(Abstract 11)
Greek Universities Addressing the Issue of Climate Change

Constantina Skanavis
Professor
Department of Environment
University of the Aegean
University Hill
81100 Mytilene
Greece
E-mail: cskanav@aegean.gr

Aristea Kounani
PhD candidate
Department of Environment
University of the Aegean
University Hill
81100 Mytilene
Greece
E-mail: akounani@yahoo.gr

Ioannis Ntountounakis
Department of Environment
University of the Aegean
University Hill
81100 Mytilene
Greece
E-mail: giannisntountounakis@gmail.com.

Abstract

Nowadays, a great challenge, that most countries are struggling to assess, is the rapid change of earth's climate. At the same time, the sea level is constantly rising, floods and droughts are increasing and global greenhouse gas emissions continue to rise. Climate change (CC) is a wide world problem, which requires international partners, such as industries, educational institutions, individual citizens, in order an environmental and energy revolution process to be somehow initiated. Universities, as having the important mission of the education of world's future decision makers, can contribute to mitigating and adapting CC.
The purpose of this survey is to assess whether or not Greek universities have incorporated CC issue into their curricula and research efforts. Additionally, it is aimed to identify the outreach of the Universities to the society, meaning communicating through civic ecology procedures on global CC and its impacts on the region. Greece is a country that generates electricity by burning coal, in a high percentage, to cover citizens' energy needs. The results of this research could give information whether the higher educational institutions in Greece have given the appropriate attention to the issue of CC.

Keywords: Greek Universities, Greece, Climate Change, Higher Education

1 Introduction

Today, climate change is one of the greatest threats faced by humanity. This is because it has many implications for human survival. Man is an ecological being who needs a decent environment for effective and fruitful life (Offorrma 2014). The issues and challenges of climate change affect all people on the planet regardless of nationality, religion, profession as it interrelates with all aspects of life such as the economy, infrastructure, health, natural resources, transport and industry. Clearly, the prospect of adverse change of climate will not diminish in the near future. The dominant effect of climate change will be in different areas, especially in tropical and subtropical regions (Downing et al. 1997). Although scientists have long known that the emissions of greenhouse gases and changes in land use in an industrialized society bring relentless changes in climates and affect ecosystems, much of the theory and practice of how to modify the management of natural resources to address this threat is more recent (Young et al 2015). It becomes readily apparent that human activities are those that affect the climate. Anthropogenic climate change is likely to present new and largely unforeseen challenges for societies (Naess et al 2005). So the challenge posed by climate change cannot be skipped because it constitutes a significant threat to global economic growth. The impact of climate change on the economy is not a new phenomenon, but the effects on this are becoming more noticeable. Climate change has not only led to low agricultural production, but also destroys all other sectors of the economy such as tourism and the pace of industrialization (Huho 2015). A simple example of this is the droughts, which apart from agriculture have affected tourism and industry.

Climate change in the context of sustainable development requires a holistic approach that promotes a better quality of life in a long time frame, rather than a quality of life that aims at short-term profits (Bangay and Blum 2010). Climate change can be addressed with some intervention strategies.

The consequences of climate change have been recognized internationally as areas of concern, with two main lines of action: mitigation and adaptation (Fussel and Klein 2006).The mitigation most often refers to changes in anthropogenic behavior to reduce the extent of climate change. Adaptation strategies aim to reduce the severity of the adverse effects of climate change on vulnerable communities or infrastructure (Fussel 2005; Owen et al 2013).

Universities have an important role in implementing adaptation and mitigation of climate change (Adger et al. 2005). The purpose of this research is to assess whether or not Greek universities have seriously incorporated the climate change issue into their curricula and research efforts. Also it aims to examine the extent of the implementation of adaptation and mitigation, by giving emphasis in identifying the outreach of the Universities to the society, meaning communicating through civic ecology procedures, on global CC and its impacts on the region.

1.1 Adaptation to climate change

Adaptation to climate change is defined, as the adjustment in ecological, social or economic systems in response to observed or expected changes in climatic stimuli and their effects and impacts in order to alleviate adverse impacts of change or take advantage of new opportunities. (Adger et al. 2005).

