

# **The convergence of societal advancement and the education of future sustainability professionals: a solution-oriented approach to place-based environmental challenges**

A descriptive case study of the Master's course 'Strategic Environmental Development' of Lund University, Sweden

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# MESPOM



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## Abstract

Building sustainable, collaborative solutions to contemporary sustainability challenges requires a new generation of future professionals or ‘change-agents,’ the engagement of non-academic stakeholders, and academic facilitation. Educational reform is needed in order to enhance students’ competencies in becoming effective sustainability professionals. Effective collaborative platforms have the potential to contribute to such reform and also engage societal actors and academic experts in building solutions for local, regional and global sustainability problems. *Sustainability research education* and *participatory sustainability research* are two complementary concepts which provide a framework to evaluate and understand the processes and outcomes of participatory, solution-oriented projects between students, stakeholders and academics. In this thesis, these frameworks are applied to gain insight to a course within a Master’s of Science program in Environmental Policy and Management. The course, called Strategic Environmental Development (SED), is conducted yearly at the International Institute for Industrial Environmental Economics (IIIIEE) within Lund University in Lund, Sweden. It has been implemented for 20 years and has engaged over 500 students and dozens of societal actors around the world, ranging from municipalities to companies. The course is based on a practical, real-world approach to learning using short-term projects in collaboration with professionals throughout various sectors of society and from around the world.

The aim of this thesis is to describe the course as a phenomenon in its implementation and further describe and analyze the process and outcomes, structured according to the concepts of *sustainability research education* and *participatory sustainability research*, as well as *key competencies in sustainability education*. This research sought perspectives within three distinct stakeholder groups; students, the academic institution and clients. The findings explore the causal links between the recognized outcomes of the course (e.g. enhanced capacity and expanded networks) to specific variables of the process (e.g. supervision, communication, course structure, collaborative elements, and client interaction). This thesis recommends flexible and dynamic but well-structured management, a combination of one-time projects and repeating clients, making information clear and accessible, introducing tools to maximize student learning, and cultivating a balance between stakeholder groups in allocating responsibility.

**Keywords:** sustainability research education, participatory sustainability research, key competencies, stakeholder engagement, real-world learning, higher education.

## **Executive summary**

### **Introduction and problem definition:**

There is pressing need to address urgent sustainability challenges which are often complex, cross-scale and cross-sectoral (Brundiers, Wiek, & Redman, 2010; van der Leeuw, Wiek, Harlow, & Buizer, 2012). The nature of these challenges requires unprecedented collaborative efforts spanning from the local to global scale and engagement from stakeholders from various areas of society (Leal Filho & Brandli, 2016; van der Leeuw et al., 2012; Wiek et al., 2013).

The academic sector has the responsibility to contribute to building sustainable solutions and enhancing processes of sustainable development. On the most basic level, academic institutions can equip students with skills, ways of thinking and competencies which are hands-on, practical or “real-world” learning and are well-suited to the sustainability discipline because they engage students in real-world and solution-oriented challenges. This type of pedagogical approach not only augments student learning but can also be a method for stakeholder engagement and therefore have a more resounding impact. Universities should engage in partnerships which have positive social, environmental and ecological impacts (Leal Filho & Brandli, 2016; Trencher, Bai, Evans, McCormick, & Yarime, 2014).

Participatory sustainability research (PSR) uses “cross-sectoral partnerships or programs as a platform for using pedagogical methods for real-world learning, and therefore incorporate students into a cooperative, practical research process.” A related concept is sustainability research education (SRE), which is similar but incorporates students into cooperative research. Education should prepare students for professional roles in addressing emerging global issues and governments, businesses, and other institutions need collaborative partners in addressing problems today. The concept of cooperative research with students is a potential platform but research is needed in order to know whether such courses are effective in education for sustainability, and whether there is significant impact on participants which justify the use of the chosen approach. Identifying and understanding the implementation and impacts of this type of engagement is relatively recent, and there is a need for more research on how PSR and SRE impact students, stakeholders and academic institutions.

This research focuses on the Strategic Environmental Development (EMP) course which is a component of the M.Sc. in Environmental Management and Policy (EMP) at the International Institute for Industrial Environmental Economics (IIIEE) of Lund University. In this course, students are divided into groups and assigned a task associated with a stakeholder such as a company, municipality, non-profit, international organization etc. The task manifests as a short-term cooperative project which deals with a complex, real-world environmental challenge faced by the stakeholder in their local context. The course has three main stakeholder groups: 1) students, 2) the academic institution and 3) non-academic stakeholders.

The purpose of this research is to describe and analyze the SED course in order to provide a basis for comparison with other education approaches and techniques in sustainability education and collaborative research platforms. The aim is to find causal links between process and practice to outcomes and impacts on all stakeholders.

### **Research questions and Methodology**

Research Question 1: <i>Phenomenological Description</i>	How does the course align with pedagogical approaches to sustainability education?
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<p>Research Question 2: <i>Process analysis</i></p>	<p>As an applied research methods course in sustainable development, how does the SED course fulfill the recommended criteria for the <b>sustainability research education</b> process?</p>
<p>Research Question 3: <i>Outcomes analysis</i></p>	<p>As <b>participatory sustainability research</b> with an additional education component, what are the societal effects and learning outcomes of the course?</p> <ul style="list-style-type: none"> <li>• What causal links to the process can be addressed to improve the outcomes?</li> </ul>

In order to answer the proposed research questions, I designed a qualitative single in-depth case study using multiple methods for data collection. This thesis partially takes a phenomenological approach, studying the experience of the SED course from the perspective of individuals. The first research stage was a **literature review and analysis** on education, pedagogy and stakeholder engagement for sustainability-related challenges, which guided the selection of relevant conceptual theories and the case study. To gain more specific knowledge, a **document review** of published student reports and internal documents were analyzed and used to create a descriptive database on the case study. Primary data collection began with **initial exploratory interviews** with key informants from the IIIIEE and evolved into a series of **semi-structured interviews** with a sample of stakeholders including students, IIIIEE staff, and clients. During the same period a combined **qualitative/quantitative survey** was disseminated online to alumni and current students. **Participatory observation** occurred throughout the entire research process while the current implementation of the course studied was undertaken. Time was spent observing the current students and a small group of students assigned to a single project. Collecting data from distinct stakeholder groups and using different methods allowed for data triangulation to cross-validate results. The cumulative data collection was **coded and processed** then applied to three evaluative conceptual frameworks. The data collection was primarily inductive throughout, allowing existing theories and concepts to partially guide the analysis while allowing for other themes to emerge. The **results** are presented within the structure of the guiding frameworks.

