Walter Leal Filho

Editor

Transformative Approaches to Sustainable Development at Universities

Working Across Disciplines

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Preface

Sustainability in higher education is a fast growing field. From a slow start back in the late 1990s, where only a handful of people and institutions were engaged, this particular domain has evolved considerably over the past decades, and has now become mainstream. Moving on from a marginal area, with only a few researchers, sustainability as a whole and sustainability at university level in particular, has taken a central place in the scientific arena. As a result of this evolution, many people working with environmental education in the 1990s have chosen to embark on sustainability research, a trend which has been positive in the sense that a wide critical mass has now become available, across the continents, and many researchers are now following careers in this area.

But even though there are many actors now working in and around sustainability matters, and that much has been written about sustainability at universities, there is still a perceived need for forward looking, international publications, which go beyond the trivial and push the frontiers of this exciting field. Therefore, this book intends to fill in this gap and at the same time provide a timely contribution to the global debate on how to permeate sustainability across disciplines.

Consistent with this goal, this book presents a set of papers which show the effectiveness of transformative approaches towards sustainability in higher education, moving away from the theoretical discourse, and more into practice, illustrating how sustainability may be implemented within and between disciplines. With inputs from re-known experts and from emerging researchers from a wide range of higher education institutions across the world, the book demonstrates the value of transformative approaches to sustainable development, and the many benefits they may yield.

This book is structured along three parts:

- Part I: Deals with Integrative Processes and Concepts
- Part II: Handles Integrative Approaches in Teaching and Learning
- Part III: Discusses Problem-Solving and Integrative Practices

Papers in this book have derived from the "2nd World Symposium on Sustainable Development at Universities" (WSSD-U-2014), organised by Manchester Metropolitan University (UK) and the Research and Transfer Centre "Applications of Life Sciences" of the Hamburg University of Applied Sciences (Germany),

in cooperation with the United Nations University initiative "Regional Centres of Expertise on Education for Sustainable Development" (RCE).

The Workshop, held in Manchester during 3–5 September 2014 and attended by over 120 delegates from 26 countries, was one of the last events to be held as part of the UN Decade on Education for Sustainable Development (UNDESD), with a focus on "transformative approaches to sustainable development across disciplines", contributing to the further development of this field.

I would like to thank the authors for their inputs and for the opportunity to access their experience and their wisdom. I hope this book will help to address the need for truly international works on integrative approaches to sustainability in higher education, and inspire further works in this still developing area.

Autumn 2014   Walter Leal Filho

Contents

Part I
Integrative Processes and Concepts

Education for Sustainable Development in Higher Education: Reviewing Needs

Walter Leal Filho

Abstract

This paper presents a review of the role of education for sustainable development and points out the benefits higher education institutions may gain, from implementing a holistic sustainability thinking as part of their work and institutional practice. It also outlines some of the needs seen in order to maximize the potential benefits of sustainable development to higher education institutions, with a special emphasis to the role of education for sustainable development in the process.

Keywords

Higher education · Education for sustainable development · Integration · Processes

1 Introduction: Education for Sustainable Development in Higher Education

The term education for sustainable development (ESD), coined in the mid-1990s as a replacement to the expression "environmental education" (i.e. education for, about and with the environment) widely used until then, is one of the results of the changes in the way of thinking catalyzed by the report "Our Common Future", also known as the "Brundtland Report". "Our Common Future" stated, in essence, that

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3

sustainable development is a process via which today's (environmental) resources need to be used with care, so that they are available to future generations. Consistent with this trend, ESD can be defined as an educational process characterised by approaches and methods aimed at fostering awareness about the issues pertaining sustainable development (e.g. social, political, economic and ecological matters). This differs from the previous approaches, where the emphasis was on environmental issues.

Evolving from environmental education, ESD widely enlarged its scope. Whereas environmental education had a formal concern with the environment and ways environmental resources are used, ESD's emphasis is on the means, tools and processes which may allow people to develop (or acquire) the values, competencies, skills and knowledge needed to contribute towards a more sustainable (i.e. more conscious) society.

The implications of this change of focus were significant. Instead of focusing on environmental protection or studies on matters of strict environmental concern, educators across the world were compelled to work towards the revision of teaching contents, so as to allow education systems to better respond to socio-economic (and not only environmental) challenges at the local, regional and global level. Furthermore, a new emphasis was given to the development of innovative teaching methods having sustainable development as focus, as advocated by UNESCO (2012a) on a report focusing on as education and learning in the context of sustainable development (SD) and involving a range of stakeholders (policy makers, practitioners, administrators, researchers, etc.) at different levels (local, regional and global) across all UN regions (Asia/Pacific, Africa, Europe, Arab Region, Latin and North America). This was complemented by a further document titled "Exploring Sustainable Development: A Multiple-Perspective Approach" (UNESCO 2012b), which states that the ability of educational institutions to respond to the complex expectations embedded in ESD can be enhanced, through a multiple-perspective approach to teaching and learning. The multiple-perspective approach, the document claims, promotes interdisciplinary and intercultural competencies, as it addresses challenges to local or planetary sustainability. Interdisciplinary thinking, in which concepts and knowledge from different academic traditions are used to analyze situations or solve problems, allows students to use knowledge in new and creative ways (UNESCO 2012b).

