Reducing carbon emissions in business through Education for Sustainable Development and Responsible Management Education: Influence at the Micro, Meso and Macro-Levels

Abstract

There has long been an understanding that in order to achieve meaningful progress against sustainability challenges, action is required at multiple scales and at a range of levels. With regard to education initiatives these levels range from macro-level international agreements and activities such as the United Nations Sustainable development Goals (SDGs) and the United Nations Principles of Responsible Management Education, meso-level influences such as the role of national bodies supporting sustainability in higher education, and micro-level influences such as the commitment of individual Universities or Departments. The decision makers are individuals however, and the development and delivery of such initiatives requires decisions and actions at the scale of the individual, as do the implementation of recommendations within organisations. . This paper explores the impact of scale on University-level business education aimed at addressing the United Nations Sustainable Development Goals (SDGs). The paper explores one educational initiative carried out in the United Kingdom where students conduct a carbon footprint of an organisation and recommend measures to reduce the company's greenhouse gas emissions. The total recommended greenhouse gas emissions savings from two years of the project are 507, 435 kg CO_2e, averaging over 10 tonnes per organisation and 2 tonnes per student. If this project was scaled up over 5 years and taken on by an additional educator, the recommended reductions increase to 2,562,418 kg CO_2e. It demonstrates that action undertaken at the micro-level can be effective at the macro-level should scaling up initiatives be supported and encouraged.

Keywords: Scale, climate action, RME, SDGs, ESD, carbon, business

1. Introduction

Transformation to a more sustainable society and adaptation to climate change requires action at different scales or levels, from the international, through local action right down to the individual (Adgar *at el*., 2005). In business, the terminology of scales is usually expressed in terms of micro, meso and macro levels and the integration of sustainability and responsibility that effect social change proceed simultaneously across all three Jeurissen (1997). The direction of influence of these different levels on activity works in all directions. At the macro-level, the United Nations Sustainable Development Goals (SDGs) set out a framework to direct actions to meet sustainability challenges. Such International policy, through its effect on national to organisational governance, feeds down to have an impact on the actions of the individual. Broad societal paradigms such as neoliberalism, which influence cultural norms and expectations, as well as national and organisational governance, also impact on the actions of the individual. However, individuals also have an influence at much broader, spatial, temporal and organisational levels. It is individuals, at the micro-level who are key decision makers in government and business, it is individuals who communicate through the traditional and social media and hence influence wider societal opinion, it is individuals who educate classes of students, or direct educational policy. Yet these individuals rarely work independently. They work in teams, at the meso-level through sometimes informal, sometimes formal governance structures, which can act to limit the influence of any one individual. It is important to consider that action taken across multiple levels, or a set of interventions by different actors at mico-, meso- and macrolevels can be effective in addressing sustainable development if scaled up (van den Bosch, 2010).

When considering initiatives that result in carbon emission reduction, these take place at a range of different levels. At the macro-level, global agreements between nations such as the Kyoto Protocol dictate

actions across international boundaries. Such international agreements translate to meso-level actions at national or sub-regional scale such as legislation limiting carbon emissions by organisations operating within national boundaries, or carbon mitigation activities such as energy policy which promotes renewable sources or energy. Finally, action takes place at the micro-level. Here individual actors may undertake specific actions such as deciding to reduce personal flights, switch to a vegetarian diet or other such initiatives.

It is important then to understand the relationships between the different levels of action in line with Frynas and Yamahaki (2016) who demonstrated the need for sustainability scholarship which explores multiple levels of analysis, in particular connecting the micro-level to the meso-level and the macro-level. In addition to this Doh & Quigley (2014) point out that more research is needed to understand the process through which responsible leaders, and leaders in general, manage the process of dealing with divergent stakeholders across all levels of activity. Similarly, Aguinis & Glavas (2012) assert that micro-level theories should be used to improve our understanding of the underlying psychological processes associated with sustainability activities. Finally, it is understood that an accumulation of relatively small changes can add up to very large changes (Turner *et al*, 1990) however it is important that educators understand the relationship between larger-scale driving forces and issues, the linkages between places and scales, and the importance of access to resources to support effective actions.

With this in mind this paper seeks to explore the relationships between macro, meso and micro-level actions within the fields of Education for Sustainable Development (EDS) and Responsible Management Education (RME) for business and management education. With reference to a case study taken from a UK Higher Education Institution, this paper examines an educational initiative where students conduct a carbon footprint of an organisation and recommend measures to reduce the company's greenhouse gas emissions. It discusses the influence of the project and the different levels that this initiative has influenced. This paper goes onto to analyse the 'keystone' drivers at different levels for facilitating change within organisations through initiatives within higher education. We argue that that an analysis across all levels of influence is necessary to understand both the potential to create and resist change in organisations from educational initiatives.

2. Literature Review

An understanding of the role of scale when considering interventions to achieve meaningful progress against sustainability challenges is essential as it is well known that action is required at multiple scales and at a range of levels (see for example: Jeurissen, 1997; Cash *et al*, 2006; Wilbanks, 2007). A key reason for this is that sustainable development involves the interaction between scales in systems and processes, abilities to act, and potentials for multi-scale analyses and actions (Wilbanks, 2007). A number of researchers point to the need for research that considers the relationships between sustainability initiatives and specific actions across and between different scales and levels. Bies *et al* (2007) discern three different levels of analysis for corporate social responsibility (CSR) research: micro-level (involving psychological bases among individuals), meso- level involving relational issues among organizations), and macro-level (involving wider political, economic and societal dynamics). Finally, business educators also need to develop an understanding of the role of scale and level. Frynas and Yamhaki (2016) suggest that a multi-level approach can enrich many areas of responsibility related scholarship pointing out that scholars need to make efforts to better understand the connections between the micro, meso and macro-levels. The next section sets out the way in which an understanding of scale influences action towards education for sustainable development.