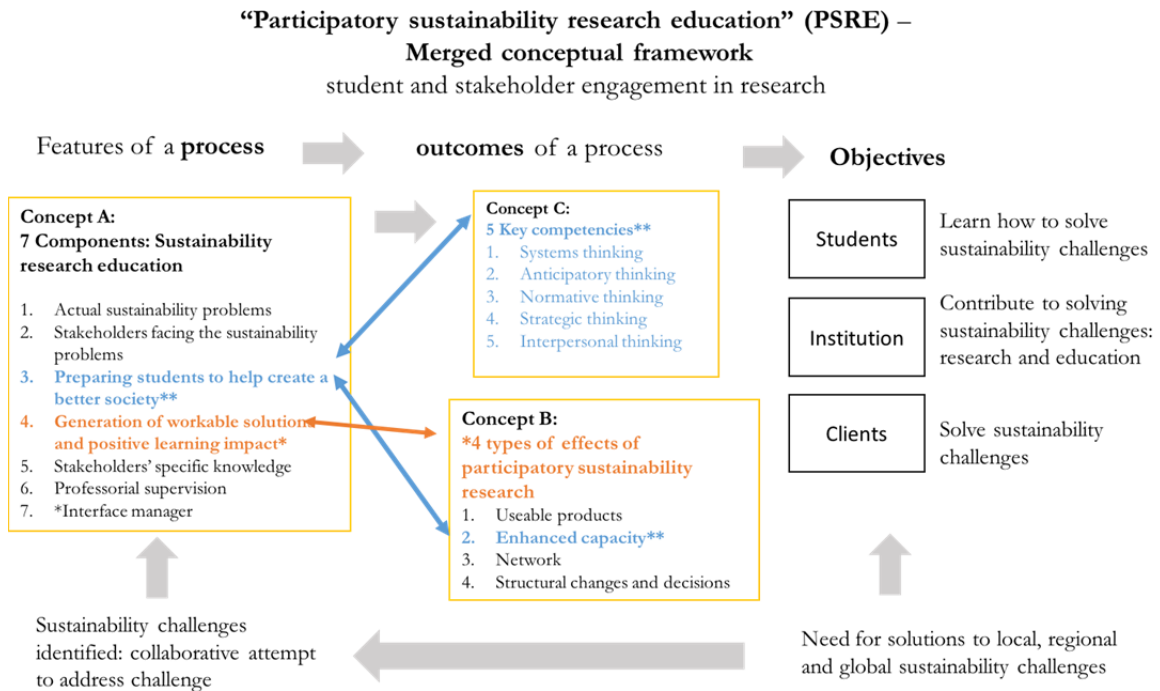
## Conceptual framework

The conceptual framework used for this thesis is a combination of three related concepts as described in depth in Section 2.4: Introduction of Relevant Conceptual Frameworks. One concept is aligned with Research Question 2, two concepts are aligned with Research Question 3 and all three are used to answer Research Question 1 (see Section 1.3 Research Questions). In this thesis the concepts are used to provide a basic platform for a) structuring and organizing the results and b) analyzing the specific components of the case study. The thesis does not provide a critique of the frameworks but rather of the course being studied.

*The key competencies in sustainability* conceptual framework suggests five key ways of thinking which students should develop while studying sustainability-related topics and to potentially set and measure learning objectives and outcomes. *Key competencies* fits into the enhanced capacity component of *participatory sustainability research* framework, which accounts for student learning but also provides a scheme to evaluate the societal effects of transacademic partnerships. The final framework, *sustainability research education*, aims to assess the process undertaken in transacademic partnerships while integrating student participation and education. This framework also accounts for student learning and enhanced capacity in several components. Enhanced capacity is the common link between all three frameworks, while *key competencies* provides more nuance and depth into types of capacities, and *participatory*

*sustainability research* accounts for societal gains. These three frameworks have been merged in order to process and present the results and analysis of this thesis. See Figure 0-1 below for the merged conceptual framework. The framework aims to capture features of the process, outcomes of the process and link them to the objectives of a “PSRE” or participatory sustainability research education” project or program.

Figure 0-1 Merged conceptual framework



## Main Findings and Discussion

The following points represent significant findings of the research which correspond to the utilized framework, according to process categories.

- 1. Topic and task: actual sustainability challenges:**
  - Diversity of projects allows experience in stakeholder-defined sustainability problems.
  - Students are motivated by *urgent and harmful* problems.
  - Value is placed on gaining real world experience with little attention to defining the problem as a sustainability problem.
- 2. Stakeholder initiation and ownership:**
  - Varied level of engagement and initiation from client for different projects results in varied perceptions.
  - Important that client be familiar with academic institution to set realistic expectations.
  - Potential for increased involvement of students in project initiation/ownership.
- 3. Two-way exchange with stakeholders:**
  - More clarity on roles and responsibilities is needed throughout the process.
  - Students value clear communication, presence and friendliness given by the client.
  - Knowledge exchange is the primary effect of the interaction.
- 4. Preparing students to be ‘change makers’**
  - Interpersonal and collaborative learning is one of the main results of such a learning exercise, and students were retrospectively surprised by the impact the group work had on their own experience.

- International context of projects has added value but doesn't necessarily provide higher learning. More important is connection to place and obtaining local knowledge through in-situ learning.
- Students are the most confident about interpersonal, normative and futures thinking overall, becoming more confident about interpersonal and futures thinking afterwards.
- Students who have completed the course recently are more confident in their learning and ability to fulfil course objectives.
- Alumni have a wider range of confidence levels in their abilities than current students.

#### **5. Professorial supervision**

- Explicit and clear communications and instructions are critical success factors for students as they navigate their tasks, but are not delivered consistently.
- Having and utilizing networks, as well as leveraging new potential contacts, is essential for establishing such ad hoc projects.
- A supervisor's connection to a place, which is useful in leveraging networks and providing students opportunities to meet people they wouldn't otherwise, but can also be a competition for the students' attention if the supervisor is working.
- Students perceive that supervisors are not structured or prepared and there is a lack of communication between course implementers and supervisors.

#### **6. Interface facilitation**

- Critical reflection throughout the learning process is valued by students.
- Involving alumni as clients or partners can ease interfacing/coordination responsibilities.

#### General practical recommendations (see Discussion 6.2 for more details)

- Flexible and dynamic but well-structured implementation.
- Combination of one-time projects and medium-term collaborations.
- Make information clear and accessible.
- Introduce tools for additional skill-building.
- Balance roles and responsibilities between all stakeholder groups, clearly and adaptively.

#### Additional areas for research

- Structured approach to competencies assessment, including wider program assessment.
- Comparison with a wider context e.g. the entire Master's program and other Master's programs.
- Assessment of stakeholder engagement, impact and types of partnerships and actual societal impact of student work and projects.



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## Abbreviations

EU- European Union

IIIEE – International Institute for Industrial Environmental Economics

MENA – Middle East North Africa

NRC – Norwegian Refugee Council

PPBL – Problem- and Project-Based Learning

PSR - Participatory Sustainability Research

PSRE – Participatory Sustainability Research Education

SED – Sustainable Environmental Development

SRE – Sustainability Research Education

UNDP – United Nations Development Programs



## **1 Introduction**

The environmental problems the world faces today are a result of the of interconnected socio-economic problems and accumulated human impact which manifest on the local, regional and global scale (Burns, 2015; Evans, 2015). There is pressing need to address urgent sustainability challenges which are often complex, cross-scale and cross-sectoral (Brundiars et al., 2010; van der Leeuw et al., 2012). Due to these characteristics, these challenges require unprecedented collaborative efforts, from the local to global scale, and which are representative of various interests from diverse stakeholders (Leal Filho & Brandli, 2016; van der Leeuw et al., 2012; Wiek et al., 2013). A sustainable future requires a rising generation of professionals who are able to build solutions to sustainability challenges in areas such as climate change, water quality and quantity, energy, food systems, waste management and conservation of biodiversity and natural resources.

On a societal level, the systemic changes and social transformation which is needed relies fundamentally on cooperation between government, industry, academia and civil society (Trencher et al., 2014). Academic institutions are well-adapted to promote cross-sectoral collaboration and to facilitate the shared platforms which can increase understanding on sustainability topics, and provide the foundation for implementing solutions (Trencher et al., 2014). The academic sector has a particular responsibility to contribute towards building sustainable solutions and furthering sustainable development (Brundiars & Wiek, 2011; De Welde, 2015; Evans, 2015; Hidalgo & Arjona Fuentes, 2013; Lee & Schottenfeld, 2012a; Mintz & Tal, 2013; Nixon & Salazar, 2015; Ribalaygua Batalla & García Sánchez, 2016).