Over the past 15 years or so, educational institutions across the world have been encouraged to mobilise students and to take a more active participation in local, national and global processes towards sustainable development. Starting from a general confusion of what sustainability means (Jucker 2002), things have evolved greatly. As outlined by Brundiers et al. (2010), there are many opportunities to learn about sustainability, and more advantage may be taken from them.

Among the education sectors strongly influenced by the surge of ESD, mention can be made to higher education, which was all of a sudden expected to play a key role in the ESD debate. Due to their positioning and strategic nature, there is solid evidence that higher education institutions can and should make a strong contribution to sustainable development as a whole (Leal Filho 2010a), and to the

implementation of education for sustainable development in particular. Publications such as "Sustainability at Universities: Opportunities, Challenges and Trends" (Leal Filho 2010b) or "Sustainability at Universities: New Horizons" (Leal Filho 2012) attest this. The latter book in particular, prepared in the context of the UN Conference on *Sustainable* Development (UNCSD) in Rio de Janeiro in June 2012, contains a comprehensive overview of the approaches, methods and tools currently being used, to integrate sustainable development in research programmes, curriculum and campus greening.

This is so, for two main reasons:

- firstly, it is partly thanks to the work of University researchers, that global threats such as high pollution levels, depletion of biodiversity, global warming or the damages to the ozone layer were identified;
- secondly, and closer to the point, university staff train millions of graduates each year—across all disciplines- and are hence in a strategic position to foster a broader awareness of what sustainable development is and of what it means means.

Not to be omitted is the fact that, due to the formidable body of knowledge and expertise they have, higher education institutions (especially their teaching and research staff) are uniquely placed to help society to identify and implement the social and technical solutions to the environmental challenges they have helped to identify. An interconnected approach to sustainable development may thus prove very useful.

As illustrated in Fig. 1, there are three main approaches currently being used by higher education institutions when implementing sustainability. They are, as Fig. 1 outlines, interrelated and characterized by a limited degree of overlapping, being at

Fig. 1 Main approaches towards sustainability
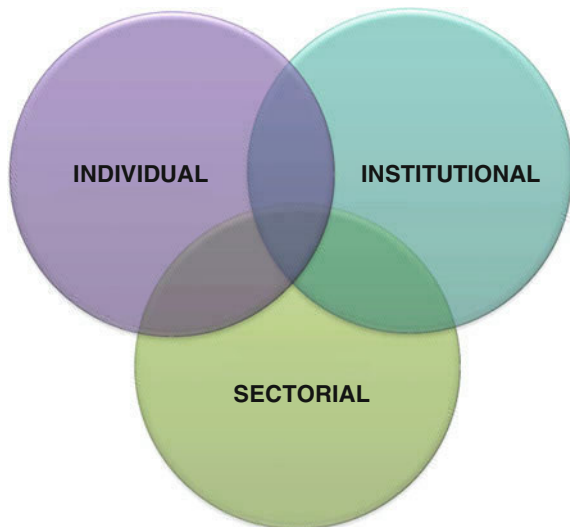
the same time quite distinct. The first approach is the individual one, i.e. matters related to sustainable development are tackled by individual members of staff. The second is the sectorial one, whereby a Faculty (i.e. Natural Sciences) engage on sustainability, whereas others (e.g. Social Sciences) do not. Finally, the third approach is the institutional one, where there is a commitment from the whole university, towards sustainable development. Unfortunately only a small percentage of universities adopt the institutional approach, which shows that much still needs to be done.

The state of affairs here outlined suggests that, if ESD is to be properly integrated and embedded in higher education institutions, a change of perception is needed.