2.1 Scales of influence on Education for Sustainability in Higher Education

Education for Sustainable Development (ESD), also referred to as Education for Sustainability, or Learning for Sustainability, has been defined by many authors but perhaps the most well used definition stems from the UK's Quality Assurance Agency for Higher Education (QAA). Here ESD is defined as the process of equipping students with knowledge and understanding , as well as the skill and attributes required to work and live in such a way that safeguards environmental, social and economic wellbeing both now an in the future (QAA, 2014). Much has been made of the importance of ESD in a higher education setting, both because of the role of higher education institutions in preparing professionals who will influence society's institutions (Cortese, 2003), but also because of the potential to change behaviours as students are undergoing a major life course transition, making them more likely to shift behaviours (Verplanken *et al*., 2008).

There is strong support for addressing ESD through embedding of sustainability into the curricula of different disciplines (Dawe *et al*., 2005). In several institutions the Business disciplines are at the vanguard of embedding sustainability, driven both by macro-level international educational initiatives such as the United Nations Principles of Responsible Management Education, and a micro-level appreciation by individual educators of the potential for business graduates to effect large-scale changes throughout their careers (Parkes, 2017). In fact, business schools have long played an important role in social responsibility (Rive et al, 2017) and are increasingly seeking to influence the broader institutions within which many exist. In fact, the drivers for ESD activities carried out within higher education institutions and more specifically business and management schools, take place across the macro-, meso- and micro-level. These initiatives are summarised in Table 1

Table 1. Different scale influences on Education for Sustainable Development in Business Education in the Higher Education sector.

Scale/Level	Description of level of analysis	Type of contribution to ESD	Examples
Macro (International agreement)	International organisations e.g. World Commission on Environment and Development; United Nations	International agreement of the need for sustainability	WCED (1987) Our Common Futures. UN (1992) Agenda 21
Macro (International agreement)	International organisations e.g. United Nations	International agreement of the need for education to contribute to moving towards a more sustainable society, and international support for ESD	UN (1992) Agenda 21. UN (2005) UN Decade of Education for Sustainable Development 2005-2014 UN (2016) UN Sustainable Development Goals
Macro (International sector)	International higher education sector	International support for the role of higher education in moving towards a more sustainable education	ALSF (1990) Talloires Declaration UNEP (undated) Global University Partnership on Environment and Sustainability

Macro (international sector)	International business and management education in higher education sector	Internationally adopted framework for embedding sustainability in business education	UN Principles of Responsible Management Education
Meso (national-devolved government)	National higher education sector	Higher education strategy	HEFCE (2009) Sustainable development in higher education: 2008 update to strategic statement and action plan
Meso (national organisation)	National higher education sector	National organisation support for sustainability in higher education	HEA ESD project Environmental Association for Universities and Colleges QAA (2014) Education for Sustainable development: A guidance for practitioners
Micro (organisation)	Higher Education Institution	Institutional commitment to and embedding of sustainability	University Strategy University Teaching and Learning strategy
Micro (sub-organisation)	Department	Departmental commitment to and embedding of sustainability	Signing up to Principles of Responsible Management Education Department Learning and Teaching strategy
Micro (sub-department)	Programme	Programme commitment to and embedding of sustainability	Programme aims
Micro (individual)	Staff	Staff commitment to and embedding of sustainability	Embedding in teaching
Micro (individual)	Student	Student engagement in sustainability action	Engagement in activity

2.2 Macro (International) scale

Sustainable Development by its very nature is a concept defined on the macro-level of society due to the interconnectedness and global scale of sustainability challenges such as climate change and other environmental issues (Baumgartner & Ebner, 2010). The essential role of education as a strategy for sustainable development, was given international recognition in 1992 at the 'Earth Summit' in Rio de Janeiro. Education was embedded as an enabling strategy in each of the 40 chapters, as well as being a path in its own right, of Agenda 21, a voluntary action plan for sustainable development, made public at the conference, and voted on for adoption by 178 governments (Calder & Clugston, 2003). Following this the Johannesburg World Summit on Sustainable Development in 2002 proposed a UN Decade for Education for Sustainable Development which ran from 2005 to 2014 (Filho, Manolas & Pace, 2015). The Decade sought to mobilise educational resources worldwide as a means to create a more sustainable future (UNESCO, undated a). The Decade was followed up by the UN's Global Action Programme on ESD which sought to generate and scale-up actions on ESD (UNESCO, undated b). The initiatives outlined above culminated in 2015 with the advent of the development of the United Nations Sustainable Development Goals (SDGs), 17

goals which build upon the Millennium Development Goals and act as a universal call to action to end poverty, protect the planet and ensure all people enjoy peace and prosperity (UNDP, 2019). The SDGs came into effect in January 2016 and guide UN policy and funding unto 2030.

At the macro (international) scale there have also been ESD initiatives relating to whole discipline areas. The UN Principles of Responsible Management Education (PRME) is one such example, launched in 2007 at the UN Global Compact Leaders' Summit in Geneva (Forray & Leigh, 2012). This principle-based global engagement platform for academic institutions represents a relationship between the UN and business schools, with the mission of transforming management education, research and thought leadership at a global scale (Storey *et al,* 2017). The aims of Responsible Management Education (RME) share many similarities with those of ESD in equipping students with the requisite knowledge and understanding to deal with sustainability issues within business as well as contribute to achieving progress against the SDGs though business activities (Parkes, 2017). Here RME can be defined as any teaching, research or enterprise activities in the areas of ethics, sustainability and responsible corporate practices, which business schools engage with in order to develop a more responsible strategic focus (Beddewela et al 2017).