Adaptation can involve both, building adaptive capacity, thereby increasing the ability of individuals, groups, or organizations to adapt to changes, and implementing adaptation decisions, i.e. transforming that capacity into action. Both dimensions of adaptation can be implemented in preparation for or in response to impacts generated by a changing climate. Hence, adaptation is a continuous stream of activities, actions, decisions and attitudes that informs decisions about all aspects of life, and that reflects existing social norms and processes. It can therefore be difficult to separate climate change adaptation decisions or actions from actions triggered by other social or

economic events. Some adaptations can be clearly identified as being triggered by climate change and those adaptations are often purposeful and directed. Clearly, attributing adaptations to climate change is not a simple process (Adger et al. 2005).
Actions associated with building adaptive capacity may include communicating climate change information, building awareness of potential impacts, maintaining well-being, protecting property or land, maintaining economic growth, or exploiting new opportunities. The objectives associated with implementing adaptation decisions are more likely to focus on reducing the cumulative impacts of climate change, ensuring that adaptive measures taken by one organization do not adversely impact upon others, avoiding anticipated adverse impacts of climate change, and ensuring that the distributional impacts of adaptation are minimized (Adger et al. 2005).

Even though climate change education is important to all education levels, from primary schools to universities, it is in the higher education sector that the need to tackle it in a systematic way is particularly acute. This is due to the fact that university students will soon pursue careers in science, education, law or engineering among others and hence need to be conscious of the impact their professions have both on the environment as a whole and on the climate in particular (Adger et al. 2005).

1.2 Civic Ecology and the benefits of the Civic Ecology approach

Civic Ecology is a framework for community resilience. It can be defined as the integrated web of energy, resources, financial, information and cultural flows and interactions that re-envisioned, created and managed by citizens acting for the common good within a geographically-defined community and its city-region. It is a human ecology of place, intimately integrating both natural and social/culture systems. In this framework, citizens are empowered to "own" their place and they know that they don't have to be a type of expert to impact their community's future. So, Civic Ecology is a framework that facilitates creation of a shared vision based on their knowledge of their place and their shared core values. This is really a different way of designing high standards environmental communities; it's a more resilient and humanistic approach. People without a technical background seem to understand the systems approach and get to know how to design community systems without any trouble and with very little training (IMCL 2016).

When citizens start designing this way they realize they can have greater control over their community resources. They can begin to see ways to reduce the negative impacts of current market forces with respect to energy, food, services, water and a list of other resources. Participating citizens are empowered to create and manage such communities. They can also turn around easier an ecological catastrophe, like the one due to climate change and its impacts.

Finally, Civic Ecology creates a living culture. By creating and managing local community systems we create the community's DNA, the basis for perpetuating the community from generation to generation. Citizens can create systems that address current problems, but they also have to create a living culture that is emergent and learns forward to address future problems (IMCL 2016).

1.3 The role of education at climate change implementation

The current global economic crisis and the major environmental problems have underscored the need for educational approaches, hat equip and empower people of all ages to deal with uncertain environmental, economic and political scenarios. If the role of education is to help learners of all ages to develop the knowledge, skills and capacities which enable them to think critically, to solve problems, and to address uncertainty, then the focus of climate change interventions should not simply be on new inputs/content (although these are also necessary), but also on more holistic ways of addressing climate change through high quality teaching and learning (Bangay and Blum 2010).

Environmental awareness and especially the part that concerns climate change issues have to be incorporated in all levels of education, from pre-school to university (Leal Filho 2010). Education plays a very important role in sustainable development and climate change. It is a tool that aims to increase public awareness and understanding of global environmental problems but also can contribute to a better and more sustainable future for the people and societies. The younger generation reflects the future citizens of society who will be called to confront the issues and impacts of climate change. Environmental degradation, increasing global poverty and climate change are just a few of the problems that mankind and especially the youth is called to provide solutions for. The first step in recognizing the importance of climate change in our lives is to imagine the influence of humans (Feher et al. 2010).

