Climate Change Management

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Editor

Universities and Climate Change

Introducing Climate Change to University Programmes

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Foreword

It is widely acknowledged that universities can play a key role in helping to meet the various challenges posed by climate change. However, the means to do so are not always widely known, nor are there clear mechanisms via which matters related to climate change may be systematically included in university programmes. Part of the problem is due to the complexity which is inherent to climate change, but part of it is also due to the "tunnel vision" of many higher education institutions, which limits the handling of climate matters to a few subjects, without taking into account the whole picture.

Yet much could be gained by giving a proper and broader consideration to climate issues in university degrees, extension courses and projects at universities. No matter if we are speaking about global warming, sea level rise, anthropogenic or naturally induced climate change, there is a pressing need to properly inform and educate university students, so as to allow them to understand not only the direct facts and phenomena which are related to climate change, but also their social, economic and environmental impacts.

Overall, universities may help to foster a broader understanding of the challenges of climate change by:

- providing more adequate teaching programmes vis-à-vis the proper inclusion of matters related to climate change in teaching, beyond the traditional, technical subjects;
- ensuring a stronger emphasis on applied research into climate change which integrates technical issues with social and economic ones, hence opening up the way for a holistic understanding of the problem and its ramifications;
- fostering deeper involvement from students in the process of understanding climate change, from campus-based initiatives to the organization of climate-friendly events so as to allow universities to practice what they preach.

This book fills a long-standing gap in publications specifically focusing on the means via which climate change at university level may become a reality. It does so by listing various initiatives being undertaken at universities all around the world,

as well as by describing practical projects performed by a number of universities. By means of a combination of elements related to curriculum design, research methods, projects and case studies, it provides a unique overview of the subject matter of climate change at universities and describes some of the ongoing efforts to give it a more prominent position in university programmes.

Prepared in the context of the International Climate Change Information Programme (ICCIP), led by the Hamburg University of Applied Sciences, this publication will be very useful to all those interested in the handling of matters related to climate change at university level and in fostering a holistic awareness among students and staff about the meaning of and the need for a proper emphasis on climate change at universities.

Hamburg,
Winter 2009/2010 Prof. Walter Leal Filho

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Chapter 1
Climate Change at Universities: Results of a World Survey

Walter Leal Filho

Abstract This chapter presents an analysis of the extent to which climate change is being dealt with in the context of university programmes. It also describes the methodology used and the results obtained from the "World Climate Change Survey", a research initiative aimed at identifying the general level of awareness of and needs of university students about climate change in university programmes worldwide. The survey was specifically targeted at university students so that first-hand information on current practice can be gathered and reality-based suggestions can be made to address the identified problems and needs.

Keywords Curriculum · Research · Survey · Training · Universities

Introduction

Climate change is not only a problem limited to meteorology or geophysics. It is among the most significant challenges facing society today. Whereas it was in the past an issue whose discussion was mostly performed by a limited number of scientists, awareness about its strong social, political and economic implications means that it has evolved to become an issue of central relevance to both science and politics.

Similar to what happened to sustainability education in the past, education about climate change has now become a top priority. Indeed, instead of being regarded separately, climate change education and sustainability education need to be seen as closely related, with climate change at the *micro level* being regarded as a *unit* of sustainability education at the *macro level*. Any improvement seen in respect of awareness about climate change automatically leads to an increase in awareness about sustainability, since most matters are intertwined. The impact of human activities on ecosystems and the control in emissions of greenhouse gases are, for example, two of the many items which need to be better understood if long-term solutions for the problems posed by climate change are to be found.

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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. The objectives of climate change education at university level are numerous. They include the following components:

- The development of a broader knowledge among university students about the basic principles of climate change and the degree of contribution provided by the natural sciences, social sciences, economics, architecture, arts, etc. towards both the understanding of climate change and the complexity of problem-solving approaches related to it.
- The education of university students in the socio-economic issues (e.g. poverty, social justice, security) associated with climate change and to which governments need to find a solution in order to ensure the survival of people and habitats.
- The motivation of students to take action both during their time as students and, later on, as professionals.

One of the special features of climate change education is the fact that it fosters a broad awareness of the historical evolution of the problem and how it will affect future developments and society. It is therefore a field of work where lessons from the past may be useful in identifying the sorts of action expected in the future. Figure 1 illustrates some of the abilities students need to develop in order to fully understand the complexity of climate change.

Awareness of the issues outlined in Fig. 1 (whose list is by no means exhaustive) is important in the development of climate change education initiatives and in fostering the action needed to put the principles of climate change education into action (Leal Filho 2009).

- Awareness of about the connections between global and local events
- Understanding of the impact of geophysical events on local communities
- Envisioning the need for global, regional and local action against climate change
- Understanding of the role of policies in the climate change problem-solving process
- Acceptance of the need for climate change governance
- Consciousness of the need for mitigation and adaptation measures
- Critical overview of situations and contexts which exacerbate the impact of climate change
- Distinction between the role of global institutions and national governments
- Use of mental processes to understand and interpret the causes and consequences of events related to or resulting from climate change
- Willingness to take action

Fig. 1 Abilities to be fostered among students in climate change education

Climate Change Education Initiatives at Universities

The value and relevance of sustainability initiatives as a whole, and on climate change education at universities in particular, is beyond dispute (UNESCO 1995; Breyman 1999; Foster 1999). In the specific case of climate change at universities, the literature refers to some works aimed at fostering this field, such as the book by Eagan et al (2008) on higher education in a warming world, and Rappaport and Creighton (2007) who, by means of "Degrees that Matter: Climate Change and the University", drew attention to the problem.