2   The Role of Education for Sustainable Development in Higher Education

The influence of sustainable development as a whole -and ESD in particular- in university systems, has evolved over time. Whereas sustainability was in the past a term hardly ever used, things have changed considerably since the Brundtland Report was issued in 1987. Leal Filho (2012) analysed the conceptual evolution of sustainability, and has identified the fact that it has gone through three main phases:

- Phase 1 (1987–1997)—on this initial phase, under the influence of the World Commission on Environment and Development (WCED), sustainable development was mostly regarded as a matter of concern to nations, as advocated by Agenda 21 (UN 1992) and as agreed by the Heads of States who attended the UNCED, held in Rio de Janeiro in June 1992.
- Phase 2 (1998–2002)—on this second phase, there was a noticeable change in the general perception of sustainable development, which has evolved from being something countries should be engaged with, towards a matter of concern to individuals and institutions. On phase 2, the World Summit on Sustainable Development (WSSD) held in Johannesburg in 2002 (also called Rio+10), it was seen that comparatively little progress had been made since UNCED held 10 years earlier, and that much of the commitments and pledges made by many governments at UNCED, were yet to be realized.
- Phase 3 (2003 to date)—the current phase has been characterized by a new dynamics in the general perception of what sustainability is, with a wide assumption that not only governments, but also individuals, institutions and even businesses—which until then had largely been kept aside- need to commit towards sustainability. The fact that the United Nations declared the period 2005–2014 as the UN Decade of Education for Sustainable Development (UNDESD), has provided some further impetus, albeit not to the extent it was originally expected.

The earlier mentioned World Conference on Sustainable Development, also known as Rio+20, held in Rio de Janeiro, Brazil in June 2012, offered an additional momentum to the current state of affairs. The publication of the report "The Future We Want" (United Nations (UN) 2012) may start a new phase, with a greater perception of what sustainability is, what it means and about what it can achieve. "The Future We Want" is the text of the Resolution by the General Assembly of the UN, inviting all relevant agencies of the United Nations system and other relevant international organizations to support developing countries and, in particular, the least developed countries in their efforts towards sustainable development—especially capacity-building for developing resource-efficient and inclusive economies.

The United Nations, which declared the years 2005–2014 as the "UN Decade on Education for Sustainable Development", also earlier referred to in this paper, hoped to foster the ideal of sustainable development in all areas of education, drawing attention to the need provide education opportunities to all people, enabling them to acquire knowledge and values and learn about behaviour and lifestyles which are needed to ensure a liveable future.

The higher education sector has not been indifferent to the many international developments seen in the field of sustainable development over past two decades. Rather, it has engaged to a considerable extent. Many universities and colleges across the world have critically analysed and substantially reduced the environmental impact of their operations. Many have engaged on new learning paradigms, using systems thinking (Habron et al. 2012).

In the United Kingdom, for example, the Higher Education Funding Council for England (HEFCE) document "Strategic statement and action plan on sustainable development" has reiterated hat individual higher education institutions should play a key role in their positions as centres of teaching and research (as well as managers of sometimes large campuses) both within the institution itself, but also in their local communities. The document outlines the elements which need to be considered by universities, in including sustainable development as part of their institutional plans.

The HEFCE is one of the few agencies across the world which specifically targets funding for such activities, working in partnership with its member universities and facilitating the sharing of good practice. However, this is not to say that current trends are all positive.

There are many reasons why many higher institutions have been lagging behind in the implementation of ESD. Some of them are:

- the lack of a critical mass of staff who work on the theme and may represent it in the relevant decision-making bodies at universities;
- the lack of strategic goals or action plans which may provide them with "a sense of direction" as to what they may want to achieve and why;
- the reduced willingness to engage on the structural changes required or pursue the investments needed so as to place sustainability more centrally in university programmes.
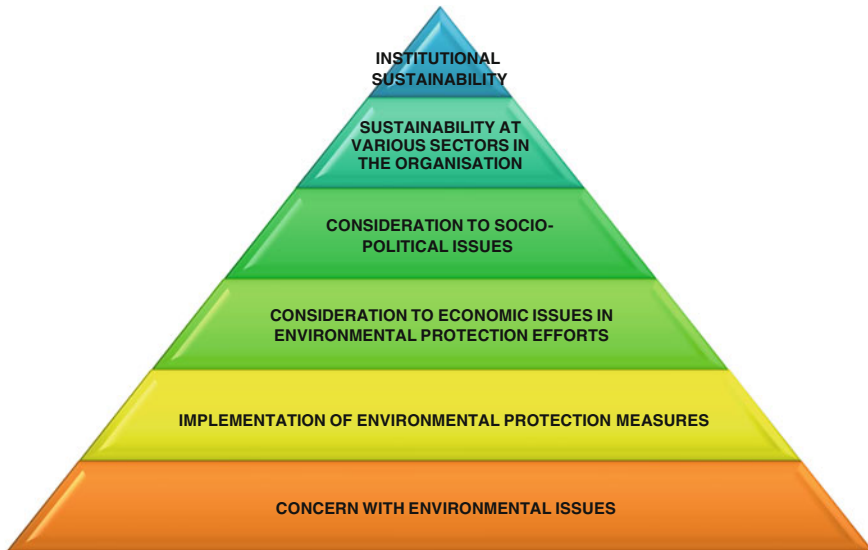
Fig. 2 Climbing the sustainability hierarchy

This list is by no means exhaustive, but offers an overview of the needs to be met. Moreover, the deep differences seen in the ways higher education institutions perceive ESD and the different levels of consideration to sustainability components as part of their activities, means that many need to "climb the hierarchy", i.e. they need to address the problems seen inthe past and intensify their efforts.