Within the academic sector, higher education plays a role in addressing global sustainability challenges through educating students and therefore “incubating agents of change” who are motivated and competent individuals who eventually move into the professional domain (Evans, 2015; Heiskanen, Thidell, & Rodhe 2016; Mintz & Tal, 2013; Thomas, 2009). Students develop a fundamental sense of professional identity during their higher education experience (Mintz & Tal, 2013) and therefore universities have the opportunity to inspire and empower a future generation of change-makers. Students of sustainability-related topics, or future “change-agents,” should gain specific skills, ways of thinking and competencies to prepare for facing challenges which require interdisciplinary thinking, problem-solving, critical thinking, teamwork, and dealing with complexity (Brundiars & Wiek, 2011; Pfeifer & Rosbach, 2016; Thomas, 2009).

There are various educational approaches utilized to provide students with such skills, ways of thinking and competencies. Education which is hands-on, practical or “real-world” learning has been highlighted by a range of academic thinkers and educators as well-suited for sustainability related- education (Alvarez & Rogers, 2006; Brundiars, Wiek, & Redman, 2010; Evans, 2015; Higgins, 2009; Nixon & Salazar, 2015; Pfeifer & Rosbach, 2016, 2016; Thomas, 2009; Wiek et al., 2013; Wiek, Xiong, Brundiars, & van der Leeuw, 2014). Such approaches are effective beyond sustainability topics as well, but are particularly compatible to this discipline. The nature of sustainability challenges is known to require a solution-oriented approach, be complex and involve multiple stakeholders, and are often urgent. To go beyond the use of conventional classroom methods and to further engage students in real-world and solution-oriented challenges allows direct engagement and problem-solving, which are known to empower and engage students (Lee & Schottenfeld, 2012a) and can further student motivation to innovate solutions.

Practical learning approaches not only engages students and increases their learning, but also serves as a method to enhancing stakeholder engagement and have a wider and more resounding impact on society (Brundiers & Wiek, 2011). Universities should engage in partnerships which have positive social, environmental and ecological impacts (Leal Filho & Brandli, 2016; Trencher et al., 2014). Stakeholders outside academia may be financial institutions, government, business, communities and non-profits (Leal Filho & Brandli, 2016). Academic research which involves such non-academic stakeholders should be designed in a way that facilitates such a collaboration (A. Wiek, Talwar, O’Shea, & Robinson, 2014) when stakeholder engagement is explained as being able to “drive strategic direction and operational excellence for organizations, contribute to the kind of sustainable development from which organizations, their stakeholders and wider society can benefit” (Unerman et al. 2010, (Leal Filho & Brandli, 2016).

There are various proposed various frameworks which describe what is required in an effective collaboration or scheme for sharing responsibility on sustainable development between academia and society. Wiek et al. (2014) proposes the term *participatory sustainability research* (PSR) to encompass a range of paradigms and approaches for engaging stakeholders found in previous literature. PSR is described as “cross-sectoral partnerships or programs as a platform for using pedagogical methods for real-world learning, and therefore incorporate students into a cooperative, practical research process.” This research recognizes that there are a variety of potential societal stakeholders across domains, sectors and a geographical range who can benefit from a university’s knowledge, social capital, financial resources, existing networks. With PSR, Wiek et al. introduces a scheme or tool which can measure how the impacts of cross-sectoral partnerships and the implications for sustainability.

A related concept coming from some of the same authors as PSR is *sustainability research education* (SRE), which is similar in that it addresses cross-sectoral partnerships between academic and non-academic stakeholders. However, it further considers the role of students in such collaborative efforts. Including an education component in a cross-sectoral partnership is an opportunity to provide real-world learning opportunities to students but also leveraging students’ knowledge and work to contribute to building a solution. Practical coursework is not only effective for student learning, but should be leveraged as a resource in wider society.

The concept of PSR is is designed to analyze the outcomes and effects on society and consider the stakeholder perspective, while SRE can be useful for analyzing the implementation of a partnership from multiple angles including student learning. Both PSR and SRE are types of transacademic research which are cross-disciplinary, participatory, and engaged with non-academic stakeholders (Rosenberg Daneri, Trencher, & Petersen, 2015). They are both useful frameworks to evaluate the implementation and outcomes of such transacademic projects towards sustainable development. Further research and evaluation of methods and results is needed to develop or enhance strong and effective collaborative programs. There is a gap of knowledge not only on the effectiveness of collaborative programs, but also the effectiveness of the educational component and resulting student learning. There are an increasing number of case studies conducted on higher education programs or courses which engage stakeholders, but there is a need for more comparison, follow-up and measurement, and validation of approaches and methods used.

## 1.1 Problem definition

Addressing sustainability challenges collaboratively requires stakeholders who are engaged, knowledgeable and equipped to address the problems at hand (Leal Filho & Brandli, 2016). This need presents two areas of consideration:

1. How to best engage stakeholders who are not sustainability professionals in addressing sustainability issues (D. Collins & Gannon, 2014; E. Collins & Kearins, 2007; Leal Filho & Brandli, 2016; Ribalaygua Batalla & García Sánchez, 2016), and;
2. How to best prepare a future generation of professionals who will be well-equipped with the competencies need for such collaboration (Brundiens & Wiek, 2011, 2013; Heiskanen et al., 2015; Higgins, 2009; Lander, 2015; Lippuner et al., 2015).

The first consideration and resulting problem is that sustainability challenges affect stakeholders who do not necessarily have a background in sustainability or professional knowledge to deliver a solution which doesn't cause other environmental or societal problems. Engagement strategies should be designed together with experienced professionals who can provide sustainability expertise (Burns, 2015; Crow, 2010; Irazábal, Mendoza-Arroyo, Arciniegas, Sánchez, & Maya, 2015; Leal Filho & Brandli, 2016; Wiek et al., 2014). Such expertise can come from both academic researchers, professors, and students or educated professionals in the field. The challenge is to balance both theoretical and practical knowledge effectively, and strategies to do so much be tested.

The second consideration and problem is that future generations will inherit problems they did not themselves generate but must be well-resourced to address them and the education system must reform accordingly (Crow, 2010; Arnim Wiek et al., 2015). On a pedagogical level, methods are needed which will maximize the value and benefit for students. According to Thomas (2009), "teaching approaches must focus on elements relating to processes of learning rather than accumulation of knowledge," putting an emphasis on developing ways of thinking. There are a number of studies which have begun to research what type of competencies students need and what they gain from various forms of education such as; Anderson, 2015; Boetto & Bell, 2015; Brundiens & Wiek, 2011; De Welde, 2015; Heiskanen et al., 2015; Higgins, 2009; Koehn & Uitto, 2014; McGibbon & Van Belle, 2015; Mintz & Tal, 2013; Nixon & Salazar, 2015; Thomas, 2009; Wiek et al., 2013; Wiek, Withycombe, & Redman, 2011. These studies either explicitly or implicitly point out a necessity to further research the effectiveness of current programs in their cultivation of the these competencies for students in alignment with needed reform (Anderson, 2015; Barth, Godemann, Rieckmann, & Stoltenberg, 2007; Brundiens & Wiek, 2011; Wiek et al., 2013, 2011).

The two problems areas converge in the potential of collaborative projects or programs between academic and non-academic stakeholders which include student education aspects. Education should prepare students to professionally address emerging global issues in the future and governments, businesses, and other institutions need collaborative partners in addressing problems currently. Collaboration between non-academic stakeholders and students, supported by experienced academic experts, can help mitigate both these problem areas (Brundiens & Wiek, 2011; E. Collins & Kearins, 2007; Leal Filho & Brandli, 2016; Wiek et al., 2014). To enhance the capacity of all stakeholders in building solutions there is a need to identify success variables and challenges, and identify the cause-effect structures. Further study is needed on how these partnerships affect society and societal stakeholders (A. Wiek et al., 2014) and how the learning experience enhances the competencies of students.