Education, including formal education, public awareness and training should be recognized as a process by which human beings and societies can fully realize their potential to quality of life. Education is critical for promoting sustainable development and improving the capacity of people to address the issues of environment and development (Bangay and Blum 2010). The role of education is recognized more and more intensely to solve the problems of climate change. Environmental education (EE) contributes to adaptation and mitigation measures. The objectives of EE are the increase of environmental knowledge, awareness and active participation (Skanavis and Petreniti 2006). Education for sustainable development seeks to achieve similar results, by allowing students to make decisions and choices promoting sustainable development (Bangay and Blum 2010). The literature reveals lack of scientific understanding of the processes of climate change within the wider public. The consequences due to absence of understanding tend result into ineffective mitigation actions, and possibly weakened support for government initiative on the issue (Huxter et al. 2015).

Climate change today is no longer the exclusive domain of scientific experts. It calls for action from all citizens. Higher education, in particular, has an important building role in educating students about climate change, and the link to the variety of social dimensions, including access to food, drinking water and sustainable energy. Previous studies show that environmental studies at university level can improve the environmental education of students (McMillan et al. 2004).

1.4 The role of universities in addressing the challenges of mitigation and adaptation

Although education on climate change issues is important at all levels of education is legitimate to focus on higher education, i.e. university level. This is because students will soon follow careers in science, education, technology and other sectors and should be aware of the consequences attached by their professional activities and decision making both on the environment and particularly on the global climate. The universities are needed to take initiative to address and provide answers to such problems of modern society, which relate to the sustainability of the planet and the survival of human life. Universities not only should they contribute to dissemination of knowledge but also by example they should set the standards to be followed. Universities themselves, have to become greener institutions. (Virtanen 2010). The overall objective of a university could be to achieve energy autonomy and be self-sustained. Activities dealing with students include the understanding of climate change. These will aim to further study climate and student participation in regional or international workshops, seminars and conferences (Carlin 2010). Institutions of higher education can promote social change (Virtanen 2010).

2 Case Study: Greek Universities

2.1 Methodology

2.1.1 Research Area

The study takes place in Greece, which has a population of 10,815,197 inhabitants. Greece with an extent of 131.957 km² has a relief characterized by the accumulation of many mountains. Only the 1/5 of the land consists of plains, usually surrounded by high mountains. Greece has a coastline about 13,676 km and more than 2,500 islands, but only 227 of which are inhabited (European Union 2016).

The generation of electricity in Greece comes from thermal power plants. In Western Macedonia region, 50% of total electricity is produced. Lignite is the significant domestic energy source, accounting for 53.15% of domestic production in 2011. Natural gas contributes a 28.3%. At the same time the aim to increase the electricity needs input from renewable energy resources has been set to reach 34% by 2020. In the same context, emphasis is placed on busting the use of gas in the energy consumption. In 2011, based on data for the Interconnected System, the 66.5% of the installed capacity of power plants are thermal power stations, including coal-fired 4930 MW, with 730 MW oil and gas 4579 MW. The 19.6% is composed of large hydroelectric plants and the 13.9% are units RES (RAE 2016).

2.1.2 Research Instruments

Greek Universities' web sites were checked in order to extract information whether or not they have incorporated CC issue into their curricula and research efforts. This investigation aimed to identify the Universities' community outreach, meaning communicating through civic ecology procedures on global CC issues and related local impacts.

All Greek universities were initially assessed through a qualitative research approach in order to have three out of them selected for further study. A group of 4 questions were sent by email to all Greek Universities, asking them whether or not the university has in its' curricula a course or a class on CC, whether or not it does research on CC, whether or not it is organizing CC seminars, meetings, conferences. Then, three Greek Universities were selected in order to be evaluated quantitatively in the above issues. These universities were the National and Kapodistrian University of Athens, the University of the Aegean and the Democritus University of Thrace. A questionnaire of 13 questions was sent by email, whose questions were related to: 1) the total number of undergraduate students, 2) the total number of post graduate students, 3) the total number of Ph.D. candidates, 4) the total number of undergraduate courses related with the CC issue, 5) the total number of post graduate courses related with the CC issue, 6) the total number of post graduate programs related with the CC issue, 7) the total number of researches' publications related to CC issue, 8) the total number of seminars, events etc, that the university is organizing concerning the CC issue.

2.1.3 Research Sample

In Greece Higher Education, is provided by Universities, Polytechnic schools and Technological Institutes. Moreover, in the academic year 1997-1998 an Open University was enacted, offering distance-learning opportunities. Higher University Education has been charged with the task of high scientific training of the future experts (HNARIC 2016). Today, in Greece 23 Universities are in operation and the total number of active students is about 221,942 for the year 2014-2015 (HSA 2016).