Figure 2 provides an overview of how this may take place. This paper defends the view that there should be an evolution from the basic concern with environmental issues (bottom level), up to the implementation of sustainability components as part of the operations of the whole institution (top level).

In doing so, higher education institutions can organize and undertake a wide range of measures, and take a set of concrete and effective actions, that can on the one hand help them to fulfill their institutional academic goals, but also create a new generation of students and help to promote a more sustainable and fair use of resources, on the other.

Drayson et al. (2012) on a study of students' attitudes towards and skills for sustainable development, report on an online survey of first and second-year students in 2011 across the UK. The overarching aims of the research were to understand any trends in new first-year student in 2011 as well as tracking the university careers of second-year students (surveyed as first-years in 2010) in terms of their demands and expectations. The study showed the value of giving the focus on the green economy as a solution to the economic situation currently facing the UK, the associated jobs creation linked with the green economy and the associated high levels of youth unemployment bringing a new focus to graduate skills in sustainability.

3 Education for Sustainable Development and Universities: Some Issues, Challenges and Needs to Be Met

The implementation of ESD at universities can take different shapes and formats. For instance, university campuses may be role models on how an institution can be both more sustainable and more resources efficient. If one picks an example, such as the reduction in energy use, this may lead to lower energy bills (an immediate economic benefit) but also to lower consumptions of fossil fuels. The same applies for areas such as waste management: reductions in the waste produced lead to less pressures in disposing it.

But the amount of progress reached to date should not overshadow the fact that there are many issues and challenges to be tackled. Some of the **needs to be met** are:

- the need for institutional guidelines to foster sustainable development within the institution
- the need for more engagement of senior staff, to broaden support for sustainability initiatives and foster capacity building
- the need for curriculum development—or in some cases curriculum modernisation- to cater for the inclusion of sustainability programmes at universities
- the need to make universities' footprint (i.e. environmental pressures caused by the operations) more sustainable, from energy use to CO_2 emissions from transport
- the need for local and regional partnerships on sustainable development, so as to yield results in the communities surrounding universities
- the need to mainstream sustainability research, possibly integrating it with organisational processes.

Moreover, it is a matter of fact that in order to yield the expected benefits, education for sustainable development at university level, as stated by Mehlmann et al. (2010) should be targeted towards:

(a) the development of interdisciplinary thinking,
(b) fostering skills in integrated planning,
(c) developing a broader understanding of complexity,
(d) understanding the role of decision-making processes.

A further need which exists is related to the shortage of initiatives to document and promote successful initiatives, so as to inspire others. Also, the fact that students' engagement is important, is often overlooked. Students have an important role to play in promoting sustainable development and encouraging behavioural change. Indeed, there are some research showing the potential of students in catalysing positive changes on environmental issues at higher education institutions– for instance at business schools. Jabbour (2010) in a study of greening of business

Fig. 3 Some elements catalysts of transformative sustainable development

schools specifies how the greening of business courses may be implemented, with a concrete analysis of the elements which influence the process.

Due to its scope, sustainable development is both a political goal and an institutional target. As such, it should have a greater degree of priority. There is no doubt that countries need innovative solutions which bring them economic wealth, social well-being and social equity, at the same time bearing in mind the need to afford due attention to the natural environment,

In order to achieve the goal of broadening the scope of sustainable development, and the effectiveness of ESD, there is a need to take into account a set of elements. Figure 3 shows that the conceptualisation and actual practice of sustainable development as a whole and ESD in particular, needs to be based on social justice, technical correctness and a sustainability focus, complemented by an integrative character and ethical acceptance. Their meaning is:

- **Integrative character**: meaning sustainability should be an integrated part societal efforts Ethical acceptance: meaning ethical values, need to be considered in the overall thinking
- **Socially just**: meaning social inequalities should be weighted and avoided
- **Technical correctness**: meaning that technical and technological components need to be adequate to specific situations and be methodologically sound
- **Sustainability focus**: meaning that a focus on the whole approach to sustainability is needed, instead of a sectoral one (e.g. environment or nature protection)

There are some good examples of universities, which have succeeded in integrating sustainable development as part of their programmes in a holistic way. In North America, mention can be made to Yale University and Columbia University (USA) as well as the University of British Columbia (Canada). In Europe, the University of Lüneburg, University Zittau-Görlitz or the Hamburg University of

Applied Sciences (in Germany), Polytechnic of Barcelona (Spain) and the Royal Institute of Technology (Sweden), offer good examples of what may be achieved. The University Saints Malaysia, University of Hong Kong or Tokyo University are exemplary of what is happening in Asia, whereas in Latin America and Africa the University of Sonora (Mexico) and University of Nairobi can be cited as other examples.