The course which provides a case study for this research, Strategic Environmental Development (SED), is illustrative of a partnership between academic and societal stakeholders, and has been the subject of some previous research from the perspective of the academic institution (Heiskanen et al., 2015; Lindhqvist, Luth-Richter, & Rodhe, 2015). The gap which remains from previous research is the perspectives of students and stakeholders. The course is run as a real-world, client-based and solution-driven exercise based on the collaboration between students and external partners. Systematic assessment and evaluation of the course has been limited mainly to the standard student feedback forms and a recent alumni survey. Each year the course faces major financial, administrative and logistical barriers in implementation and exceeds the available resources (Kogg, 2016; Lindhqvist et al., 2015; Rodhe, 2016). This case study is an example of an education program which utilizes a practical and collaborative approach, has been implemented for a significant period of time (20 years), has expressed willingness to change, emphasizes engagement with societal actors, and seeks to innovate in sustainable development. Therefore, gaining insight on this case has potential to inform the discourse on sustainability education practices which are collaborative and seek to benefit wider society.

## 1.2 Scope and limitations

This research focuses on the Strategic Environmental Development (SED) course which is part of the Environmental Management and Policy Master's (EMP) program at the International Institute for Industrial Environmental Economics (IIIIEE) of Lund University as a single case study. The course is designed to engage students in regional sustainability challenges in different sectors, domains and areas of the world through cooperating with mainly non-academic stakeholders. Though the course is primarily a student-learning experience, the framework involves the IIIIEE research programs, staff researchers and a collection of municipalities, companies, non-profits, international organizations and other stakeholders (A. Wiek et al., 2014).

The study focused on three main stakeholder groups; students, program staff, and non-academic stakeholders (known as clients). The population sample was limited to a selection of representatives from each group in order to gain multiple perspectives including societal stakeholders, based on the snowball effect. Insider access, good timing, and need for a documented description of the academic course were motivations for a single case study. Participant observation methods as the course was conducted in the Spring of 2016 provided an opportunity for depth and a further triangulation of perspective. Use of interventions in participatory research was deemed appropriate based on the nature of the course as experiential education and the program's willingness to change and experiment.

The scope of the literature review focused on educational and cooperative research approaches which are related to are aligned with the studied course. The comparative aspects were mainly related to pedagogical approach or program framework. The scope was further narrowed to focus on the use of several conceptual frameworks.

Because of the length, width and breadth of the study there were natural limitations to the size and selection of the sample populations. The quantity of interviews conducted for each stakeholder group was limited in order to gather perspectives from different areas, allow time for participant observation in the study.



### 1.3 Research questions

The purpose of this research is to describe and analyze the SED course in order to provide a basis for comparison with other approaches used in collaborative sustainability education. The aim is to determine causal links between practice to impacts on all stakeholder groups.

The description of the course comes primarily from academic institution’s perspective. The analysis of process and outcomes comes from various shared perspectives of students and non-academic stakeholders. The research questions overall aim to build a description and analysis based on multiple perspectives.

The overarching research objective is to contribute to the discourse on sustainability education and the role of such programs in societal sustainability challenges, as a response to the call for higher education institutions to take responsibility for facilitating cross-sectoral collaboration in addressing these challenges.

*Table 1-1 Research questions*

<p>Research Question 1: <i>Phenomenological Description</i></p>	<p>How does the course align with pedagogical approaches to sustainability education?</p>
<p>Research Question 2: <i>Process analysis</i></p>	<p>As an applied research methods course in sustainable development, how does the SED course fulfill the recommended criteria for the <b>sustainability research education</b> process?</p>
<p>Research Question 3: <i>Outcomes analysis</i></p>	<p>As <b>participatory sustainability research</b> with an additional education component, what are the societal effects and learning outcomes of the course?</p> <ul style="list-style-type: none"> <li>• What causal links to the process can be addressed to improve the outcomes?</li> </ul>

**R1:** The course is implemented based on the institution’s pedagogical approach, which needs to be understood in context of the discourse on sustainability education. Information on the course framework, history and approach exists primarily in collective memory and experience of IIIIEE staff members. This research question fulfills the need to situate the SED course in the discourse and provide documentation based on the institutional perspective and resources. This will assist in identifying further research gaps and the potential transferability to other education programs, as well as contribute to an ongoing discourse.

**R2:** This research area aims to expand upon the description aimed for by RQ1 by seeking additional perspectives from the three main stakeholder groups and to analyze the series of steps and actions which make up the SED process. The use of the sustainability research education provides a framework to measure not only the student learning experience but all aspects of the process involving other stakeholders.

**R3:** As an academic course in higher education, there is an academic explanation for measuring learning outcomes, especially with a focus on sustainability. As a collaborative process, there is a need to develop the program with stakeholder and institutional outcomes in mind. This question area seeks to ascertain and discuss the outcomes, including learning, which have occurred, or are typical, of the SED course or single SED projects.

## 1.4 Overview of methodology

This section provides a brief overview of the methodology, with the full methodology further explained in Chapter 3: Methodology. In order to answer the proposed research questions, this thesis takes the form of a qualitative in-depth single case study using multiple methods for data collection. The first research stage was a **literature review and analysis** on education, pedagogy and stakeholder engagement for sustainability-related challenges, which guided the selection of relevant conceptual theories and the case study. To gain more specific knowledge, a **document review** of published student reports and internal documents was conducted and used to create a descriptive database. Primary data collection began with **initial exploratory interviews** with key informants from the IIIIEE and evolved into a series of **semi-structured interviews** with a sample of stakeholders including students, IIIIEE staff, and clients. During the same period a combined **qualitative/quantitative survey** was disseminated online to alumni and current students. **Participatory observation** occurred throughout the entire research process while the current implementation of the course studied was undertaken. Collecting data from distinct stakeholder groups and using different methods allowed for data triangulation for cross-verification. The collected data was **coded and processed**, and then applied to three evaluative conceptual frameworks. The research was deductive but data collection and analysis were guided by inductive methods, allowing existing theories and concepts to partially guide the research and structure the analysis while allowing themes to emerge inductively. The **results** are presented within the structure of the guiding conceptual frameworks.

## 1.5 Ethical considerations

The primary ethical consideration was regarding the anonymity of the research participants who shared personal perspectives and experiences. The IIIIEE staff have been identified by name, as the implementers of the course under evaluation, but students and clients are not named. Anonymity was chosen to support the unique culture of the IIIIEE and associates - many interviewees shared forthright opinions and personal experiences which are relative to others who are part of the community. All participants gave permission for the information to be used, and understood the research was being conducted on behalf of a Master's thesis with cooperation by the IIIIEE. Staff members of the IIIIEE provided support and guidance but did not make decisions or have ownership of the research.

The chosen methods relied on close interaction with current students which was ethically complex based on a peer relationship and rapport already established with the students, as I was a fellow Master's student. A shared community and personal relationships with students added both access and complexity to the research. Current students were relating to the experience in-situ while other interviewees relied on memory recall, so this required additional attention and reflection as I interacted with them. I sought to use only relevant data, despite my exposure to additional information (e.g. personal dynamics between students) and disregarded extraneous information.

Because of degree of immersion in my area of study, I sought feedback from external sources. Arnim Wiek, Associate Professor of the School for Sustainability at Arizona State University, provided guidance in three separate feedback sessions. Additionally, a staff member of the Academic Writing Center at Lund University provided valuable perspective. Finally, I had a number informal discussions with former professors and colleagues who were separate from the research.

## 1.6 Audience

This thesis was conducted for the completion of the Master of Science programme in Environmental Sciences, Policy and Management (MESPOM), an Erasmus Mundus joint-programme between Central European University in Budapest, Hungary, University of the Aegean in Lesvos, Greece, and Lund University in Lund, Sweden. The IIIIEE served as the official host institution of the final thesis semester and provided an academic supervisor. The initial audience of this thesis is the immediate academic audience of the MESPOM consortium. As a consortium partner the IIIIEE is within this audience, but has a special interest as the implementer of the course. These findings may be informative to the program's development.