One example of an international initiative on climate change education was the "European Climate Teach-In Day" organized by the Hamburg University of Applied Sciences within the context of the International Climate Change Information Programme (IICIP). The "European Climate Teach-In Day" was held on *5 June 2009*, which is also World Environment Day, a key date in the world environment calendar. The aims of the "European Climate Teach-in Day" were:

- To disseminate scientific information on climate change in a way that allows it to be broadly understood, including elements related to its environmental, social, economic and policy aspects to schools and universities around Europe
- To raise awareness among secondary school and university students on the complexity of matters related to climate change and the need for personal engagement and action
- To provide an opportunity to introduce projects and other initiatives being undertaken at the international but also at the regional and local level by schools, universities, government bodies, NGOs and other stakeholders
- To discuss the problems, barriers, challenges and opportunities and potential related to climate change both at the local and regional level, but also globally

Last but not least, the "European Climate Teach-In Day" was meant to encourage more networking and information exchange among participants and hopefully catalyse cooperation initiatives and possibly new projects. Figure 2 offers a screenshot of the event's website.

The initiative was a great success: University lecturers and teachers from 265 institutions in more than 55 countries used the opportunity to download the climate content provided in the framework of the event. Over 12,000 students from universities and schools were involved in the initiative.

The World Climate Change Survey: Methodology of the Study

Even though much has been written about climate change as well as climate change education, there is a shortage of empirical studies which aim to understand how climate change is seen and perceived among university students. Therefore, a survey about climate change among university students would seem an effective

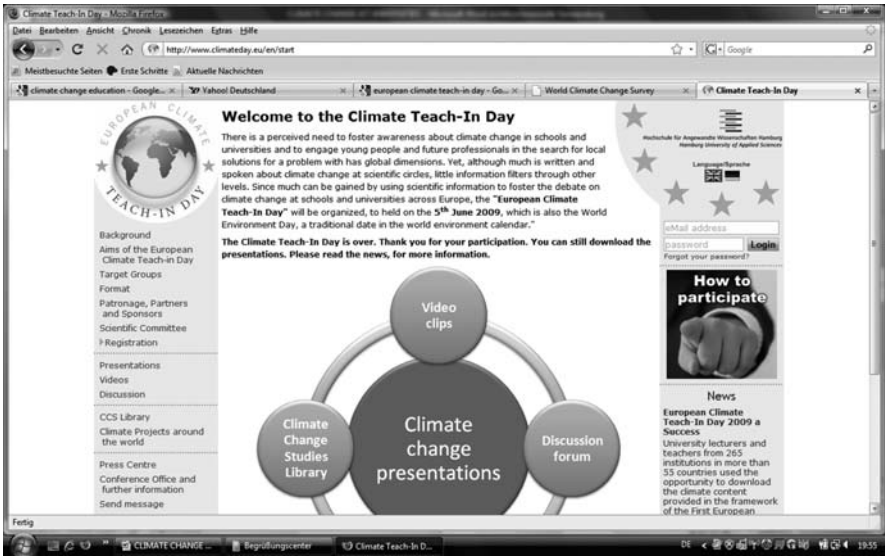

Fig. 2 Site of the European climate teach-in day
Source: http://www.climateday.eu/en/start

way to analyse current trends, identify possible problems and propose some possible solutions.

From a methodological perspective, surveys have for many years been used to assess attitudes and characteristics of a wide range of subjects from opinions about services to the identification of habits. But it is noticeable that the variety and scope of survey research has experienced many changes over the past 30 years, both with respect to design (Schuman and Presser 1981; Sudman and Bradburn 1982; Schafer and Rogers 2003) and applications (e.g. Lipps 2008), as well as with respect to data collection (Forsyth et al 1992). There is at present a wide range of survey tools being used, which vary from automated telephone surveys which use random dialling methods, to computerized kiosks in public places (e.g. theatres, bars, cinemas) which seek to gather people's input. Surveys can also be performed as part of project work in order to gather data (e.g. Bennett 1996; Leal Filho et al 2000; Leal Filho and Manolas 2004). In addition, surveys can also be directed towards gathering input needed for the delivery of services such as car hire, flights, hotel or restaurants, in which case the survey focuses on the opinions of users.

In a step-by-step guide, Salant and Dillman (1994) provide a number of tools that one should consider in a survey, such as:

- Determine which type of survey is best for you
- Estimate the cost of your survey

- Conduct mail, telephone, and face-to-face surveys
- Draw accurate samples
- Write effective questionnaires
- Compile and report results
- Avoid common survey errors
- Find reliable outside assistance
- Salant and Dillman (1994)

With the advancement of technology, surveys may now be undertaken electronically and this has led to many interesting developments and to a wider use of surveys as a whole. Electronic or online surveys have developed considerable in the past ten years or so, with a substantial contribution being provided by Dillman (1999) with a compendium of email and Internet surveys. Works written by Schonlau et al (2007) on attitudinal questions on web surveys and by Potaka (2008) on the design of Internet forms, provide further evidence of the usefulness of Internet surveys as research tools as well as the various elements that need to be considered in using them.