ESD as a modality of future-oriented education, needs to provide university students with the tools to know and be motivated towards engaging in global challenges such as biodiversity degradation and climate change on the one hand, but also use organisational learning towards sustainability on the other (Cebrian et al. 2013). Therefore, teaching sustainable thinking and promoting sustainability at universities—and other educational institutions- will catalyse the incremental changes which will lead to further progress towards fostering sustainability.

4   Conclusions

As this paper has tried to demonstrate, there are many problems which prevent universities from implementing education for sustainable development as part of their programmes. The issues and problems outlined in this paper, demonstrate that the elements related to the implementation of sustainable development at higher education institutions deserve more serious considerations.

The means to be used to implement ESD at universities vary and may include from better institutional and curricular integration, to improved institutional and decision-making mechanisms, which also cater for sustainable development thinking. Attempts to trigger the required transformative changes in a given institution need to be assessed based on a set of criteria, including—apart from and a sustainability focus- social justice, technical correctness and ethical acceptance. The absence of suitable arrangements for one or more of these elements may jeopardize the prospects for transformative change which is exactly what many higher education institutions need. Moves towards creating a sustainable future require people to fully understand the complexity of the work we live, and appreciate the need for more sustainable ways of living. ESD can help towards this understanding and facilitate this appreciation, and universities are in a good position to provide their contribution to this process.

The current emphasis to sustainable development as a whole and ESD at universities in particular, cannot however be regarded as sufficient, given the relevance, interdependence, complexity and impact of activities and targets associated with ESD. Therefore, further action is needed and the "sustainability hierarchy" (Fig. 2) may help to guide developments in this direction. The ground for this is very fertile, since the momentum for changes may continue and even increase, if higher education institutions intensify their efforts in helping society meet the challenge of sustainable development.

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The Matter of Geography in Education for Sustainable Development: The Case of Danish University Geography

Thomas Skou Grindsted

Abstract Geographical imaginations are absolutely vital to make sense of sustainability challenges. Yet, a number of studies reveal that geography education has been slow in integrating issues of sustainability into curricula. Geography is particularly interesting in the context of ESD, due to its tradition of investigating human-environment interactions. In this paper we aim to contribute to this particular field of knowledge by providing an empirical analysis of ESD in Danish University Geography. In this paper it is examined how programs in Geography in higher education have taken different approaches to addressing issues of sustainability. Then, it is examined how geographers articulate their role and function as to addressing issues of sustainability. It is concluded that, though geographers generally are reluctant with using the concept of sustainability, and find it better serves as an implicit notion, geographers' find their discipline contributes considerably to ESD in three ways. First, geography's strong tradition in the human-environment theme provides a methodological basis for dealing with issues of sustainability. Second, the spatio-temporal dimensions of sustainability call for geographical approaches to be able to understand the dynamics, complexity and interactions in various scales. Third, geographers find their discipline provides an integrative knowledge platform between the natural and social sciences.

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1   Introduction: Greening Educational Policy and Geography in Higher Education

Since the Stockholm Conference on the Human Environment (1972) that first established a relation between education and sustainable development, the Rio Declaration (1992) and a number of subsequent declarations, policies and national strategies have promoted the idea of integrating ESD into all disciplines and academic traditions. Today, more than 31 declarations on sustainability in higher education have been made and during the past few years also declarations that address specific disciplines have developed (Grindsted and Holm 2012; Lozano et al. 2013). In 2007 the International Geographical Union Commission on Geographical Education (IGU CGE) officially announced their commitment to ESD with the "Lucerne Declaration on Geographical Education for Sustainable Development" in addition to UNDESD 2005–2014 (IGU-CGE 2007; Rienfrield 2009).