The National and Kapodistrian University of Athens, officially founded in 1837, is the first University not only of Greece but of the Balkan Peninsula and the Eastern Mediterranean region. It has got 8 Schools (School of Economics and Political Sciences, School of Education, School of Health Sciences, School of Law, School of Philosophy, School of Science, School of Theology and School of Physical Education and Sport Science) and 33 Departments (eg Law, Biology, Chemistry,

Geology and Geo-environment etc.). It is considered the largest university in Greece, with a total of 65,010 students (45,553 undergraduate, 11,479 postgraduate and 7,978 PhD candidates) in the current school year (NKUA 2016).

The University of the Aegean (UAegean) was founded in 1984 aiming to introduce new approaches in higher education in Greece and to promote regional development. Situated in 6 picturesque islands in the Aegean Archipelago, the UAegean offers a unique natural, cultural and human environment for modern studies in the ancient cradle of knowledge. In less than thirty years, the UAegean has evolved into an international research–oriented University offering 18 undergraduate (BA or BSc) and 28 postgraduate (MA or MSc) programs in modern interdisciplinary thematic areas such as environment, communication systems, cultural informatics, product design, food and nutritional sciences, education design and Mediterranean studies. In addition, the UAegean has established joined international postgraduate programs (i.e. in Biodiversity, Environmental Policy and Management, European Integration) as well as joined PhD degree programs in a wide range of thematic areas. The total number of students is 16,265 (13,947 undergraduate, 1,662 postgraduate and 656 PhD candidates) in the current school year (UAegean 2016).

Democritus University of Thrace (DUTH) was established in July 1973. The University plays an important role in strengthening the national and cultural identity of the region of Thrace, and contributes to the high level of education in Greece. The administration of DUTH is headquartered in Komotini, which is the capital city of the Administrative Region of Eastern Macedonia and Thrace. The DUTH is currently operating eight Faculties and nineteen Schools in four cities of Thrace - eight in Komotini, five in Xanthi, four in Alexandroupolis and two in Orestiada. Overall, 25,280 students are studying at DUTH (21,520 undergraduate, 2,046 postgraduate and 1,712 PhD candidates) in the current school year (DUTH 2016).

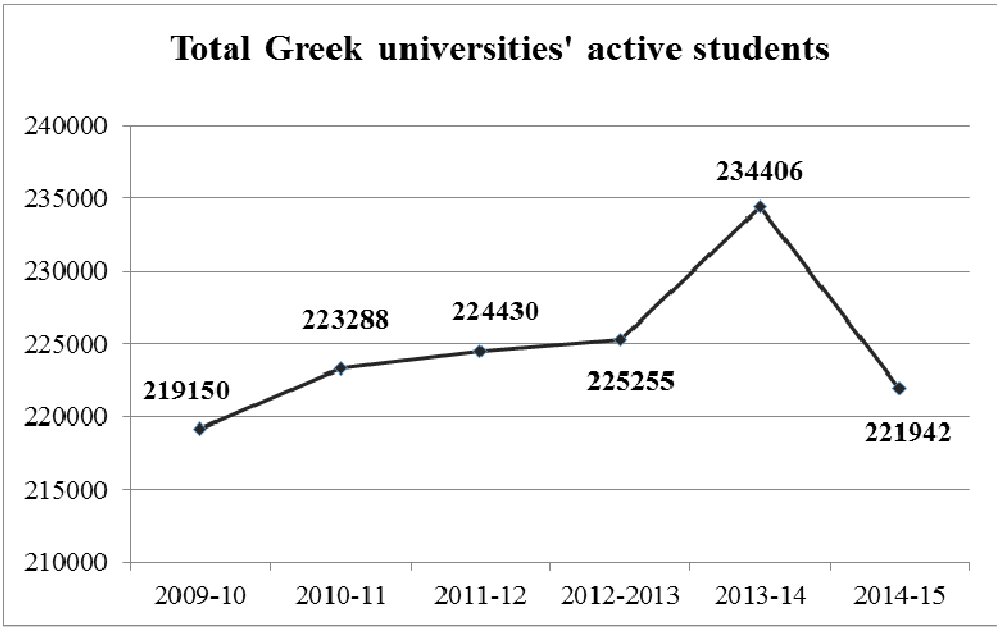
2.1.4 Research Limitations

The fact that only three Greek Universities were finally assessed, arises concerns as far as how accurate the findings are across the line. Geographic location, budget allocation and administrative obstacles could be causes that affect the sustainable policy implementation of a specific University.