In order to allow an assessment of the general level of awareness of and needs of university students about climate change in university programmes, the "World Climate Change Survey" was performed. This was meant as a research initiative targeted at university students from around the world so that first-hand information on current practice could be gathered and reality-based suggestions could be made in order to address any identified problems or needs.

The technique used in this study, namely a *questionnaire-based Internet survey*, is a relatively new modality of performing survey work and a format whose use could not be easily undertaken 20 years ago due to the rather limited use and access to Internet and web-based technology at the time. Indeed, in the past, mail questionnaires were the most intensively used method of conducting surveys in places away from the researcher and were sent to the respondents via either surface or air mail. Mail questionnaires had the main advantage of being inexpensive. In addition, they could also include pictures and allowed respondents to complete them in their own time. Mail questionnaires have however some disadvantages, one of which is the fact that it may take considerable amounts of time to collect the responses. Moreover, response rates are often rather low and their use could lead to biased sampling since researchers do not always know the background of the respondents well.

Although in the past many questionnaire surveys have been carried out by post (e.g. Leal Filho et al 2000; Leal Filho and Manolas 2004; Leal Filho and Faisal 2004), it is believed that greater savings in both time and costs can be achieved if the Internet can be used. Dillman (1999) has described the advantages related to mail and Internet surveys, whilst in a work undertaken for the US Federal Committee on Statistical Methodology, Schafer and Rogers (2003) described the many advantages of data collection using web services.

Internet surveying needs to be compared with any other survey project, which means it needs to have sound planning behind it (Berkun 2005). Technically, it

can be regarded as a descriptive research method. Surveys are techniques widely recognized as useful when a researcher intends to collect data on facts and phenomena which cannot be directly observed (i.e. opinions, levels of information or attitudes) and this fits well with the thinking behind Internet surveys. In general terms, Internet surveys provide the following advantages:

- Geographical distance does not matter
- They are relatively inexpensive to conduct
- If properly designed they may offer a user-friendly interface and motivate responses
- The same instrument can be sent to a large number of people

In addition, Internet surveys allow respondents to fill in questionnaires at their own convenience. But there are some disadvantages as well. For example, response rates from Internet surveys are often very low since many people may confuse them with spam. Also, Internet-based questionnaires are not the best vehicles for asking for detailed written responses.

A SWOT analysis of Internet surveys reveals that they have some weaknesses and threats, which represent some real limitations. However, the analysis also shows that some interesting opportunities exist (Table 1).

In respect of the work performed as part of the "World Climate Change Survey", the intention was to find a reliable way to cater for data collection from different countries within various geographical regions. Methodologically speaking, the emphasis of this study was on qualitative aspects. Consistent with this, the approach used consisted primarily of non-numerical measurements, with a focus on the frequency of responses given to the questions asked.

There have been a few past and ongoing studies on climate change performed at universities such as:

Table 1 SWOT analysis of Internet surveys

Strengths	Weaknesses
Inexpensive to run	Not all respondents may provide accurate information
Allows data from various countries to be collected	Limited control of who will take part
Use is internationally accepted and regarded as valid	Lack of interaction with respondents
A track record of success exists	Requires Internet access
Opportunities	**Threats**
The infrastructure is often available	Competition with various other surveys
Detailed IT support is not needed	Lack of familiarity among some respondents with the completion of surveys
Respondents can complete the survey in their own time	Respondents may be distracted and do not reply accordingly
Possibilities for including open-ended and multiple-choice questions	Respondents may answer the survey more than once

- The Global Climate Change Survey at the University of New Mexico (http://www.unm.edu/~rberrens/gcc/)
- The MIT survey on climate change concerns (http://web.mit.edu/newsoffice/2006/survey.html)
- Penn State's Survey on Climate Change Values (http://pennstatefocusthenation.org/survey/) or
- Virginia State Climate Change Survey (http://millercenter.org/academic/gage/panel/detail/4051)

Little research has been done so far on the handling of climate change specifically in the context of university programmes and no surveys have ever been performed with a focus on the assessment of the degree to which climate change is dealt with in universities across the world. This demonstrates the existence of a research and information gap that needs to be addressed.

The World Climate Change Survey also aimed to point out any information and communication needs that exist and that should be met in order to allow a better integration of climate-related issues in the university curriculum across the world. In order to cater for a wide participation, the survey was performed by means of an easily accessible website. Figure 3 provides a screenshot of the website of the survey.