Declarations as well as the UN DESD, that will find new ways of continuation this year, are by nature designed to produce an impact on policy. Thus the development of declarations and the influence SHE declarations, have on educational policy and curricula constructs are closely interrelated (Adomßen 2013; Wals 2014). By way of example, the 2005 Graz Declaration on Committing Universities to Sustainable Development (Made under the umbrella of the European University Association and UNESCO) was developed to encourage the European Ministers of Education to integrate sustainability into the Bologna process. Thus the aim was to "Call on Ministers (…) to use sustainable development as a framework for the enhancement of the social dimension of European Higher Education as well as to contribute to the attractiveness of the European Higher Education Area" (Graz Declaration 2005). Sustainability issues have also gradually been incorporated in the Bologna process, and in Louvain-la-Neuve (2009) the European Ministers of Education decided to keep sustainability as a research topic for the next decade. Furthermore, the EU Commission has encouraged EU member states to use the UN Decade of Education for Sustainable Development (UNDESD) 2005–2014 as a point of reference in the development of national plans for ESD (EU Commission 2009). Correspondingly, The European University Association's annual rectors' conference (2012) carried the theme "Europe for Sustainable Universities". The EUA President, Maria Helena Nazaré, recognized that the challenges of sustainability is one of the greatest challenges for humanity: "Sustainability is the biggest issue for humanity on Earth; universities should be a role model to integrate sustainability into its activities, should contribute by informing (…) sustainable values and achievements should be part of education" (Personal Communication, Maria Helena Nazaré 2012).

In a Nordic context, national strategies have been prepared for implementing ESD. In 2007 the Nordic Council of Ministers (NCM) announced its commitment to education for sustainable development (ESD). The Nordic Strategy (NCM 2009) states that the Nordic countries should integrate knowledge on sustainable development into curricula from primary school, secondary school, adult education and higher education. In the NCM 2011 Strategy (NCM 2011) this was repeated, and national strategies, at least at a symbolic level, have been prepared for implementing ESD (Holm et al. 2012).

How the greening of educational policies influence various disciplines and academic traditions is particularly interesting in geography due to its strong tradition concerning the human-environment theme. Yet, a number of geographers (Yarnal and Neff 2004; Higgitt 2006; Chalkley 2006; Westawey 2009; Lui 2011; Kidmann and Papadimitriou 2012) reveal that in the US and UK the integration of sustainable themes into Geography curriculums is wanting: "Global warming presents an enormous threat to humanity, but the response from academia, including geography, has been relatively slow (…). I find this surprising, indeed astonishing, for there could hardly be a more important geographical topic" (Sayer 2009, p. 350). Sayer's statement is remarkable. Geographical representations are highly relevant to the agenda(s) of ESD. Disciplines like geography is expected to take a leading role on taking methodological approaches into consideration in dealing with the interface of society-environment interactions relevant to contemporary and future sustainability challenges (Yarnal and Neff 2004; Chalkley 2006; Clark and Button 2011).

Based on an empirical study (Grindsted 2013), we explore how sustainability challenges have been dealt with in the case of geography. The aim of this paper is to examine how Geography in Danish higher education contributes to ESD approaches. To do so, the following questions have been addressed: (1) Is the human-environment theme being reconfigured in geography? (2) How do Geography courses contribute to ESD? (3) How are issues of sustainability addressed in curricula? and (4) What is the influence of the Lucerne Declaration on Geographical Education for Sustainable Development? Answering these questions shows that the environmental theme is being reconfigured in geography paying greater attention to sustainability and how ESD has been introduced into curricula.

2　Is the Human-Environment Theme Being Reconfigured in Geography?

Three interesting perspectives substantiate the hypothesis that the human-environment theme is being reconfigured in geography, but also suggest a discrepancy between the "role(s)" of ESD in geography. However this does not imply that all geographers working on human-environment interactions conceive their research activities in terms of sustainability. Nothing could be more contradictory. Geography is much else than sustainability and most research geographers find their field of study have no relevance to the topic at hand. Nevertheless, the following three tendencies suggest changes in discourse coalitions toward being associated sustainability.

Table 1 The human-environment theme in the International Geographical Union Declarations

International Charter on Geographical Education (1992)	International Declaration on Geographical Education for Cultural Diversity (2000)	Lucerne Declaration on Geographical Education for Sustainable Development (2007)
Sustainable: 0	Sustainable: 1	Sustainable: 60
Pollution, Contamination, Hazards: 0	Pollution, Contamination, Hazards: 1	Pollution, Contamination, Hazards: 1
Climate change/global warming: 0	Climate change/global warming: 1	Climate change/global warming: 2
Ecology: 0	Ecology: 0	Ecology: 7
Environment: 2	Environment: 13	Environment: 13
Emission, greenhouse gas: 0	Emission, greenhouse gas: 0	Emission, greenhouse gas: 0
Nature: 0	Nature: 1	Nature: 8
Energy: 0	Energy: 0	Energy: 3
Biodiversity: 0	Biodiversity: 0	Biodiversity: 1
Human-nature interaction: 1	Human-nature interaction: 6	Human-nature interaction: 14