2.2 Results

As the research has shown, Greece is a country where the Higher Education is well advanced in relation to the total population of the country. A research of Eurostat showed that, 1/3 of young people up to 24 years old, were university students in 2009. This is a percentage of 29.9%, while the highest in general in Europe was 27% (EUROSTAT 2014). The last years a further increase was noted in Greece (Figure 1) (HSA 2016).

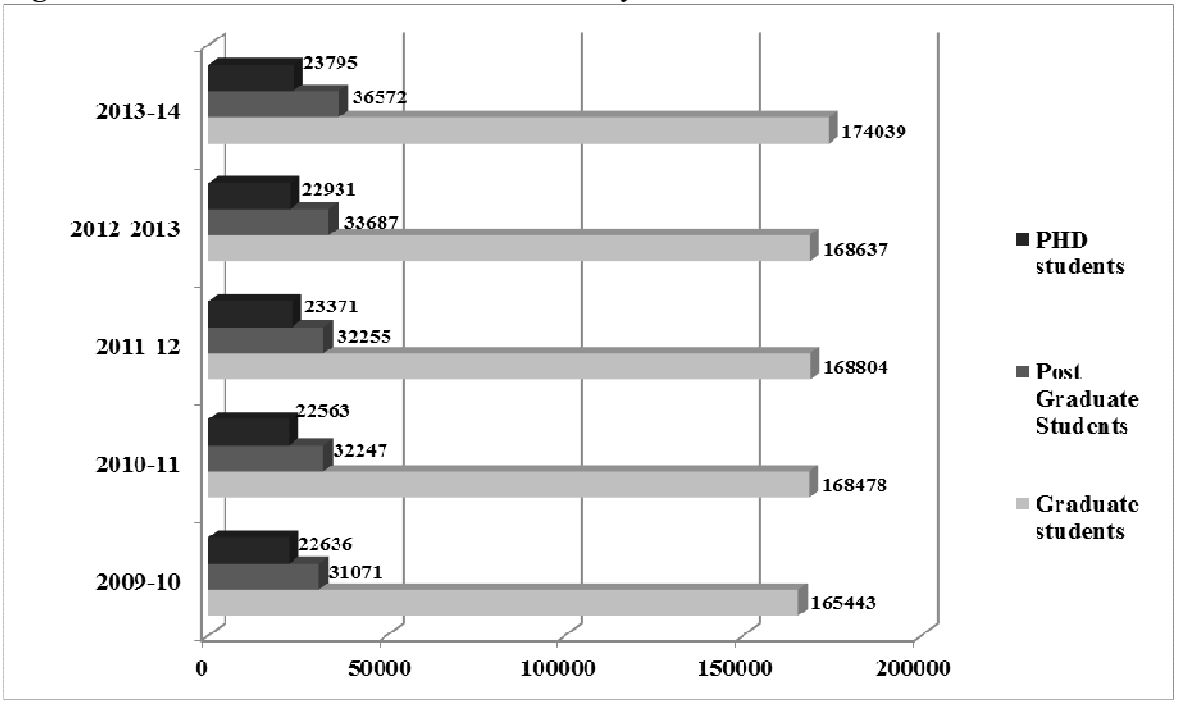
Figure 1.



Based on Data received by HSA

Post-graduate studies lead to the award of a diploma of specialization. Greek universities offer a total of 213 post-graduate courses. Only the Open University offers ten post-graduate courses (HNARIC 2016). Figure 2 presents the total number of students at the Greek Universities.