This thesis also seeks a broader audience in the academic discourse on sustainability education which is focused on stakeholder engagement and real-world approaches to learning. Studies which are conducted on the current practices of education programs can serve to inform developing programs on how to implement effective education on sustainability. This thesis utilizes evaluative frameworks which have been used in other case studies, so can further test the theories, concepts and frameworks developed for such use.

The case study describes and analyses a course which involves non-academic stakeholders and their engagement with Master's students and academic institutions. Therefore, the research may be of interest to representatives of municipalities, companies, non-profits, development agencies and other organizations who are developing a new or existing collaboration or partnership with a university or university students. The partners or "clients" which have engaged with IIIIEE students over the past 20 years may have special interest in this thesis to understand the broader context of their involvement.

Finally, this case study may be of interest to individual students who are interested in doing an in-depth comparison of potential higher education programs, or wish to critically consider their own education. Potential or incoming students of the EMP Master's program can utilize this thesis to understand a course in their intended program and gain insight towards the pedagogical approach of the IIIIEE. Furthermore, it may be of special interest to the alumni of the EMP program who have participated in the course and can relate personally to the experience, providing a chance for further reflection on individual or group learning. This thesis contains a dialogue ongoing between alumni of the program and provides a platform for multiple perspectives gained during in shared experience to be contrasted and discussed.

## 1.7 Disposition

Following this introductory chapter which includes the proposed research questions (**chapter one**), **the second chapter** will provide a background on sustainability education, methods for educating future sustainability professionals, and the chosen evaluative frameworks for the case study of SED. **Chapter three** aims to describe the methods used as a qualitative in-depth single case study in the field of education, and the resulting conceptual framework. **The fourth chapter** aims to provide an in-depth description of the course and programmatic and institutional context, including the history, current framework and definition of key stakeholder groups. This chapter includes a more detailed section on the current implementation of the course (2016) for background on the participatory aspect of this thesis. **The fifth chapter** presents the results and analysis based on the data set utilizing the merged conceptual framework. **Chapter six** discusses significant findings and interpretation of results, recommendations and reflection on the research process. **Chapter seven** concludes the thesis with a restatement of the research questions and final remarks.

## 1.8 Scientific positioning

The foundational theory in this research is constructivism which seeks subjective knowledge, and to understand why things happen and what meaning exists behind actions. The guiding ontology asserts that knowledge comes through individual interpretation and the guiding epistemology, or relationship with the knowledge, is that knowledge is subjective. The research methodology was both deductive and inductive, using conceptual frameworks to guide the process and structure the analysis, but inductive methods were used in coding and processing data to allow for emergent themes. This qualitative thesis is mainly descriptive, intending to to ‘richly describe’, as well as explanatory, intending to explain a phenomenon. (Nagy Hesse-Biber & Leavy, 2010).

There are several theories of ‘human science perspectives’ (Moustakas, 1994) which have influenced my research design including ethnography, grounded theory, and phenomenological research, all of which utilize qualitative design and methodology, search for meaning behind experience through first-person accounts, and focus on the wholeness of experience (Moustakas, 1994). Ethnography influenced my observation of the current students which included both informal and formal interactions and partially led towards “a cultural description” (Moustakas, 1994: Van Maanen, 1982). This thesis partially takes a phenomenological approach, studying the experience of the SED course from the perspective of individuals. According to Moustakas (1994) “phenomenology commits itself to descriptions of experiences, not explanations or analysis” and the “data of experience” such as thinking, intuiting and judging are part of the evidence. While this thesis does commit to a deep level of analysis due to scoping, the research is based on the subjective perceptions of individuals, the data of experience is mainly evident in the discussion and recommendations where latent knowledge has an influence.

## **2 Literature Review and Analysis**

This literature review begins with providing context of environmental challenges and moves on to the discussion around preparing students and professionals to face these challenges. The discourse of sustainability as addressed in academia is introduced, mainly focusing on the features of sustainability education and pedagogical approaches. The last section describes the conceptual frameworks and theories which are used, as explained further in Chapter 3: Methodology.

### **2.1 The status of environmental crisis and sustainability challenges**

This research will most often use the terms *sustainability* and *sustainable development* in order to discuss the relationship between contemporary social, ecological and environmental challenges and solutions. In 1987 the Brundtland Commission coined the term *sustainability* in the report 'Our Common Future' as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987). Major environmental challenges which induced the concept of sustainable development include (but are not limited to): climate change and rising sea levels, loss of biodiversity, water and air pollution, resource depletion, deforestation, and desertification. Social and economic factors have increased the pressure on natural resources and been the source of "wicked problems" which present a substantive challenge to address (Brundiers & Wiek, 2011). In recent decades it has become increasingly clear that both the manner and rate at which human society consumes natural resources opposes sustainability and sustainable development. Attitudes and behavior in consumption must shift for sustainable development to be achieved, and continued research is essential for determining courses of action as part of this shift.

### **2.2 The future "change agent" and sustainability professional**

According to Pfeifer and Rosback (2016) the best educational approaches for enabling sustainable development are experiential and problem- and project-based learning (PPBL) in which students must approach, understand and develop solutions for real-world problems. Such learning engages students on a deeper level because the students are motivated to solve a real, authentic problem (Pfeifer & Rosbach, 2016). Real-world learning can take place both inside or outside the classroom, and generally is understood as shifting away from more traditional, lecture-based styles of teaching for primarily enhancing knowledge or theory (Thomas, 2009).

Education related to sustainability is distinct from other disciplines because it must "control the challenges of our time" (Evans, 2015) in the sense that sustainability professionals face a unique set of problems and therefore require specific abilities. Current literature asserts that certain skills, competencies, ways of thinking will be necessary in building solutions to contemporary problems, especially as environmental problems are not isolated to a single discipline and are pertinent across various domains, sectors, scales, etc. Therefore, adapting current educational practices in an education reform is essential.

According to Pfeifer & Rosback (2016) sustainable development requires collaboration which is dependent on a set of competencies, the appropriate application of concepts and epistemologies, skills, values and attitudes. Based on the nature of sustainability challenges, education must be tailored to generate professional-level capacities such as improvisation, adaptation, innovation and creativity (Thomas, 2009). Specific skills needed include the ability to think critically and across disciplines, analyze and reflect, problem-solve, work

collaboratively, be flexible, and target specific information (Pfeifer & Rosbach, 2016; Thomas, 2009; Wiek et al., 2011). Thomas (2009) emphasizes that “because the end point of sustainability is unknown, and the exact processes of reaching decision-points about sustainability are unknown, we will need people who are able to think – in such a way that they can assess the usefulness of the processes and assess the options that may appear to offer a sustainable future.”

Several program evaluations suggest that in order to meet environmental challenges students must be able to overcome culturally imposed or global boundaries (Karen P. & Bush, 2010; Wynveen, Kyle, & Tarrant, 2011). This is generally done through direct engagement set in the context of a new place and can be short or long-term experiences, or through participants in a course who can represent their cultural background while studying outside their home country. Students’ values and actions are more likely to change if they personally experience overcoming cultural or global boundaries (Brundiers & Wiek, 2013) and an enhanced awareness of cultural boundaries and perspectives increase students willingness to take responsibility for problems caused by globalization (Karen P. & Bush, 2010; Lee & Schottenfeld, 2012a). An increasingly globalized world and the subsequent challenges requires people who are willing to promote interdependence and interconnections in building solutions (Wynveen et al., 2011).