Finally, business school accreditation bodies such as Association to Advance Collegiate Schools of Business (AACSB), European Foundation for Management Development (EFMD) and the Association of MBAs (AMBA) also have a high influence on business schools. For example, through their EQUIS accreditation scheme, the EFMD is influencing business schools by putting a higher emphasis on ESD. Their EQUIS standard states that expanded coverage of Ethics, Responsibility & Sustainability reflects the need of business schools to contribute to the resolution of societal challenges and to act as 'good citizens' in the environment in which they operate (EQUIS, 2016). All three business accreditation bodies played a part in the conception of the UN PRME Initiative and continue to actively support and promote HEI involvement in it.

Whilst Macro-level action is important in setting the agenda for sustainable development and indicating where policy makers should focus their attention, such as carbon emission reduction, the sheer complexity of working at this level requires that interventions are devolved down to the meso and micro levels. For example, the UN SDGS are referred to as global goals, however the UN is simply a forum for nation states to debate policy at the global level whilst retaining their national sovereignty. As such action that results in impact at a global scale takes place at the meso-level via national or regional activities.

2.3 Meso (national) scale

The macro-level activity discussed above, cascades down to action at a smaller scale - the national scale. At the national level, different countries will respond to the drivers above them in different ways. The role of policy in promoting sustainability within higher education institution has been key in the UK. In 2005 a national level strategy underpinning sustainability in higher education was the focus of the Higher Education Funding Council for England's Report and action plan on Sustainable Development in Higher Education (HEFCE, 2005). HEFCE's support for ESD was further affirmed in its 2009 report (HEFCE 2009). Alongside the Higher Education Academy (HEA), which supports teaching quality across the United Kingdom has also been a key meso-level influence. In 2005 the HEA initiated ESD as a special theme within the Academy's overall programme which was effective in driving the embedding of sustainability within programmes and institutions, often through engaging with individual 'champions' within institutions (Sterling and Witham, 2008). Finally the UK's Quality Assurance Agency (QAA), an independent body with the remit of monitoring and advising on standards and quality in UK higher education, published a

'guidance document for practitioners' on Education for Sustainable Development. The guidance has provided a useful benchmarking of a definition of ESD (Shephard and Dulgar, 2015).

Meso (national) level influences also include national, independent organisations. The Environmental Association of Universities and Colleges (EAUC) was launched in 1996 as a membership organisation aiming to be the environmental and sustainability champion within Further and Higher Education in the UK (EAUC, 2016). The EAUC originally had a focus on environmental performance issues in the Estates operations of Universities and Colleges, but increasingly engage in activities relating to ESD and has now become an important influence on the adoption of RME in business schools as well (Storey et al, 2017). Another meso (national) scale influence is the National Union of Students (NUS). Sustainability is only one part of the activity of the NUS, but has grown in size and scope, with an increasing focus on ESD-related initiatives, including in their activities working to get sustainable development into the curriculum of every student across every discipline (NUS, undated).

League tables are important to UK higher education institutions and as such sustainability focussed league tables and awards have a major influence on the ESD activities. These meso-level initiatives include the Green Gown awards, which are run by the EAUC, and the Green League (now University League) run by the national student sustainability organisation, People and Planet, and published annually in the Guardian newspaper (Lightfoot, 2016). The Times Higher Education (THE) rankings, published by the corporate media company Times International, has become a central part of government policies around global competitiveness that have had a profound influence on Higher Education Institutions (HEIs) (Stack, 2013). In 2019 the organisation introduced the Times Higher Education University Impact Rankings, a league table based on the United Nations' Sustainable Development Goals (SDGs) (THE, 2019). Whilst the impact of this initiative remains to be seen, the introduction of a new sustainability ranking from one of the most influential organisations demonstrates the importance of considering sustainability in the sector.

As indicated in section 2.1, some macro-level international organisations have devolved some of their actions and influences down to the meso-level and as such it is appropriate to consider these institutions as important actors at this scale. In business, the UN PRME initiative relies heavily on its regional and national scale Chapters to carry out activities and build influence locally. PRME Chapters develop their own internal arrangements and activities whilst committing to the broader aims of providing a platform for dialogue, learning and action on responsible management and leadership education and research (UNPRME, 2019a). As such the PRME Chapters compliment the macro-level influences and activities of the UN PRME initiative at the meso-level.

There are challenges associated relying solely on meso-level activities to generate impact for sustainability within higher education institutions. As many of the initiatives are developed within quasi-governmental organisations, they are susceptible to political change. For example, a change in government and a change in leadership, and departure of specific 'champion' individuals, within HEFCE led to a significant reduction in the visible support for ESD from HEFCE (Chalkley & Stirling, (2011). Similarly, a reduction in central government funding of the HEA saw a decline in its activity in relation to ESD (Fiselier & Longhurst, 2018). Within the UK, the meso scale is further complicated by the devolution of educational powers to the four constituent countries that make up the United Kingdom, with Wales and Scotland having notably greater continued commitment to ESD (Martin *et al,* 2013). Finally, despite that fact that the initiatives above all occur at the meso-level, it is at the level of the individual that the implementation of such initiatives actually takes place.

2.4 Micro-level (Institution and individual)

The micro-level can range from the individual to the organisational scale, which within the educational sphere could be a Higher Education Institution (HEI). HEIs can respond to ESD drivers, through adoption of institution-wide strategies, either holistically, covering all of the activities of an institution, or through just one element, for example the Teaching and Learning Strategy. Embedding of Sustainability at this scale may then influence activity at other micro-levels from decisions to embed ESD considerations at a programme level, to the choices that an individual educator makes to their own curriculum design. This latter is made possible within HEIs due to the high level of autonomy that individual educators often have over their teaching (Holmberg *et al,* 2008). The adoption of ESD at an organisational or programme level, may be influenced by competition at a higher-level scale, whether competition between universities (supported by meso-level instruments such as awards and league tables), or competition within institutions. In this respect, some HEIs are beginning to develop institutionally wide policies around ESD such as embedding the UN SDGs into their organisational strategies (Fleacă, *et al,* 2018).