For practical purposes, the survey instrument contained multiple-choice questions but respondents were also able to provide additional information if they so wished. On occasions, the survey instrument was sent by email to respondents, who

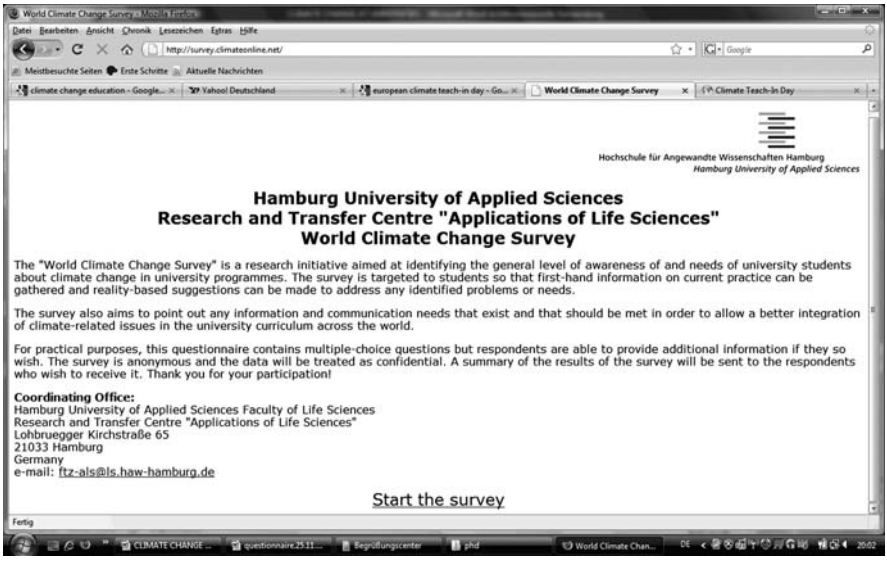

Fig. 3 Homepage of the survey
Source: http://survey.climateonline.net

would fill in the form and also return via email. The survey was performed over a period of 6 months, between January and July 2009. It was anonymous and the data was treated as confidential. As a courtesy to the respondents, a summary of the results of the survey was to be sent to those who expressed an interest in being informed of the results.

Results and Discussion

In general terms, 1,250 students from 166 universities in 43 countries took part in the survey. These form the basis for the analysis of the results obtained. For practical reasons, the results will be presented and analysed at the same time. As a whole, universal findings will be presented. On occasions, significant regional differences are specifically discussed. Due to space restrictions, distributions of findings per region or cross-references of findings will be outlined in other publications.

The first part of the questionnaire gathered some general information about the respondents. From the total replies obtained, it can be seen that 43% of the respondents were female and 57% were male. The distribution of the respondents by age groups is as follows:

- 18–22 years old: 32%
- 23–26 years old: 59%
- 27 years old or more: 9%

As to the countries of origin of the respondents, these were distributed across 47 nations in the following continents:

- Europe: 53%
- North America: 21%
- Latin America: 9%
- Africa: 5%
- Australasia: 12%

It can be seen that European countries were very well represented, whilst the participation of universities in Africa and Latin America was much lower. This could be the result of the lower degree of Internet access in Africa and Latin America and perhaps the limited dissemination of the survey in these regions. These are coupled with the fact that the survey was performed in English and no translations into other languages were provided.

Regarding the course/programme that respondents were studying at the time, Fig. 4 presents the distribution of the findings. The item "Others" relates to courses such as "philosophy" which were specifically named.

It can be seen that the majority of the students were pursuing courses of study in the social and natural sciences, while engineering came in third place. Proportionally fewer respondents are from the field of computer science/IT.

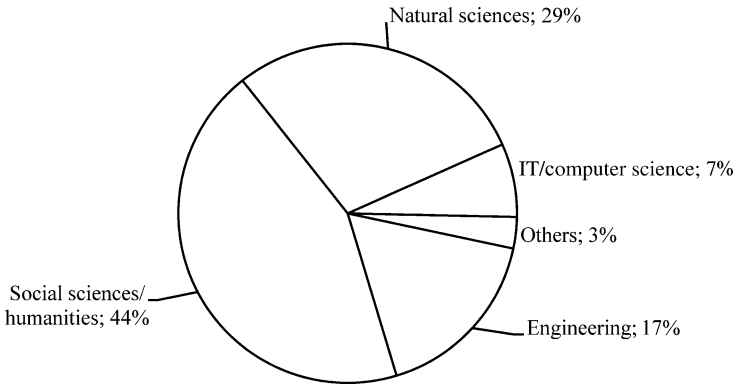

Fig. 4 Courses/programmes attended by the respondents

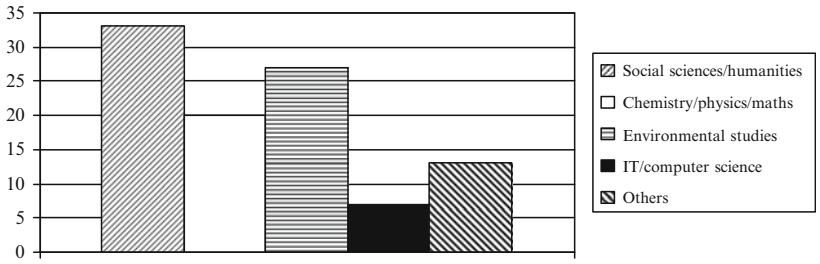

Fig. 5 Main disciplines taught

Table 2 Students' interpretation of what climate change is

Opinion	Frequency of replies (%)
It means the world's climate is changing	62
It means the ice in some areas will melt	57
It means more rains/droughts may be expected	52
It means increases in global temperatures	47
It means in some areas more storms are expected	42
It means the sea level may rise	53

In respect of the year of the programme they were in, 32% of the students were in the first year of their studies, whilst 11% were on the second and 16% were in the third year. Students attending the fourth year accounted for 27% of the sample, whilst students attending Masters courses made up 14% of the sample. The main disciplines taught in their courses and programmes are outlined in Fig. 5.