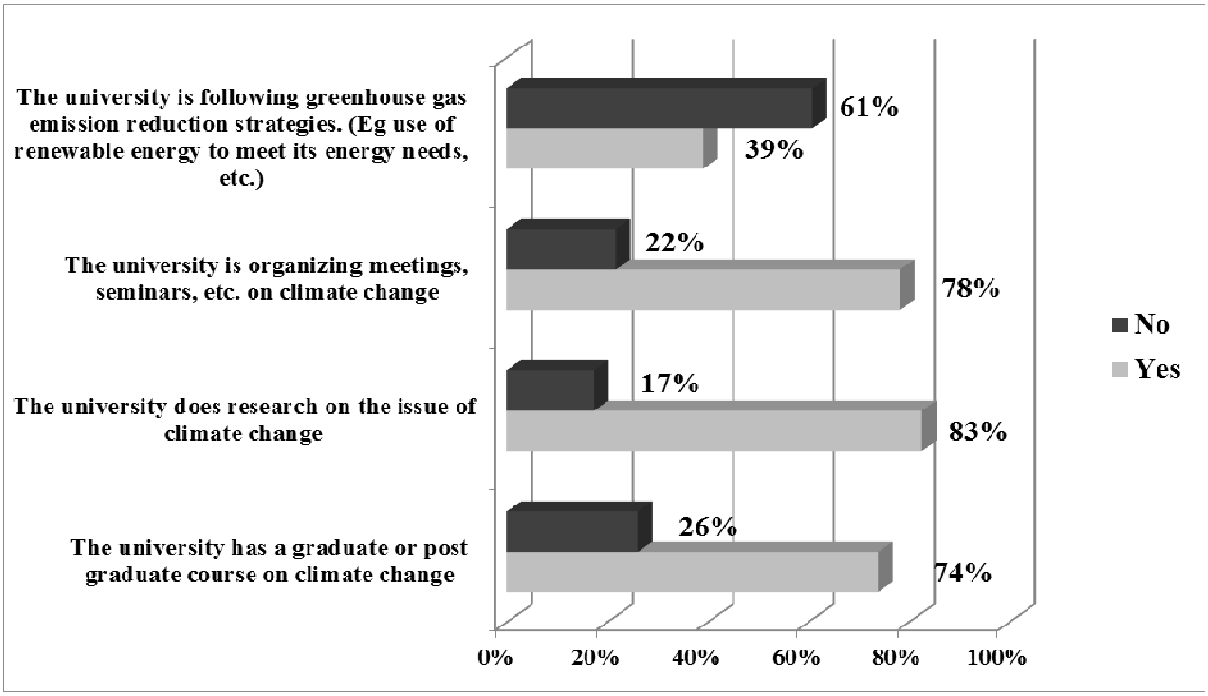
Figure 2. The Total Number of Greek University Students



Based on Data Received by HSA

In Figure 3 the answers to the questions that were emailed to the participating Universities are being presented.

Figure 3. Greek Universities' response



Based on Survey's Data

The Case of the National and Kapodistrian University of Athens (NKUA)

The university with the largest student body (65,010 students) is NKUA. The data have shown that out of the total number of 1979 undergraduate courses only 4 of them were related with the CC issue, which means a percentage of 0.2. At the post graduate level the percent becomes 0.58. The total number of the post-graduate programs is 110, and none of them is on the CC specifically, and only 5 (4.55%) have even courses related with the issue of CC.

Data based on Scopus, showed that in 2015, NKUA from the produced publications a 0.2% was related to the CC issue (SCOPUS 2016). NKUA organized a total number of 90 seminars, conferences and events, with 3 (3.33%) of them being related to CC, for the year 2015. One of the major outreach efforts was the 8th International Scientific Conference on Energy and Climate Change, which was held in Athens, in 2015.

The Case of the University of the Aegean (UAegean)

University of the Aegean has a fairly large student population (16,265) and offers 1278 undergraduate courses. Only 2 of the university's courses were related with the CC issue, which means a percentage of 0.156. At the post graduate programs' courses the percent of CC ones increased to 0.769. The total number of the post graduate programs is 40, and 1 of them is on the CC, which means a 2.5%. Out of the UAegaean's publications only a 0.7% was related to the CC issue (SCOPUS 2016). The University's outreach efforts through seminars, conferences and other events had 1 out of the 117 that took place, concentrating on CC topic, a percentage therefore of 0.85, for the year 2015.