The smallest micro-level is the individual. However, this micro-level clearly has influences on all other scales, just as they are also influenced by all other scales. In an Education for Sustainable Development context the influence of the individual does not remain at an individual level, as the very point of ESD is to have a larger scale impact. The individual sustainability educator aims to influence students, from individual students to entire cohorts over several years. These students may then go on to drive other activity in the University through student organisations and activism, or to have influences on sustainability in their future professional careers.

The activities and assessment devised by individual educators may directly influence at other scales of activity outside the university. For example, community-based educational assignments are a common feature of ESD, where students in some way work within the local community to make positive change (Zachariou & Symeou, 2009). Likewise, educational assignments in businesses, may see students positively influencing the sustainability of an organisation's operations (Stubbs & Cocklin, 2008). Thus, the impact at the micro-level in the form of the individual educator has the potential to influence directly the organisational scale. The educator might also excerpt impact on the other scales by occupying positions within organisations such as the local UN PRME chapter as well as publishing scholarly textbooks and articles. Through the sharing and adoption of best practice, often facilitated through meso-level organisations, the actions of these micro-level individual educators may have an impact on the meso-level sector, and potentially, where individuals become involved in macro-level activities such as through the UN more broadly can have an impact on this macro-level. In addition to individual educators, there is increasingly a shift amongst traditional Environmental and Facilities Managers in higher education institutions towards a broader sustainability remit which often includes some responsibility for ESD at the institutional level (Mcmillin, & Dyball, 2009; Wright & Wilton, 2012). Such roles tend to be brought about by a combination of micro-level influences, driven by personal values and interests, and micro-level organisational influences, driving the support of such positions.

These different scales of influence are used in the analysis of a case study of an ESD initiative at one business school in one University in England, in order to explore the importance of different scale influences on such an initiative, as well as to identify the different scales that such an initiative can have influence on. This particular initiative focuses specifically on greenhouse gas emissions from organisations.

3. Methodology

This paper adopts a single holistic case study design as a means to better understand the relationships between micro, meso and macro level impacts. As Yin (2003) describes, a case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. In this respect this micro-level perspective offers the opportunity to investigate the way in which small scale educational interventions may result in macro-scale impact. The case study explored in this paper is a 'Greenhouse Gas Management Project' undertaken by Nottingham Business School at Nottingham Trent University. This study details how the project is carried out and explores both the results of the project at different scales, and the different scales of influence on the project, hence both the context and the phenomenon under investigation are of equal import. Whilst the case study provides insight on a single initiative in a single HEI, case study research such as this can provide generalisations to theory and practice where theoretical explanations of the data observed may also be applicable to similar cases where similar conditions prevail (Yin, 2003). Such generalisations are likely to be possible in this research given the similar conditions within which many HEIs operate internationally.

The analysis…..

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4. Case Study: The Greenhouse Gas Management Project

The Greenhouse Gas Management Project was founded in 2010 by one of the authors as part of a final year undergraduate option module available to Business students. In its first iteration it was undertaken as solely a desk-based exercise to identify areas of potential greenhouse gas reduction in companies. In 2011 it became part of the core curriculum of an undergraduate degree at Nottingham Business School (NBS). Parallel to this, the educator contacted the Nottingham Trent University 'Future Factory' project, part funded by the European Regional Development Fund, and with their financial support the first small and medium enterprises (SMEs) took part directly in the project, with the students acting as consultants to local businesses to help them to reduce greenhouse gas emissions. Most of the organisations involved were small and medium-sized enterprises (SMEs), and local companies, which were part of national or international chains. In these first years (2011-2013) over 200 students and 50 companies ranging from shopping centres to Indian restaurants took part.

In 2013 the educator, with the financial help of Future Factory, enlisted an external environmental consultant from Nottingham Energy Partnership (NEP) to give further advice to the students through lectures and seminars, and to form a higher-level strategic partnership. Part of this new strategic partnership was to link the student projects to the Investor in the Environment (iiE) network. The iiE programme is run as a franchise, owned in Nottinghamshire and Derbyshire by NetPositive Ltd (former NEP), while nationally the network is run by Peterborough Environment City Trust (PECT). It offers a three-part environmental management accreditation scheme (bronze, silver or green) and a local low-carbon business network. Members are supported to implement an Environmental Management System (EMS) and are encouraged to network and trade amongst themselves. The key barriers to small business taking on EMS accreditation are usually cost, time and expertise. By working with NEP to build the iiE accreditation into the curriculum as a student project, all three of these issues have been addressed while at the same time NBS has offered students the chance to also gain the practical skills, understanding and experience to engage with the low carbon economy in their careers beyond graduation. Since 2014, the students have

worked in groups with companies, and increasingly organisations from the public sector, in order to reduce carbon emissions and associated costs while at the same time encouraging them to achieve iiE accreditation. As a result of this collaboration, NBS and Nottingham Energy Partnership (now NetPositive Ltd) received the Guardian University Award for Business Partnership in 2015 (Thomas, 2015).

The project is ongoing, however in our analysis for this paper we focus on the student reports detailing greenhouse gas reduction strategies, produced by the students in 2014/2015 and in 2015/2016. The purpose of using these reports is two-fold: 1) to measure, on a micro-level, any positive impact undergraduate work can have on company's overall greenhouse gas emissions (GHG), and 2) to analyse how a company can influence the sector itself, in relation to addressing GHG emissions.