Other responses, which accounted for 13% of the total, include geology, politics, international relations, policy and agriculture to name a few.

The survey also aimed at enquiring about respondents' views about what climate change is. The results are summarized in Table 2 (multiple answers were possible).

It can be seen that the respondents have a fairly structured interpretation of what climate change means.

Other meanings mentioned included:

- Climate change also means controversies between scientists, climate package, political problems
- Increased suffering of the people living in developing countries of Asia and Africa
- The natural variation in Earth's climate, most likely recently exacerbated by human activities
- Loss of charismatic species, greater spread of insect-born diseases to higher latitudes, increased number of human deaths from heatwaves, storms, and disease
- It implies all the various effects of a changing climate on humans, animals, biodiversity, etc. The roots of climate change are man-made, which is what makes it so difficult to find out what changes in nature are normal and which are caused by climate change

The levels of responses obtained indicate that students' views of what climate change is and what it entails are fairly accurate.

One further question asked in the context of the survey was the main sources of information among students on climate change (multiple answers were possible). Table 3 shows the responses obtained and a breakdown of answers by continent.

Table 3 illustrates the fact that although the media is the predominant source of information about climate change in all surveyed regions, there are differences seen in respect of the role played by universities as sources of information. Only in Africa were universities perceived as being consulted for information more often than the Internet, which is regarded as major source of information to over 80% of the sample in North America. Elsewhere, the information provided by the media and the Internet seems to outweigh the level of information provided by universities. In addition, in Africa and Latin America, the family seems to be an important source of information when compared to other regions.

Other information sources mentioned were academic books, journals, conferences and seminars, NGOs, charities and religious organizations.

When asked whether climate change appeared as a subject/topic in their courses and teaching programmes, respondents provided different levels of responses. As

Table 3 Sources of information on climate change among university students

Source	Europe (%)	Africa (%)	Asia/Oceania (%)	Latin America (%)	North America (%)
Media (TV, newspapers, radio, etc.)	63	54	44	67	71
University courses	42	32	22	54	68
Internet	54	29	35	56	82
Family	12	22	11	23	7
Friends	32	18	20	19	12
Clubs/associations	29	11	31	4	21
Others	5	6	4	7	9

Table 4 Presence of climate change as a topic/subject in courses/teaching programmes

	Europe (%)	Africa (%)	Asia/Oceania (%)	Latin America (%)	North America (%)
YES	71	43	59	61	83
NO	29	57	41	39	17

seen in Table 4, climate change is prominently featured as part of courses in North America and Europe, with a lower level of emphasis in universities in Latin America and Asia/Oceania. Interestingly, climate change as a teaching topic seems to appear in less than half of the surveyed universities in Africa.

The question as to which subject(s) have so far closely tackled matters related to climate change (multiple answers were possible) as part of their teaching programes produced the following level of replies:

- Natural sciences (e.g. biology, physics, chemistry, etc): 73%
- Social sciences (e.g. economics, politics, etc): 68%
- Humanities (e.g. history, ethics, etc): 21%
- Engineering sciences (e.g. maths, statistics, processing, etc): 44%
- Arts/Design or entertainment: 12%
- Sports/Leisure: 4%
- Others: 9%

It can be seen that, overall, the sample seems to indicate that climate change matters are mostly taught in the framework of the natural and social sciences, with a lesser emphasis in engineering. There seems to be room for improvement in respect of the emphasis given to the human dimensions of climate change, since less than a quarter of the students mentioned humanities as being among the subjects within the context of which climate issues are approached at universities. A degree of deficiency is also seen in the level of emphasis given to climate issues in the context of the arts and sport/leisure courses.

Other subjects areas mentioned were planning, management, forestry and agriculture, among others.

In order to allow a better understanding of the current level of emphasis to matters related to climate change given at universities at present, students were asked to rank their opinion from a Likert scale (i.e. from 1 to 5, with 1 being the highest and 5 the lowest ranking given). The results are summarized in Table 5, which distributes the responses among the various geographical regions.

Data amassed in Table 5 indicates that significant room for improvement exists regarding the coverage of climate change issues at universities. It is of great concern that over half of the respondents in Africa and nearly half of the respondents in Latin America think that climate change is poorly covered or not covered at all in university programmes. In addition, nearly half of the surveyed students in Europe believe that climate change is not as well covered as they expect – a line of thinking seen in over 40% of the sample in North America. Despite these differences, the Likert scale used to rank the opinion of the surveyed students about the importance of knowledge about climate change to their studies shows the following trends.