Firstly, the development of geographical declarations demonstrates a remarkable shift. Three declarations have been developed by the International Geographical Union, i.e. The International Charter on Geographical Education (1992), The International Declaration on Geographical Education for Cultural Diversity (2000), and The Lucerne Declaration (2007). The three declarations demonstrate a shift in the role of geography. From a shrinking and globalized world, with spatial transformations of economic, social and political significance, the Lucerne Declaration suggest the discipline performing a key role in solving sustainable challenges on Earth. By way of example, the International Charter of Geographical Education (1992) represents spatio-temporal tides and waves scarcely paying attention to the human-environment theme. Though human-environmental interactions are mentioned once, issues of globalization related to human rights remain the central focus (The Geographical Charter (1992) was developed the same year as the Rio (1992) conference and Agenda 21, Chap. "Experiences of 'Reflective Action': Forging Links Between StudentInformal Activity and Curriculum Learning for Sustainability"). The Lucerne Declaration by contrast states that the themes of the UNDESD 2005–2014 are very much in common with geography's objects of study; "the paradigm of sustainable development should be integrated into the teaching of Geography at all levels" (Lucerne Declaration 2007 p. 243). In Table 1 a word search condenses key aspects of the human-environment theme in the Geographic Education Declaration (1992), International Declaration on Geographical Education for Cultural Diversity (2000) and Lucerne Declaration (2007) sketching the role for geography.

As can be seen from Table 1 sustainability was not mentioned in 1992, once in 2000 and 60 times in 2007 which marks a noteworthy increase in the quantification of "sustainable related content". This illustrates that social-ecological and

political-economic processes are not only intertwined, but also that core themes in geography are under reconfiguration. For whatever reasons they might be, the content analysis of declarations illustrates the down scaling of the human environment theme during the late 1980s and early 1990s, as Birkeland (1998), Fitzsimmons (1989) and Stoddart (1987) among others have argued.

Secondly, interviews demonstrate that sustainability issues are considered hugely important to geography. For example, one interviewee stated: "The concept of sustainability is of huge importance to geography at Copenhagen University, but also are related concepts such as resilience, vulnerability or ecology" (Interview 2012). Nearly all geographers interviewed found sustainability issues essential to geography, but remain critical of the concept itself and question of whether related concepts are better applicable for geographical analysis. The majority of the teachers claimed that sustainability is important to geography as an implicit notion, but when explicitly articulated many related concepts may better address particular phenomena (Interview 2012).

Compatibly, the international review suggests it is not hard to find geographers pushing the agenda for up scaling sustainability. By contrast, an interview with Danish geographers disclosed that sustainability best serves as an implicit or "hidden" curriculum. For example, Bednarz (2006, p. 239) states: "It seems that non-geographers also think that geography has an important role to play in environmental education (…) many geographers have defined geography as a discipline with a major, if not primary, interest in human—environmental interactions". Also in the context of ESD many researchers (e.g. Huckle 2002; Yarnal and Neff 2004; Chalkley 2006; Westaway 2009; Firth 2011; Morgan 2011; Cotton et al. 2013), offer an explanation of why geography plays an indispensable role in ESD. The recognition that geographical knowledge has importance for sustainable development makes Westaway (2009, p. 9) state that geography has a special role, maybe even above other disciplines: "Sustainable development is the extrinsic educational purpose that geography is best, indeed almost uniquely, equipped to serve (…). There is little doubt that geography is the best place to take the lead on sustainable development in schools." Such claims are indeed controversial, but authenticate the human environment theme gives geography its *raison d'étre* in the struggle for having a share in sustainability issues. Thus, the nature- society as well as the spatial dimension of sustainability becomes a major pillar that geography seeks to patentee.

Thirdly, Zimmerer (2010), Lui (2011) and Kidman and Papadimitriou (2012) demonstrate how geographers' research human-environment interactions particularly relating to sustainability issues has increased exponentially. Likewise Karatzoglou (2013) illustrates how leading ESD journals like International Journal of Sustainability in Higher Education and Journal of Cleaner Production reveal a similar growth. Despite the increasing numbers of articles, Lui (2011) shows how the number of articles contrast with efforts to integrate sustainability into curriculum in practice. "An examination of publications in sustainability education journals also reveals geography's lack of participation in sustainable education" (Lui 2011). This suggests a discrepancy between statements of the "role of ESD in geography"

and geographers' research activity. Hence, there appears to be little evidence that ESD is recognized a central concern in geography within the US or UK (Higgitt et al. 2006; Morgan 2011). Also Turner (2002), Bednarz (2006), Yarnal and Neff (2004) among others argue that geography courses lag behind the growing environmental and sustainable research. But, what is the situation within Danish education in geography and might a similar tendency be identified in curricula?