Students were introduced to the concept of carbon foot-printing at an organisational scale. A carbon footprint at this scale is the measure of an organisation's direct or indirect greenhouse gas (GHG) emissions, these are a combination of the six GHG emissions covered by the Kyoto protocol. It is measured in tonnes of CO_2 equivalent (tCO_2e). The simplest way for a business to calculate their carbon footprint is to collect monthly data on the following areas: Gas, Electricity, Water, Waste, Paper and Organisational Travel. There are other emissions-related data that could be included, such as refrigeration, oil, differentiated waste streams such as wood, cardboard, plastic, batteries and printer ink cartridges. The UK government recommends that this primary information is collected from the organisation over a 12-month period from which to calculate carbon emissions (Defra, 2013). The emissions data for each resource is then multiplied by the correct carbon conversion factor supplied by the UK Government. These factors are updated every year to reflect any changes in emissions from changes in various production processes. The factors are based on recommendations made by the internationally agreed Greenhouse Gas (GHG) protocol corporate standard (WRI & WBCSD, 2004). These calculations result in a final carbon equivalent output associated with each area of activity or resource use.

The emissions are divided into different Scopes - Scope 1: Direct Emissions from organisational activities such as Gas for heat and Fuel for travel; Scope 2: Indirect Emissions from electricity, heat and steam; Scope 3: Other indirect emissions beyond the control of the company such as waste disposal, employee commuting, transport and distribution, leased assets, purchased goods and services. An organisational boundary is then completed to determine which area of operations or resources used have the greatest environmental impact.

Primary resource data was provided to the students by the participating businesses from either manual meter readings or utility bills, and students also visited the organisations. These were then used to measure the emitted carbon using the calculation above. There are 43 student reports from the projects completed in academic years 2014/15 and 2015/16. The reports contain a full carbon calculation of the businesses' use of resources over the preceding year and recommendations to reduce the carbon output through a number of various efficiency measures to be implemented by the companies involved. Students then calculated the likely reduction in carbon emissions after the improvements had been made. Although the students were given different companies each, some of the companies may be similar in terms of the sector they belong to.

Drivers of participating in the project from the companies was also analysed, for example, did a company participate in the project due to an individual employee or because the company, as a whole, believe that it needs to play a part in addressing their carbon footprint (both Micro – individual and company), or did the company participate because reporting their greenhouse gas emissions it was mandatory for them (Meso – National policy).

The names of the companies involved are not used in this paper due to ethical and confidentiality reasons. As part of the consultancy project, students have signed on behalf of NTU a confidentiality agreement that the name of companies will be only disclosed with their explicit permissions.

5. Analysis of reports

This paper is based on the analysis of individual student reports. Elo *et al*. argue that content analysis of secondary data can be utilised both inductively or deductively, with the inductive approach, including "open coding, creating categories, and abstraction…[whilst] In deductive content analysis, the organization phase involves categorization matrix development, whereby all the data are reviewed for content and coded for correspondence to or exemplification of the identified categories" (2014: 1-2). Despite us having taken an "open coding, creating categories, and abstraction" process, which Elo *et al* (2014, p. 2) would argue as an inductive method, we contend that there is more than just 'either inductive or deductive approach' to content analysis.

Each report has been analysed, after checking the student calculation are correct, to calculate the total amount of possible greenhouse gas savings for each business for the following categories: Gas, Electricity, Water, Waste, Paper and Fuel. The overall potential greenhouse gas savings were then calculated for all of the businesses each year.

Through NVivo, we used hierarchical themes, first looking at the different functions of companies that, based on students' analyses, have been involved (directly or indirectly) in addressing the GHG emissions of the companies, both through the companies' business processes, such as Marketing, Accounting, Operations, and Human Resources, or through recommendations made by the students in the two-year period. Due to the fact that most of the companies involved in this project are SMEs, with some of them no bigger than having 5 employees, we are analysing the functions of companies instead of departments. However, the role of these functions does not differ from that of departments within big organisations. Additionally, the process of how the companies communicate with their internal and external stakeholders about their climate change management programme was analysed, as companies involved in this project have highlighted that students have discovered that *what* and *how* the companies communicate their carbon emission initiatives can have a positive impact on the companies' branding.

To analyse the different scales that have motivated the companies to be involved in this project, we examined for individuals who, on a micro-level, have played a part in getting their companies to be part of this GHG Project. We also explored for any micro-level possibilities of companies working collaboratively to collectively reduce their GHG emissions. Additionally, we also compared 2014/15 companies with 2015/16 companies, to see for any Meso-level scale of influence, for example, was there a company that participated in 2015/16 whose competitors had already participated in 2014/15

Finally, we analysed the iiE documents of the companies/organisations that had taken part in the student project and then had moved on to acquire iiE accreditation. Here we were interested in finding out whether and then how many of the recommendations given by the students the organisations had actually taken up and implemented.

6. Results: The impacts on greenhouse gas reductions

Over the two years of data analysed, there were 50 Organisations that took part in total. 34 were from the private sector, 8 from the third sector and 8 from the public sector. Recommendations amounted to a potential of 507 tonnes of carbon equivalent savings. Unsurprisingly, the majority of this was within the

private sector with an average potential saving of around 9 tonnes each. The majority of these savings were identified through the potential reduction of electricity usage (189,788 kg CO_2e). For both the public and third sector the largest reductions were seen through more efficient use of alternatives to natural gas (125,301 kg CO_2e). Given that the organisations involved operate a number of care facilities with a focus on warmth rather than production this was to be expected. Over the two years a total of 219 students were educated in the systematic operation of conducting an organisational audit and carbon footprint to identify potential resource reductions. The average carbon equivalent saving per student was 2.5 tonnes. The potential greenhouse gas savings identified by the project are shown in Table 2.

In addition to potential greenhouse gas reductions, the students identified savings opportunities, and some organisations were very quick to recognise the potential savings to be made. For example, the potential monetary savings from the recommended reductions in electricity usage within the private sector alone, amount to approximately £60,000 with an average saving of £1,200 per business.