### 2.3 Sustainability in academia

There has been a call for a reform in education regarding sustainability (Crow, 2010) and the need for a focus on sustainability to become more integrated into higher education is now widely accepted (Thomas, 2009). An increased number of academic institutions are now offering a variety of courses, certificates, programs in sustainability (De Welde, 2015). Topics related to sustainability have been gradually introduced into academic institutions either as single courses, degree programs, or otherwise (Brundiers et al., 2010). In the not-too-distant past, sustainability remained a distinct discipline and was not integrated into disciplines such as business, ethics, science, etc. but has become further integrated in recent years. These educational offerings have different content emphases within the broad area of sustainability, but studies show an overlap on what competencies and values the students should be expected to gain (see Section 2.2) despite content focus or varied approaches towards learning.

Today many academic institutions choose to incorporate sustainability agendas into their internal operations or external partnerships, networks, or projects (D. Collins & Gannon, 2014; Thomas, 2009; Wiek et al., 2011). In the past, universities primarily taught courses and programs “*about* the environment” but over time this shifted from “about” to “for” the environment (Thomas, 2009), and took a more solution-oriented approach such as introducing institutional sustainability goals and protocols. Associated theories further explain these changes, such as ‘Education for Sustainability’ (which refers to the shift away from the “about”, ‘Sustainability Education’ which encompasses the integration of sustainability into curriculum across disciplines, and “Sustainable Education”, referring to structural change and university-wide opportunities for learning.

Education on sustainability topics is relevant for all levels of education, from primary through professional development, however, this research will focus only on higher education (undergraduate and graduate). Higher education is a significant area for research on education for sustainability (Hidalgo & Arjona Fuentes, 2013; Mintz & Tal, 2013) and as a result a number of sustainability topics have emerged as new academic fields, demonstrated

through the increasing number of sustainability degree programs, academic journals, conferences and study abroad programs (Brundiens & Wiek, 2013; Wynveen et al., 2011).

As previously stated, academic institutions have a responsibility to contribute to a sustainable future. However, it is important to acknowledge that influential educational experiences occur much earlier and these topics should not be addressed only at the higher level. This is related to issues of access to higher education and quality education in general, which should be mentioned but remain outside the scope of this research. Regardless, higher education remains an important area for cultivating necessary professional skills.

### **2.3.1 Features of sustainability education**

There are a number of sustainability education programs which incorporate an emphasis on experiential learning, interdisciplinarity, and global learning. Often certain pedagogical approaches are used to engage students in learning that goes beyond traditional or conventional learning environments such as frontal lecturing or examination based on memorization of facts. There are a number of non-traditional approaches which are used, such as real-world learning (Heiskanen et al., 2015), teaching outside the classroom (Alvarez & Rogers, 2006), applied academic consultancy projects (Karen P. & Bush, 2010), informal experiential learning (Lee & Schottenfeld, 2012b), problem and project-based learning (Brundiens & Wiek, 2013), transformational learning (Wynveen et al., 2011), “client-based learning” and authentic learning (Lindhqvist et al., 2015).

The studied course in this research can be analyzed using a number of these theories, the two of which have been previously applied by the IIIIEE being authentic learning and client-based learning. For example, authentic learning refers to tasks which are based on problems or projects that are “inter-disciplinary, complex and meaningful” and “accommodate collaboration and require intense effort, but allow students flexibility in their approach and level of difficulty” while also requiring skills which are necessary in the professional workplace (Lindhqvist et al., 2015). This approach acknowledges the necessity of interdisciplinarity in sustainability, and utilizes aspects of PPBL. Client-based learning assumes working with clients, such as companies, on real projects which benefit both the students and client – students might use cases studies provided by the clients, participate in simulations or actually address problems together with the company (Parsons & Lepkowska-White, 2009). The supporting theory is that students will understand and take ownership of critical problems from external organizations because the real-world context encourages identification with the problem (Pfeifer & Rosbach, 2016).

The above concepts each have individual characteristics and highlight various learning outcomes, but all are intended to provoke deep and longitudinal learning through practical or genuine engagement. Some approaches reduce classroom time and encourage real world interaction, such as project-based learning, while others provide simulations or “real” problems within the classroom. This collection of pedagogical approaches, although not comprehensive of relevant approaches for teaching sustainability, have been used in sustainability programs and somehow require students to use theoretical knowledge in a more practical, applied, or hands-on way. Many of these theories and practices are interconnected and applied concurrently with one another.

However, for education on sustainability topics to be as deep and long-lasting as is intended, engaging students in practical, authentic or real-world problems doesn't fulfill all learning goals. Studied cases that have used these types of approaches have identified variables that influence learning. These variables include evaluation and follow-up (Brundiens & Wiek,

2013), enabling participation (Mintz & Tal, 2013), good teaching and facilitation (Mintz & Tal, 2013; Wynveen et al., 2011), opportunities for discussion and reflection and a balance of theory and practice (Lippuner et al., 2015).

Another common feature of programs which provide education on sustainability topics is their multi- and inter-disciplinary nature. Environmental challenges are often considered cross-disciplinary and are not reserved to a single sector, field, etc. (Feng, 2012) and students must be able to relate to complex environmental challenges taking on different views. According to Fortuin & Bush (2010) students have an appreciation for multi-disciplinary learning, which enhances learning outcomes by encouraging students to overcome barriers and challenges. When a challenge is interdisciplinary, there are links between distinct disciplines and therefore a value on understanding the world in multiple ways (Feng, 2012). Interdisciplinarity in sustainable education is “taken for granted” as part of the approach to increase students competencies for shaping sustainable development (Barth et al., 2007; Feng, 2012). Crossing disciplines invokes a discussion on where sustainability belongs within academia and whether it can be incorporated into the curricula of fields that don’t overtly address environmental challenges. The studied institution in this research runs two programs, one of which is the primary focus of this thesis. Both programs, the M.Sc. in Environmental Management and Policy (EMP) and the M.Sc. in Environmental Sciences, Policy and Management are designed with input from multiple disciplines such as economics, law, engineering and natural sciences ([IIIIEE], 2016b).

Many programs have also provided a platform for direct engagement in global or cross-cultural learning. Environmental challenges are well understood to be related to globalization and are fundamentally trans-boundary issues (Brundiers & Wiek, 2013; Lee & Schottenfeld, 2012a) and therefore education programs must consider how students can relate to global issues. Furthermore, environmental issues are often transferrable between regions and scales and knowledge on a specific environmental challenge can often be applied to other environmental challenges. The methods for providing a global context in learning has a range and includes recruiting a nationally-diverse student body, emphasizing the global nature of environmental topics, or implementing sections of a program abroad.

## 2.4 Introduction of relevant conceptual frameworks

The literature reviewed provides a general background to contextualize sustainability-related education. This section will introduce selected concepts and theories to set the foundation for the conceptual framework designed for this thesis (see Section 3.3 Development of Conceptual Framework).

The selected frameworks are a) key competencies in sustainability (Wiek et al., 2011), b) sustainability research education (Brundiers & Wiek, 2011), and c) participatory sustainability research (A. Wiek et al., 2014). As implied by the authorship of the corresponding articles, these frameworks have interconnections and shared concepts and have all been selected to complement each other and provide multiple angles for data analysis which will be further elaborated upon in Section 3.3. These frameworks have been designed for practitioners and researchers to use for the evaluation of education programs or program components, and relate to many of the same theories and concepts described in the literature review above, such as real-world learning, cultivating a generation of change-agents, and engagement with stakeholders or clients.