Table 5 Level of emphasis to matters related to climate change according to the sample

Scale	Europe (%)	Africa (%)	Asia/ Oceania (%)	Latin America (%)	North America (%)
1. The topic is very well covered with plenty of information	13	9	8	11	17
2. The topic is covered with enough information	21	14	23	17	27
3. The topic is not as well covered as we would like it to be	43	20	34	32	41
4. The topic is poorly covered	12	33	10	22	7
5. The topic is not covered at all	9	19	19	17	6
6. I do not know/am not sure	2	5	6	1	2

Table 6 Opinion of students on the usefulness of knowledge of climate change

Scale/Opinion	Strongly disagree (%)	Disagree (%)	Agree (%)	Strongly agree (%)
It will be helpful in meeting my own information needs	2	4	20	74
It will be helpful in influencing my lifestyle	3	7	29	61
It will be helpful when I try to find a job	5	10	38	47
It will be helpful in giving me a better understanding of the world	8	12	28	52

- Scale 1: The topic is essential to my studies: 32%
- Scale 2: The topic is very important to my studies: 24%
- Scale 3: The topic is important to my studies: 14%
- Scale 4: The topic has a moderate importance to my studies: 21%
- Scale 5: The topic is not important to my studies: 6%

Only 3% of the students have stated they do not know or that they are not sure.

When asked what the emphasis on climate change in their university programmes will be in the *next two years*, 62% of the respondents believe it will increase, 26% believe that the emphasis will remain the same, 4% stated that the emphasis will decrease and 8% stated they do not know or are not sure.

Students were also asked their opinion as to whether a better level of knowledge of matters related to climate change may be useful to them now and in the future. The results are presented in Table 6. It is noticeable that the majority of the respondents confirm the usefulness of knowledge about climate change issues for meeting their information needs and for their own lifestyles. In addition, over half of the respondents acknowledged that knowledge about matters related to climate change may be useful in their professional development.

In respect of the environmental and problems they see as a result of climate change, the replies from the respondents are summarised in Fig. 6 as follows (multiple answers possible):

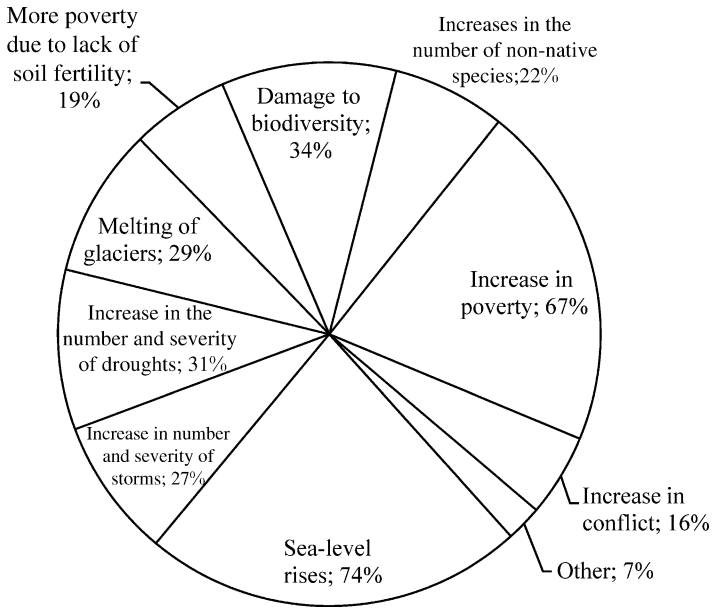

Fig. 6 Problems connected with climate change

Examples of other problems mentioned were the risks of wars, increase in the risk of diseases, depletion of the ozone layer and hotter summers and colder winters among others.

The surveyed students were also asked to list the effects they think may be related to climate change. Their replies (multiple answers possible) were as follows:

- Financial: 32%
- Social: 47%
- Ecological/Biological: 59%
- Physical: 32%
- Chemical: 27%
- Political: 19%
- Other: 6%

Other effects listed were related to items such as health problems, an increase in migration, food shortages and social conflicts among others.

When asked about their opinion of the main problems hindering communication and/or learning about climate change (multiple answers were possible), respondents provided a wide range of responses, which are summarised in Fig. 7.

The impressions gathered from the sample seem to indicate that the complexity of the subject of climate change and the fact that it is rather scientific are among the main factors which make climate change communication rather complicated.

In order to allow an assessment of whether enough emphasis is being placed on climate change at their university, the respondents were asked to rank their

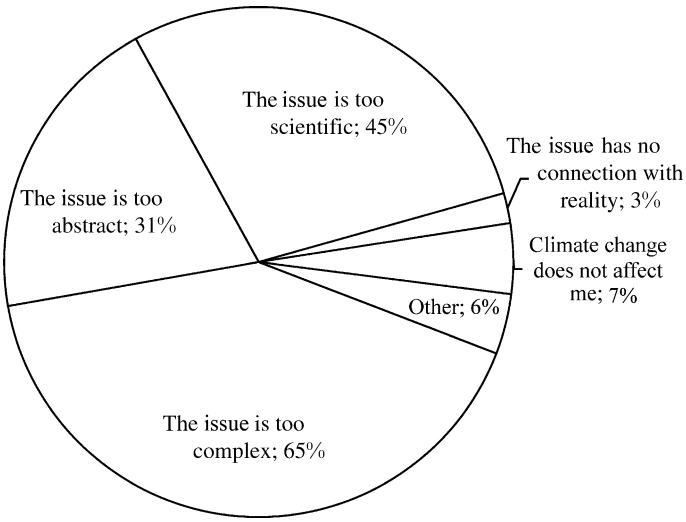

Fig. 7 Problems that hinder communication on climate change

opinion about the different levels of emphasis given to it at universities. For practical purposes, priority in the data analysis was given to the areas where *too little emphasis* is given (thus showing clear deficiencies). These were prioritized in order to offer guidance about what needs to be done to address them. The results are as follows:

- In the field of *minor university courses* (e.g. complementary courses), 42% of the African students and 37% of the Latin American ones specified the fact that too little emphasis is provided at this level, complemented by 25% of the sample in Asia/Oceania. European (21%) and North American (18%) students also feel that too little emphasis is provided.
- As far as the emphasis on climate change issues in *majoring university courses* (e.g. essential courses related to a certain degree) are concerned, little emphasis was a fact mentioned by 72% of the African students, followed by 66% of the sampled Latin American students and 52% of the students in Asia/Oceania. In terms of students in North America, 32% of the students said that there is little emphasis in majoring courses, followed closely by 29% of the European students.
- *Research* on climate change is important at universities. However, the fact that little emphasis is given to it was referred to by 67% the sample in Africa, 56% of the Asian/Oceanian sample, 49% of the Latin American sample, 39% of the North American and 31% of the European sample. This indicates that in a developing country context, research on climate change is yet to find its way into university programmes.
- The low degree of emphasis on climate change in *campus activities* seems to be a worldwide problem. Nearly 90% of the African sample, 79% of the sample of

Latin American students and 68% of the sample of students from Asia/Oceania stated that this area has been largely overlooked. A significant number of European students (51%) have stated that there is little emphasis on climate issues in campus programmes, a trend which is slightly better in North America, where 38% of the sample stated that this is a problem.

– Attempts to make *climate events neutral* are at an embryonic stage in Africa and Latin America, where over 80% of the sample said this area has had little emphasis. Trends are a little better in Asia/Oceania (71%). European students (42%) and North American ones (29%) have stated this area has little emphasis, which suggests that the climate impact of events (e.g. seminars, conferences) is receiving some attention.

The existence of climate change as a topic in *exams* is widely regarded as a rare trend. Except in North America, over half of sample in the rest of the world stated that this is an action seldom seen. In other words: climate change is not often regarded as an exam-relevant topic. If this remains so, it is unlikely to become mainstream since exams are central to university degrees and issues which are relevant to exams traditionally receive more attention.

In respect of the aspect(s) of climate change which interest them most, students replied as follows:

- Technical aspects (e.g. Modelling/scenario): 32%
- Economic aspects: 47%
- Ecological/environmental aspects: 56%
- Social aspects: 61%
- Political aspects: 22%
- Ethical aspects: 12%
- Educational aspects: 29%
- Other: 4%

These figures show that the social and ecological aspects of climate change are deemed as very interesting, along with economical issues, technical aspects and the educational ones. Comparatively little interest was seen in respect of ethical aspects.

When asked if they are happy with their current level of access to materials/publications on climate change (e.g. official reports, books, bulletins, magazines), respondents provided different levels of responses. The frequency of positive replies provided by the sample of respondents – i.e. the number of respondents who are happy with their levels of access is as follows:

- Africa: 17%
- Asia/Oceania: 31%
- North America: 37%
- Latin America: 21%
- Europe: 29%

This indicates that among African students, less than 20% are happy with their current level of access, whilst in Latin America it is just over 20%. Meanwhile, less

Table 7 Students' views on what can be done to improve communication on climate change

Scale/Opinion	Strongly disagree (%)	Disagree (%)	Undecided (%)	Agree (%)	Strongly agree (%)
More emphasis in university courses	2	4	8	28	58
More coverage by the media (quantitative)	3	8	6	34	49
Better coverage by the media (qualitative)	3	11	14	32	40
More participation of teaching staff/professors in research/teaching projects	1	9	21	32	37

than 30% of the European and under 40% of the North American students are satisfied with their level of access to climate change information.

A further question which can be referred to in this chapter asked students to specify what they think needs to be done in order to allow a better communication of matters related to climate change. The results are summarized in Table 7.

The question as to whether students are satisfied with their level of knowledge on climate change produced the following results:

- Fully satisfied: 32%
- Partly satisfied: 29%
- Undecided: 19%
- Not really satisfied: 13%
- Not at all: 7%

The final question asked students to state where more information from within their universities, about climate change should come from. Figure 8 summarises the results (multiple answers possible).

It can be assumed that mandatory courses and placements in companies are the most popular means to obtain information. Optional courses and projects also offer very good opportunities for addressing climate change matters at universities.

Conclusions: Implications for the Curriculum at Universities

Despite the constraints in the execution of the survey and the fact that the conclusions drawn from it are limited to the sampled students, some interesting trends have been identified and a number of conclusions can be drawn. The first element worth mentioning is the fact that the sampled students have a fairly realistic view of what climate change is and means. Their view also takes into account the fact that, over and above the usual items, climate change may also entail controversial matters, and has an impact on human beings and ecosystems.