Table 2 Potential carbon savings through the Greenhouse Gas Management Project

Sector	Resource Measured	Potential CO_2e Saving Per Resource Measured	Total kg CO_2e Reduction Recommendations	Potential kg CO_2e Savings Per Student	Potential kg CO_2e Savings per Organisation
Private Sector	Gas	21,279	326,418	2,743	9,601
	Electricity	189,789			
	Water	101			
	Waste	7,361			
	Paper	8,513			
	Fuel	84,332			
	Other	15,044			
Third Sector	Gas	90,317	110,314	3,245	13,789
	Electricity	13,816			
	Water	20			
	Waste	6,161			
	Paper	0			
	Fuel	0			
	Other	0			
Public Sector	Gas	34,985	70,703	2,080	8,838
	Electricity	10,219			
	Water	0			
	Waste	495			
	Paper	4,531			
	Fuel	20,473			
	Other	0			

Total			507,435	2,428	10,149

One of the key issues identified by the students in their reports, was how important it was for companies to have a full set of data, in order to measure and recommend effective steps that their companies can take to reduce their GHG emissions. Consequently, for this to happen, different functions of companies need to collaborate, to ensure that there is clear understanding of what the functions need to do in order to meet the GHG target set. For example, the analysis denotes that about 80% of the companies in the Private, 87% in the Public, and 71% of the Third Sector respectively, would benefit from these functions working together should they decide to take up the recommendations developed by their student groups. For instance, such recommendations include investing in IT facilities that would enable the companies to have video conferencing to reduce business travel, or to change their packaging so that they can communicate their GHG emission goals to their stakeholders. This highlights the importance of collaboration between the different functions of companies, to address how GHG emissions are being reduced by business. Therefore, our findings indicate that from the different functions in a company, Operations (including Estate Facilities), Accounting, and Communicating with both internal and external stakeholders (under the theme of Marketing) are the main three that need to be heavily involved when working to reduce GHG emissions

Table 3 indicates that before the GHG emission projects, not many functions of the companies were involved, either collaboratively or separately, in reducing their greenhouse gas emissions. However, after the projects and based on the students' recommendations, there has been an increase in the company functions involved in this, including Innovation, Human Resources, and Collaborating with other companies. Innovation is a theme included based on students' recommendations such as looking at alternative types of packaging, human resource is a function that encompass training of staff about the process to reduce their GHG emissions, whilst collaborations include elements of companies looking for suppliers with similar environmental accreditations, for example, so as to enable them to build on their existing branding.

Table 3: Number of functions involved in addressing greenhouse gas emissions before and after of GHG Project

Functions	Number of organisations					
	Before			After		
	Private Sector	Public Sector	Third Sector	Private Sector	Public Sector	Third Sector
Marketing (branding and communicating)	10	0	1	35	8	7
Accounting	28	8	5	35	8	7
Operations (including supply chain and estate facilities)	18	4	1	30	8	7
Human Resource	15	3	3	21	7	3
Innovation	10	0	0	18	3	4
Logistics	0	0	0	15	4	2
Collaborating with other companies	0	0	0	35	8	7

26 of the 50 organisations involved went on to achieve the Investors in the Environment Accreditation. As a result of their continued involvement, it is realistic to say that of the original 500 kg of CO_2e savings recommended around one third of those savings have the potential to be realised. Although there was limited capital available for efficiency improvements in the beginning, the recommendations of the students were taken very seriously, and a number of budgetary measures were implemented by senior management the following financial year. Developments stemming from the project and in particular Investors in the Environment members, include a knowledge transfer partnership with a local university to develop less resource intensive processes, and recommendations to six businesses within their network to take part in the student project, four of which are took part in following year's programme.

We also have oral evidence that some organisations had impact on their local sector for example one of the companies took part in 2015/2016 because one of their competitors had taken part the year before; the students had recommended steps to become a carbon neutral business and to market themselves accordingly; which in turn had led to this company winning an important series of contracts in the local area. Furthermore, we have some evidence that some bigger organisations have picked up the recommendations of the students to their local representatives.

Table 4 summarises the different scales of impact that the greenhouse gas project has had, and the scale of the major influencer.

Table 4: Summary of the scale of impact of the greenhouse gas management project and the scale of influencer

Scale of impact	Entity impacted	Type of impact	Impact	Major influencer and scale
Micro (Individual)	Student	Student engagement	Increased understanding of sustainability; increased capacity to drive change	Individual staff member (micro)
Micro (individual)	Staff	Staff engagement with student work	Recommendations made by student; Reporting recommendations to senior management	Individual student (micro)
Micro (organisation)	Office	Staff adoption of student recommendations	Changes made at one office	Individual student (micro) Individual organisation decision maker (micro)
Micro (organisation)	Organisation	Communication of recommendations across organisations	Changes adopted across organisation	Individual organisation decision maker (micro)

Meso (sector)	Sector	Communication	Positive publicity of changes leading to sector wide change	Individual organisation (micro)

7. Discussion

6.1 Different scale influences of the micro-level individual educator's actions

The actions of one sustainability educator can have an influence at different scales both directly and indirectly. The individual member of staff has a direct influence on each individual student that they teach. This may have a direct impact on the student in terms of their own immediate carbon-producing actions and decisions. Each of these students has their own sphere of influence and may influence their own peer network, or friends, family, and current work colleagues. Each of these individuals own carbon-producing actions and decisions may also be influenced. These influences may also not be immediate but may carry on into the future lives of the student, through their life choices, and potential application to their future work places.

The aim of this educational initiative is to have a direct influence on reducing greenhouse gas emissions from the organisation with which the students work. In doing so it sought to address some of the issues covered in the UN SDGs, in particular goal 17, Climate Justice and Goal 7, Affordable and Clean Energy. Therefore, it can be predicted that the student will have an impact on the particular department, or office in which they work directly. The student working in the organisation has a direct influence on the decision makers through the communication of their recommendations, and also through other staff. Yet whether these are recommendations are taken up and the potential greenhouse gas emissions realised is largely dependent on the actions of the decision makers within the organisation.