3 How Does Geography Contribute to ESD?

Geography education shows its commitment to ESD in various ways. Examination of the study regulations, curriculum and interviews with chairs of the study boards and researchers reveal that the importance of geography to ESD demonstrates similarities to the Lucerne Declaration. "Geography has a major role in terms of sustainability. Many disciplines are experts on relatively narrowed subjects, whereas geography possesses the broadness which is an important dimension of sustainability. Geography is particularly potent because of its interdisciplinary approach as many other disciplines do not encompass. Moreover, geography merges the natural sciences and social sciences" (Interview 2012). Interdisciplinary approaches which integrate economic, social and physical aspects of sustainability are not only well suited for geography, but remain a pre-condition for understanding its multiple dimensions. Phenomena on global scales are caused by cumulative small scale activities in local places, and the impact of global processes exacerbates phenomena in specific localities (Morgan 2011). We may not appropriately understand sustainability issues if we ignore the climatological, hydrological or environmental processes that work in nature. Likewise, we misguide explanations of sustainability problems if we ignore social dynamics and economic activities. Geography knowledge is important to ESD and distinguished from other disciplines, because a narrow disciplinary focus may not unfold problems of sustainability that operates on multiple scales (Interview 2012). Another aspect found to be critical is that geography has a role in integrating perspectives from the natural and social sciences. "Geography can contribute in a unique way to sustainable development, especially regarding the integration of knowledge between social and natural sciences. In this way, geography plays a crucial role in dealing with sustainable challenges that you do not find in the tradition of many other disciplines, e.g. Sociology. Secondly, sustainability has an immanent spatial dimension" (Interview 2012). Thus it is argued that current environmental problems not only call for research and education that epistemologically transcend traditional disciplinary divides, but that geographers help to bridge the gap between natural and social sciences. To this may be added that geography has a distinct role being able to enrich related disciplinary discussions on ESD. "I find that geography has a responsibility to deal with issues of sustainability. We range competences and skills from the social and natural sciences—a holistic approach is imperative for dealing with sustainability" (Interview 2012). Additionally, complex interaction between nature and society and the spatio-temporal dimension of sustainability,

requires methodological approaches to grasp such interactions that may even be impossible without geographical knowledge. "Before specialization, all students will acquire a holistic and broad basis of knowledge and approaches, about soil science, climate change, society and urban development (1.5 years of study red.). This broad foundation enables students to think critically and analyze side effects of a given phenomenon or human action. This body of knowledge is vital for sustainability, in order to understand side effects in very different areas and scales. Such questions I would say are only possible to deal with through geographical skills" (Interview 2012). Integrating the production of space and nature as a fundamental perspective of abstraction generates geographical knowledge and methodologies that make it possible to manage risks involved in the spatial distribution of problems. Non-geographical methodologies often fail to understand dynamics of spatial distribution. Though the interviews reveal recognition of the importance of sustainability issues to geography they also demonstrate that most geography teachers remain critical to the concept itself and/or find it better as an implicit basis for educating geographers (Interview 2012). "When I teach in accessibility for instance, then the aspect of sustainability is in the background. Whether or not sustainability is there [on the curriculum] depends how explicitly it should be mentioned. I rarely mention the term, but implicitly sustainability is the main objective for what we do and why we study it in this way. Sustainability is part of all geographers mindset I would say; sometimes so penetrated that one may not need to explicate it" (Interview 2012). This may be one of the reasons why the analysis of study regulation reveals that sustainability has a limited status in geography educations in practice.

4   How Are Issues of Sustainability Addressed in Curricula?

An examination of the preamble of the Aalborg, Copenhagen and Roskilde universities' curricula indicates a methodological foundation in which interconnectedness, processes and flows are given a primary status rather than fixed objects, direct causalities and permanencies. Ecological approaches focus on environmental problems from an interdisciplinary and normative angle (Rasmussen and Arler 2010). By way of example, the study regulation at Aalborg University requires that "students should acquire knowledge on human influences on ecosystems and the most important anthropogenic changes in history. They should be able to critically reflect on different philosophical views upon nature and its implications (…) understand concepts of sustainability and ecosystems in relation to elasticity and robustness to be able to analyze interactions between human activity (demands) and nature's capacity and limits" (Study regulation, Aalborg University 2010a, p. 29).

Second, there seems to be only little distinction between encouragements of the Lucerne Declaration and geographical educations as to interdisciplinary approaches. Thus study regulation requires problem based group work. "Students should be able to examine scientific problems and solutions using an interdisciplinary approach— not only from particular disciplinary premises, but also by including relevant theories, methods and philosophical interpretations from related disciplines"