The Case of the Democritus University of Thrace (DUTH)

This University with a student body of 25,280 and 1485 undergraduate courses has only 5 of them being related with the CC issue, which means a percentage of 0.33. At the post-graduate programs the percentage increases to 0.78. The total number of the post graduate programs is 28, and none of them is on the CC, and only a 3.57% has courses related with the issue of CC (DUTH 2016). Related to DUTH produced publications a percentage of 1.18 was related to the CC issue (SCOPUS 2016). Their outreach attempts based on civic ecology procedures on global CC, were on

the level of 1.11% of the total seminars, conferences and other events organized by the University (DUTH 2016).

3 Discussion

From the responses of the three participating universities, which cover the metropolitan area of Athens, the upper northern part of Greece and the island's geographic region, higher education in Greece, in its vast majority (74%) has incorporated CC issue into the curricula and research efforts. A total of 83% of the participating universities is involved on CC research. UAegean is the only one offering a post-graduate program related to the CC issue. The courses related to CC both at undergraduate and graduate levels happen to be quite low.

As Carlin said (2010), universities need to be more aware of their environmental impact and there are many things that they can do in order to strengthen sustainability processes. Also, Virtanen (2010) argued that institutions of higher education are indicators of changes in behavior, knowledge and practices in a society. Regarding the use of strategies to reduce greenhouse emissions, only the 39% of the Greek universities is following strategies that reduce its ecological footprint policy (Papaioannidou et al. 2016). The universities should be the leaders on efforts leading to reduction of greenhouse emissions. In addition, universities are charged with community outreach responsibility through civic ecology efforts. This would empower citizens to increase their level of resilience (Papaspiliou et al. 2014). A high enough participation (78%), of the assessed universities, is recorded in the spectrum of organization of organizing seminars, events, conferences etc. on CC, in order to spread knowledge and raise scientific awareness. However, the results indicate that out of their individual outreach efforts only a percentage of 3.33% is devoted by the NKUA on CC. This is lower (1.11%) at DUTH and even less (0.85%) at UAegean.

As these issues of intergenerational ethics, climate justice, and "deep" sustainability become more important in higher education, there is a critical need to find a place for them on Greek campuses—and in the arena of international university networks of collaboration. University research centers in environmental and sustainability education are particularly suited to carry out the task of envisioning and practicing the appropriate socio-ecological changes. It is suggested that environmental educational approaches supported by the national mechanism of each country could lead in reinforcement of their local initiatives (Ryan et al. 2010). Nomura and Abe (2010) revealed the significance of the governmental initiatives in enhancing education about sustainability. Policies and funding support by the government are considered critical points for strengthening sustainable development education in academia. It is also suggested that sustainability leadership support among senior management in university campuses is a key factor for continuing and enforcing environmental efforts (Normura and Abe 2010). Finally although most (83%) of the Greek Universities have in their curriculum sustainable development content and most of them have green campus procedures, only a 26% of them has a related university policy (Papaioannidou et al. 2016). This possibly explains why CC is not a top priority of the Greek universities' educational and research agenda.

4 Conclusions

It is articulated that universities could offer various innovative initiatives in education about climate change so as to strengthen understanding about the dimensions of sustainability (Ryan et al. 2010). As Greek universities have a great percentage of students studying at their campuses (almost 30% of young people), they could play a crucial role to the adaptation and mitigation of CC.

Since this research has given data about how the Greek Universities address the issue of CC, it could be a tool in the hands of the policy makers to change the whole policy of the implementation of this great global issue.

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Authors Biography

Constantina Skanavis is a Professor in Environmental Communication and Education at the Department of Environment, University of the Aegean, Mytilene, Greece. She is also the Head of the Research Centre of Environmental Education and Communication. She joined the University of the Aegean 15 years ago. Before that she was a Professor at California State University, Los Angeles; she has developed several courses on issues of environmental health and education. She currently teaches environmental education, environmental communication and environmental interpretation courses in undergraduate and postgraduate levels. She has numerous publications on an international basis and has given presentations all over the world.

Aristea Kounani is a PhD candidate in Environmental Communication and Education, and a senior researcher at the Research Unit of Environmental Communication and Education at the Department

of Environment, University of the Aegean, Mytilene, Greece. She also has a Master of Science degree in “Agriculture and Environment” and a degree as a Technician Agriculturist.

Ioannis Ntountounakis is an undergraduate student at the Department of Environment, University of the Aegean, Mytilene, Greece.