The type of organisation and the remit of the student's project will determine the scale of *potential* impact within an organisation. The direct influence of the student during their project may only be restricted to a specific department or branch in one geographic area. However, there is the *potential* for these recommendations to be taken forward at an organisational scale (depending on the size of the organisation). Yet the potential for this take up is mediated by the key decision makers who interact directly or indirectly with the recommendations of the student.

To take this to a larger scale of influence, successes in one organisation, can have an influence on the entire sector, through demonstrating the competitive advantage that this can gain organisations. This may be mediated through meso-level national policy or networks and organisations, themselves influenced by macro-level international agreements or bodies, such as those requiring reporting or greenhouse gas emissions. Such changes may be also driven by consumer demand, a collective of individual responses to the imperatives of tackling climate change and sustainability.

The educational initiative does not *directly* lead to greenhouse gas emission reductions. As the scale of the potential impact increases, the probability of greenhouse gas reduction reduces. Therefore to increase the likely greenhouse gas reductions resulting from the educational initiative, either the scale at which the intervention occurs needs to be increased, for example a focus on working in the headquarters of an

organisation, or work carried out where there is more direct influence on the senior decision makers within an organisation.

In calculating the scale of the impact of such an educational initiative, it is important to consider the scaling up of such an activity. Table 5 shows the potential greenhouse gas reductions associated with different scales of activity from one student to multiple cohorts as the educational initiative is repeated. With scaling up the calculation of impact on greenhouse gas reductions, both the direct impact increases, as does the probability of impact at a higher scale. The impact can be significantly further increased if the initiative is adopted by other educators at other institutions.

Table 5: Estimated cumulative impacts of the greenhouse gas educational initiative over years of operation (est = estimate). 3rd, 4th and 5th cohort estimates based on an average from the first and second cohort data.

	Potential kg CO_2e Savings	**No. of Organisations influenced (estimate)**
One Student	2,475	1
Student Group	10,149	1
1st Year Cohort	340,086	30
2nd Year Cohort	167,349	20
3rd Year Cohort (est)	253,717	30
4th Year Cohort (est)	253,717	30
5th Year Cohort (est)	253,717	30
TOTAL	1,281,209	140
If teaching adopted by one other educator over 5 years	1,281,209	140
Total Potential CO_2e Savings, from two educators at different institutions	2,562,418	280

6.2 Different scale influences <u>on</u> the micro-level individual educator's actions

Figure 1 summarises the different scale influences and influencers on the educational initiative.

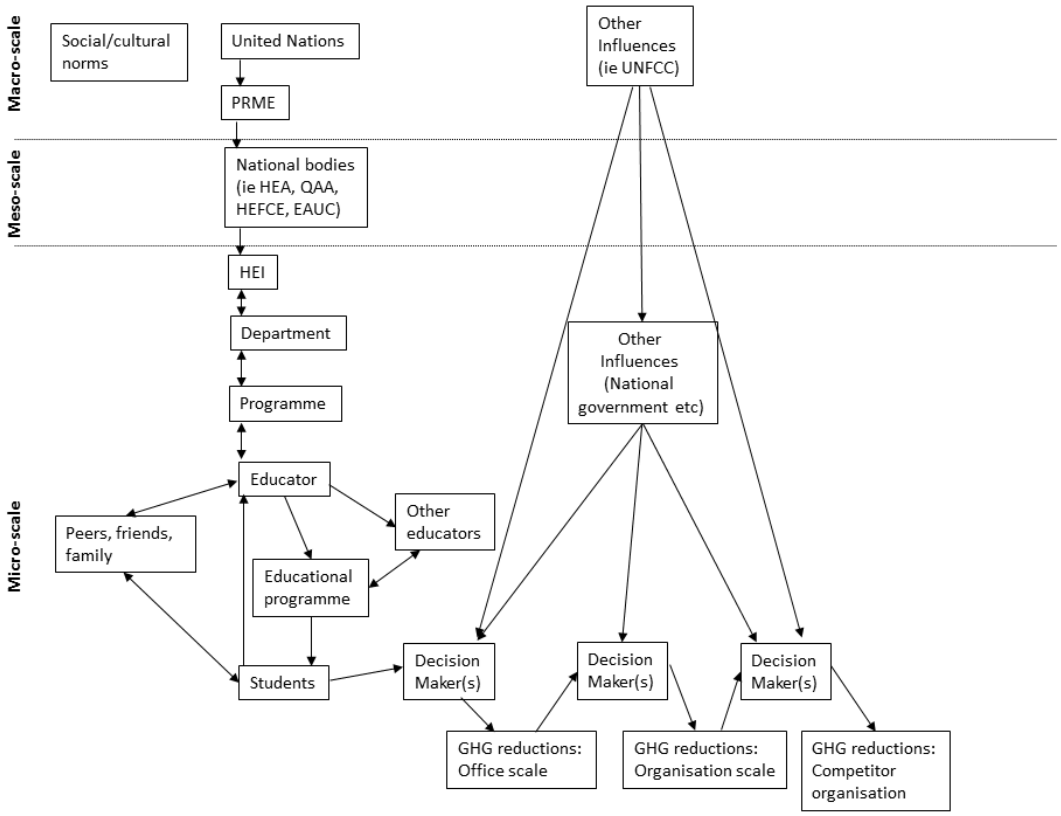

Figure 1: Summary of the different scale influences on the educational initiative and the key drivers in the impacts of the educational initiative.