*The key competencies in sustainability* conceptual framework suggests five key ways of thinking which students should develop while studying sustainability-related topics and to potentially



set and measure learning objectives and outcomes. *Key competencies* fits into the enhanced capacity component of *participatory sustainability research* framework, which accounts for student learning but also provides a scheme to evaluate the societal effects of transacademic partnerships. The final framework, *sustainability research education*, aims to assess the process undertaken in transacademic partnerships while integrating student participation and education. This framework also accounts for student learning and enhanced capacity in several components. Enhanced capacity is the common link between all three frameworks, while *key competencies* provides more nuance and depth into types of capacities, and *participatory sustainability research* accounts for societal gains. These three frameworks have been merged in order to process and present the results and analysis of this thesis (see Chapter 3: Methodology).

### **2.4.1 The vision: sustainability research education**

The following concepts and evaluative framework are proposed by Brundiers & Wiek (2011) in the article “Educating Students in Real-World Sustainability Research: Vision and Implementation” published in *Innovative Higher Education*. The article defines sustainability research education, expands on the definition to construct a corresponding framework, and applies the framework to two existing initiatives.

The concept for sustainability research education was substantiated by Debra Rowe who was the President of the U.S. Partnership for Education for Sustainable Development and described a scenario in which ‘classroom exercises produced workable contributions to solutions’ (Rowe, 2007) in real-world sustainability problems identified by municipalities, companies, organizations and institutions. The complex sustainability problems are the type of problems which are addressed in sustainability research, which is often ‘solution-oriented and equally committed to scientific rigor and social relevance’ (Brundiers & Wiek, 2011). Not only would students contribute to building solutions, but they would be empowered in their role in effecting a sustainable future while learning (Rowe, 2007).

Furthermore, student participation in sustainability research initiatives is a type of real-world engagement which will prepare students for real-world problem-solving in their future careers (See Section 2.2). A main distinction is whether sustainability research takes place in an academic setting or in the “real world.” Brundiers & Wiek (2011) listed several academic initiatives which are examples of sustainability research that connect students to real-world problems, but asserted that “small-scale projects conducted by small groups of students, faculty members and stakeholders to increase students’ activity, responsibility and accountability are still rare” (Brundiers & Wiek, 2011). Therefore, evaluations and case studies of these projects are also rare and demonstrates there is a gap in literature of cases in education for sustainability which is inter-disciplinary, multi-cultural, involves critical thinking and real-world problem solving tasks.

This thesis uses this conceptual framework, which proposes the “ideal setting” for delivering sustainability research education, as a structure and guide for results and analysis. The proposed ideal setting has seven components: 1) actual sustainability problems; 2) stakeholders facing the sustainability problems; 3) preparing students to help create a better society; 4) generation of workable solutions and positive learning impact; 5) stakeholders’ specific knowledge; 6) professorial supervision, and 7) the transacademic interface manager as a facilitator. In the table below these seven components are shown with a basic description and corresponding criteria (see Table 2-1). In the analysis and results section, the guiding questions for assessing the criterion will be used.

Table 2-1 Overview of Conceptual Framework: Sustainability Research Education (SRE)

Requirement/Feature	Basic description	Criteria
1. Actual sustainability problems	Initiative is addressing complex, “wicked problems”; students apply theory in dealing with real-world sustainability problems.	Long terms dynamics; cross-domain and cross-scale complexity; cause-effect structure; specificity; urgency; harmfulness
2. Stakeholders facing the sustainability problems	Stakeholders identifying and requesting help on a sustainability problem, taking ownership in collaboration.	Initiation; problem ownership
3. Preparing students to help create a better society	Students must develop competencies that promote stewardship, unite “intellect, hands, heart’ in academic work.	Corresponding specific and generic sustainability knowledge; link knowledge to action; problem-solving techniques; interpersonal skills
4. Generation of workable solutions and positive learning impact	Students contribute to collective problem-solving process, develop response and mitigation strategies in collaboration with stakeholders.	Salient, extended peer reviewed products
5. Stakeholders’ specific knowledge	Integrates place-based knowledge, preferences, practical experiences through prolonged stakeholder involvement. Students learn to cope with conflicting perceptions and values, build partnerships and trust.	Two-way interaction
6. Professorial supervision	Professors enhance students’ critical thinking abilities, foster basic academic skills, and supervise students’ academic performance. Professors may increase own sustainability knowledge.	Academic supervisors
7. ‘Transacademic interface manager’ as facilitator	A neutral person who facilitates, integrates, and mediates the collaboration between students, academic staff and stakeholders. Allows students to project participants to devote themselves to genuine tasks (students conducting research, professors mentoring students, and stakeholders informing the research process with expertise).	Transacademic interface management

Source: Brundiers & Wiek 2011

## 2.4.2 Societal effects: participatory sustainability research

The article “Toward a methodological scheme for capturing societal effects of participatory sustainability research” by Wiek et al. (2014) introduces a framework and applied methodological scheme, intending to provide an operational tool. The term *participatory sustainability research* is defined as “the co-production of solution-oriented and actionable knowledge between researchers and non-academic stakeholders” (Wiek et al., 2014). The authors intend for the scheme to be widely applicable, structured, and able to capture effects on different scales (Wiek et al., 2014).

‘Capturing societal effects’ refers to being able to interpret and categorize the effects and impacts of such programs, projects, cooperation, etc. The term originates with Walter et al. (2007) to describe the resulting intended and unintended outputs, outcomes, and impacts (A. Wiek et al., 2014) which can be evaluated for quality. The need to evaluate societal impacts is

relevant because non-academic stakeholders have become increasingly attentive to sustainability challenges and it's more widely accepted that solutions necessarily require a cross-sectoral approach. Since funding often comes from external sources in participatory research there is a need to demonstrate that these approaches are effective not only from an academic perspective but for society as well, which is true for a number of initiatives (A. Wiek et al., 2014).

The authors have considered a full range of research on collaboration between academic and non-academic stakeholders and groups various participatory paradigms under the umbrella term of 'participatory research'. The key commonalities which encompass these paradigms include: cross-discipline and cross-sectoral collaboration; generated knowledge is intended to be relevant to society; they include values, goals and norms in the research process; reflection, deliberation and negotiation are encouraged for participants; and mutual accountability, ownership and leadership is encouraged (Wiek et al., 2014).

Another important aspect is that participatory research processes are intentionally designed and not a matter of happenstance through ad-hoc interaction. Stakeholder engagement is intentional, planned, and ideally continual. In order to design or evaluate a project or initiative, both the nature and quality of a process should be considered (Wiek et al., 2014).

According to the framework, there are three types of immediate effects and one type of long-term effect of a participatory research initiative: 1) usable products; 2) created or expanded networks; and 3) built capacity. These three effects contribute to: 4) structural changes and actions. The four types of effects (see Table 2-2 below) do not necessarily all occur or happen sequentially, and the authors acknowledge that they are usually closely linked.

*Table 2-2 Four types of effects and the linked variables of participatory research processes*

<b>Process stages</b>	<b>Effect category</b>	<b>Variables</b>
Direct effects (outputs/outcomes)	Useable Products	Technologies, products (goods)
	Enhanced capacity	Acquired knowledge, understanding, improved research capacity, use of technologies, anticipatory competence
	Network	Network(s) created/expanded, community created/expanded, trust, distributed knowledge, accountability
Indirect effects (outcomes/impact)	Structural changes	Changed context, policy implications

The use of this framework and methodological scheme is intended not only to identify types of participation and types of effects and the variables, it also offers procedures for collecting and analyzing data, identifies potential challenges, and proposed coping strategies (A. Wiek et al., 2014). This thesis will apply the above mentioned components of the methodological scheme especially identifying specific variables and challenges (barriers).

### **2.4.3 Five Key Competencies**

The *key competencies in sustainability* is an overarching framework which intends to support academic programs to best provide graduating students critical skills and qualities and to fulfil the organizational mission (Wiek et al., 2011). The study is potentially beneficial to institutions in program revision, and is appropriate for evaluating student learning.