A second element worth mentioning is related to the sources of information on climate change. According to the sample, the media is a very important source, but

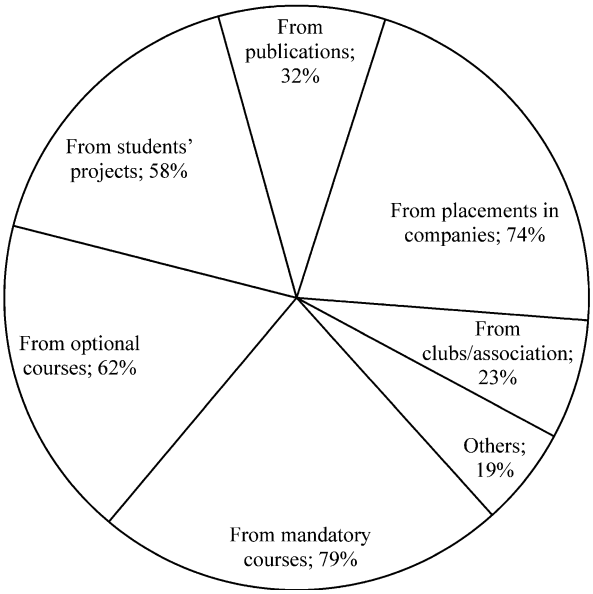

Fig. 8 Students' opinions on preferable information sources on climate change

the emphasis given to climate matters at university programmes in North America (with 68% of the replies) and Latin America (56%) is an encouraging trend. The Internet also plays an important role as a source of information on climate issues. Clubs and associations are also deemed important sources of information in Asia/Oceania and in Europe.

The presence of climate change as a topic in study courses and programmes in most regions all over the world seems to be a real trend, but one which needs to be seen in a differentiated manner. In Africa, for example, over half of the sample stated that such programmes are absent. In addition, climate issues are predominantly approached in the context of natural and social sciences and – to a lesser extent – in other subjects. In terms of emphasis on climate change at universities, the respondents indicated that the frequency of occasions where the topic is either not well covered and poorly covered is rather high. This state of affairs indicates that action is needed so as to bring the levels of coverage of climate matters at universities to a more satisfactory level. This seems an essential step when one takes into account the fact that over 60% of the sampled students regard climate change as either essential or very important to their studies and they feel that emphasis on climate issues will increase in the future.

There seems to be little doubt left in respect of the usefulness of climate change as a subject matter to students, since over 70% referred to it as important for their information needs and nearly half of the sample stated that the topic is important for their careers.

The survey also outlined the fact that there are some concrete problems related to the implementation of climate change programmes at universities. First of all, it is clear that the fact the topic is regarded as too complex or too abstract poses a problem. There is also a pressing need to make climate change more present in majoring and minor areas and in campus activities, since universities need to practise what they preach. The inclusion of climate matters in exams may be one way of positioning it more prominently in university courses, whilst the organization of climate-friendly events may also help to raise more awareness at university level.

In terms of designing future strategies to introduce climate change programmes to university curricula, the survey has established that ecological, social and economic aspects deserve a special emphasis and need to be considered, instead of a focus on technical aspects as has traditionally been the case. Since most students are unhappy with the level of information available to them on climate change, this step may be an important one. Indeed, the greater inclusion of climate matters on university courses was regarded as important by over half of the sample.

Finally, it is important that mandatory courses and optional courses strive to make more provisions for tackling climate change issues and that climate topics take a more prominent role in students' projects.

The World Climate Change Survey has established that, for various reasons, climate change as a topic deserves proper attention and needs to be taken more seriously by universities. It can no longer be regarded as a domain of meteorologists or physicists as has largely been the case in the past. Instead, its deep social, economic and social roots means that climate change needs to find its way across all relevant parts of university programmes.

There are many factors which speak for the inclusion of matters related to climate change at universities. These vary from the sheer need to properly inform and educate students, to the pressing need to train them to address what is one of the greatest challenges of modern times.

However, if it is to be properly included in university programmes, then it is necessary to address the deficiencies outlined here and provide a solid basis upon which climate issues may be positioned more prominently in teaching and research programmes in universities across the world.

In order to help to raise the profile of climate change at universities and as a follow-up to the successful "European Climate Teach-In Day", a set of regional "climate teach-in" events will be organized, under the auspices of the "International Climate Change Information Programme" (ICCIP) and in cooperation with partner universities around the world. These events will have a regional dimension in the sense that universities from a geographical region (and not from one single country) will be able to take part. The ones planned to date are:

- The "World Climate Teach-In Day"
- The "Asian/Oceania Climate Teach-In Day"
- The "African Climate Teach-In Day"
- The "Caribbean Climate Teach-In Day"
- The "Latin American Climate Teach-In Day"

These activities will be repeated periodically and will serve the purpose of engaging more universities with the issue of climate change and help to disseminate the good work and projects performed by university staff in these regions. Ultimately, they will help to provide a basis upon which long-term awareness about climate change can be (continuously) raised. Last but not least, support towards the training of a cadre of well-informed professionals will be provided.

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