It is clear from the case study that such an educational initiative can have real impacts on greenhouse gas reduction (which due to its long life-span mixes globally, and therefore has global-scale impact). Therefore, it is desirable that the number of such initiatives aiming to drive change within organisations should be increased. Figure 1 identifies the different scale influences on the individual educator who drives such initiatives. At the micro scale, other individuals in the sphere of the educator have an influence, this may include colleagues, or friends and family who have an influence on the personal values of the individual educator, encouraging them to bring their personal values into their professional lives. Other micro-level influences include the particular Department in which an individual educator sits, where there may be a recognised commitment to ESD, or the institution with a recognised commitment to ESD which may influence the educator directly, or through its influence on the Department scale. This can also work the other way around, where through such an initiative the educator might influence his/her department and institution, and other colleagues might be inspired to do similar projects.

Student demand may also have an influence, both from the individual student, who may have heard about the initiative in former years or at other universities and want to have similar opportunities, or from wider student demand, often represented by meso-level national organisations such as the National Union of Students.

Other meso-level national influences include national organisations such as the Higher Education Academy, which ran an institutional change programme to support the embedding of sustainability within higher education institutions. Nottingham Trent University took part in this scheme, and the educator involved in this initiative was the institutional team leader. Other meso-level influences include the role of national awards and league tables. The educator leading this initiative was awarded a national 'Sustainability

Professional' award by a national (Meso-level) organisation, partly as a result of this initiative, and Nottingham Trent University is also a regular high performer in the National sustainability 'University League' run by the student sustainability organisation People and Planet.

There are also indirect macro-level influences on the work of this individual educator. The International acceptance of Sustainable Development, articulated by the Our Common Futures report in 1987 (WCED, 1987), led the way to increased activity and emphasis on ESD through the UN's Decade on Education for Sustainable Development. This in turn influenced the establishment of the UN Principles of Responsible Management Education, which through Department-level decisions, driven by individual educators have been signed up to, and underpin the curriculum in these Departments. Nottingham Business School at Nottingham Trent University signed up to PRME in 2015 and become a PRME Champion school in 2018. Champion schools undertake advanced tasks and projects that respond to systemic challenges faced by the PRME community, as well as to key issues identified by the United Nations and the UN Global Compact (UN PRME (2019b).Even though the educator was a key driver in signing up to PRME, the membership of PRME provides direct support for the establishment and continuation of activities of individuals. Again, the individual educator might then have input on the macro-level for example the educator of the described project in this article is now Co-Chair of the PRME working group on climate change and environment and has written a text-book for business educators supporting sustainability teaching and learning activities.

6.3 Key scales of influence: implications to practice

Crucially Figure 1 highlights the role of the micro-level individual decision maker. The keystone to the impact of such an initiative is therefore at the micro-level, the individual decision maker. Where these decision makers are not influenced to make the required changes to reduce greenhouse gas emissions, there will be no impact on greenhouse gas emissions. In order for these decision makers to be successfully influenced, it is reliant on the student to be able to make an effective case. An effective case will be based on robust research, but also the ability to communicate and influence.

The educational initiative itself is again dependent on an actor at the micro scale, the individual educator. Although action may be driven by personal values, outside of any direct influences within the higher education sector, it is clear that larger scale influences have an important role to play in supporting the individual educator. A 'prime' example is the macro international level UN initiative Principles of Responsible Management Education, which creates pressure for Business Schools to sign up to and adhere to its six principles, and through this, Departmental support for educators wanting to develop initiatives in line with the Principles, as well as generating an international support network of individuals with similar aspirations.

By analysing the role of different scales in enacting change in an educational initiative, it highlights the importance of focussing on particular skills, in order to influence the micro scale individual decision makers. It also highlights that although these initiatives can be seen as 'bottom up' stemming from micro-level activity, there is an important role to play in terms of support at higher scales of influence, right through to the macro, international level. However, again it may come down to the individual educator to make these arguments to make institutional decision makers aware of these international scale influences.

Rather than abandoning the notion of scale altogether (Martson et al. 2005) we argue that consideration of scale in education can bring insights into what determines the greatest impact on educational initiatives and the impact that these can have on business management. As Jonas (2006, p. 399) argues, "to reject scale is to miss out on an important dimension of thinking about and acting upon contemporary economic,

political, social and environmental change." Jonas (2006) argues for the importance of consideration of 'in-betweenness of scale' and thinking through scalar categories, and multiple scales, rather than a pre-occupation with global-local binaries. This 'in-betweeness' of scale is emphasised by the complexities of the different scale and direction of influences explored through this case study. As Adgar et al. (2005) state "adaptation is made up of actions throughout society, by individuals, groups and governments", within hierarchical structures in which the levels interact with each other. They emphasise that individual adaptation actions are not autonomous, rather they are constrained by institutional processes, and social norms, and 'cascading decisions' covering local, regional, national and international scales (2005, p. 79). Adgar et al. (2005, p. 85) argue that adaptation that requires large-scale investment is likely to be 'episodic and staggered'. However, the education initiative outlined in this paper is as much about mitigation, and identifies a route for mitigation, which although at the microscale, has the potential to be continuous and impactful.

7. Conclusion

Consideration of scale is not something that is commonly applied to the analysis of educational initiatives and has not been considered explicitly in terms of Education for Sustainable Development in business education in higher education. Such an analysis highlights that there are many different scales of influence on educational initiatives on specific programmes. These include the macro-level, in terms of international agreements and international agencies, such as the intergovernmental agreement through the United Nations, of the role in education in working towards a more sustainable world, to the establishment of a United Nations Decade for Education for Sustainable Development. At the meso (national) scale, there are many influences from how sustainable development is treated by the Higher Education Funding Councils, to the role of national organisations focussing on sustainability in higher education. However, it is the micro-level, in the form of the individual, that in many ways provide the keystones for such initiatives. The individual educator makes the designs and delivers the initiatives, while the individual decision maker within an organisation decides whether recommendations are implemented or not. Such a focus on the importance of different scale actors, can influence the approach to Education for Sustainable Development, and particular highlights the importance of providing support for the individual, both the individual educator, and also developing the communication and persuasion skills of students, in order to influence the individual decision makers that they engage with to take on their recommendations.

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