61, 117–121. https://doi.org/10.1016/j.jclepro.2013.06.030

European Climate Foundation, 2010. ROADMAP 2050: A Pratical Guide to a Prosperous Low-Carbon Europe.

European Union, 2013. Decision n.º 1386/2013/EU of the European Parliament and of the Council. Off. J. Eur. Union 354, 171–200.

Foundation for Environmental Education, 2017. Eco-Schools HandBook: Engaging the youth of today to protect the climate of tomorrow, 1st ed. Copenhagen.

Foundation for Environmental Education, 2016a. Eco-Schools [WWW Document]. URL http://www.ecoschools.global/ (accessed 8.5.16).

Foundation for Environmental Education, 2016b. Seven steps — Eco-Schools [WWW Document]. URL http://www.ecoschools.global/seven-steps/ (accessed 2.5.18).

Heim, R.R., 2015. An overview of weather and climate extremes – Products and trends. Weather Clim. Extrem. 10, 1–9. https://doi.org/10.1016/j.wace.2015.11.001

Hens, L., Wiedemann, T., Raath, S., Stone, R., Renders, P., Craenhals, E., Richter, B., 2010. Monitoring environmental management at primary schools in South Africa. J. Clean. Prod. 18, 666–677. https://doi.org/10.1016/j.jclepro.2009.11.001

Keep Northern Ireland Beautiful, 2016. Eco-Schools Northern Ireland Handbook.

Lage, J., Almeida-Silva, M., Canha, N., Almeida, S.M., 2017. Fostering low carbon economy in urban areas, in: Belo, D., Mendes, F., Canha, N. (Eds.), 1st Workshop C2TN: Radiation for Science and Society – Book of Abstracts. C2TN, Instituto Superior Técnico, Universidade de Lisboa, Lisboa, p. 45.

Mathar, R., 2015. A Whole School Approach to Sustainable Development: Elements of Education for Sustainable Development and Students' Competencies for Sustainable Development, in: de Amorim Soares, M.L., Petarnella, L. (Eds.), Schooling for Sustainable Development in Europe: Concepts, Policies and Educational Experiences at the End of the UN Decade of Education for Sustainable Development. Springer Netherlands, Dordrecht, pp. 15–30. https://doi.org/10.1007/978-94-007-1754-1

Pauw, J.B., Petegem, P. Van, 2013. The effect of eco-schools on children's environmental values and behaviour. J. Biol. Educ. 47, 96–103. https://doi.org/10.1080/00219266.2013.764342

UNESCO, n.d. Eco-Schools Programme | UNESCO [WWW Document]. URL https://en.unesco.org/greencitizens/stories/eco-schools-programme (accessed 2.1.18).