The framework is based on a literature review conducted on the competencies needed in order to “analyze and solve sustainability problem, anticipate and prepare for future sustainability challenges, as well as to create and seize opportunities for sustainability” (Wiek et al., 2011, p. 204). Through interpretative process, the authors collected information from a variety of sources ranging from peer-reviewed articles to university websites. Subsequently, five types of competencies, or ways of thinking, were identified by converging the data. The proposed goal that academic programs should focus on sustainability is meant to “enable students to plan, conduct, and engage in sustainability research and problem solving” based on the five competencies of systems-thinking, anticipatory, normative, strategic, and interpersonal (see Table 2-3). It is considered reasonable that students should become more adept in several competencies and not necessarily all five, in addition to basic competencies such as critical thinking and communication and academic research (Wiek et al., 2011).

Table 2-3 Overview of key competencies in sustainability

Competency	Definition	Concepts
Systems thinking	Ability to collectively analyze complex systems across different domains (society, environment, economy, etc.) and across different scales (local to global)	a) Variables/indicators, sub-systems, structures, functions; b) Feedback loops, complex cause-effect chains, cascading effects, inertia, tipping points, legacy, resilience, adaptation, structuration; c) Across/multiple scales; d) Across/multiple/coupled domains; e) People and social systems
Anticipatory	Ability to collectively analyze, evaluate, and craft rich “pictures” of the future related to sustainability issues and sustainability problem-solving frameworks.	a) Concepts of time; concept of uncertainty and epistemic status; b) concepts of inertia, path dependency, non-intervention; c) concepts of consistency and plausibility of future developments; d) concept of risk, intergenerational equity, precaution
Normative	Ability to collectively map, specify, apply, reconcile and negotiate sustainability values, principles, targets and goals.	a) (un-)sustainability of current or future states; b) sustainability principles, goals, targets, thresholds; c) concepts of justice, fairness, responsibility, safety, happiness, etc.; d) concept of risk, harm, damage; e) concept of reinforcing gains and trade-offs; f) ethical concepts
Strategic	Ability to collectively design and implement interventions, transitions and transformative governance strategies toward sustainability.	a) Intentionality; b) transitions and transformation; c) strategies, action programs, interventions etc.; d) success factors, viability, etc.; e) adaptation and mitigation; f) obstacles and synergies; g) instrumentalization and alliances; h) social learning; i) social movements
Interpersonal	Ability to motivate, enable, facilitate collaborative and participatory sustainability research and problem solving.	a) Functions, types and dynamics of collaboration; b) Strengths, weaknesses, success and failure in teams; c) Concepts of leadership; d) Limits of cooperation and empathy; e) Concepts of solidarity and ethnocentrism

Source: Wiek et al., 2011

## 2.5 Literature Review Summary

Although the incorporation of sustainability in academia is not reserved to academic courses, this review focused on teaching and learning which involves students. The literature, while not comprehensive, presents a picture of the importance of practical learning in sustainability education. The description of the frameworks shows an important area for further research, integrating societal challenges into student learning which is both practical and has wider implications for academia’s role in building sustainability solutions.

### 3 Methodology

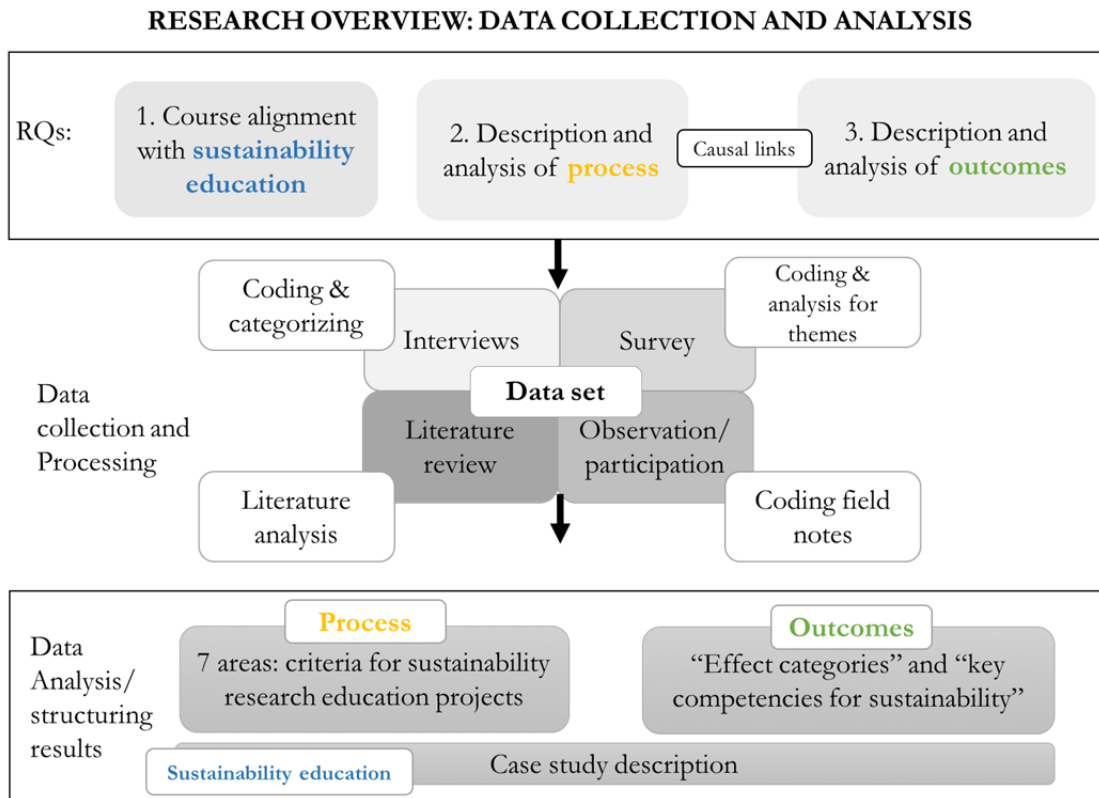
This thesis is guided by phenomenology – to study the “essence or structure of an experience” within the bounded system of a case study (Merriam, 1998) as explained further in Chapter 1.8: Scientific Positioning. Overall it is a ‘generic qualitative study’ which “seeks to discover and understand a phenomenon, a process or the perspectives and worldviews of the people involved” and attempting to inductively identify patterns based on an analysis using a theoretical framework (Merriam, 1998).

This research investigates “the meaning embedded in people’s experiences” (Merriam, 1998) through my perception of the individuals in natural interactions either at the academic institution or in the field with stakeholders. The emergent themes and concepts do not attempt to build toward a theory, rather to provide a description and analysis of the phenomenon.

#### 3.1 Research Approach and Design

This chapter describes the research approach, methods of data collection and processing for analysis, and the development of the conceptual framework. This chapter is divided into three subsections: Research Approach and Design; Data Collection and Processing; and Use of Frameworks. The diagram below shows an overview of the research methodology (see Figure 3-1) – all methods of data collection contribute to a data set which were applied to a merged conceptual framework for data analysis and structuring. The merged framework was composed of concepts which were aligned to the research questions.

Figure 3-1 Overview of research methodology



The diagram in the final section of the methodology chapter (3.3 Development of Conceptual Framework) illustrates a merged conceptual framework created for this thesis that captures the process and outcomes of the course. The amalgamation of frameworks was chosen for two reasons: one, it facilitated the study of both process and outcomes of the course, and two; within each framework is an approach to distinguish what is unique about different stakeholder experiences (students, IIIIEE, and clients). The features of a process are studied through the framework for sustainability research education, which has seven components which acknowledge these three stakeholder groups and their separate and collective experiences. The outcomes of the process are researched using the framework for participatory sustainability research: societal effects (shown in the middle of the diagram), with a second framework for key competencies in sustainability embedded within under the effect “enhanced capacity.”

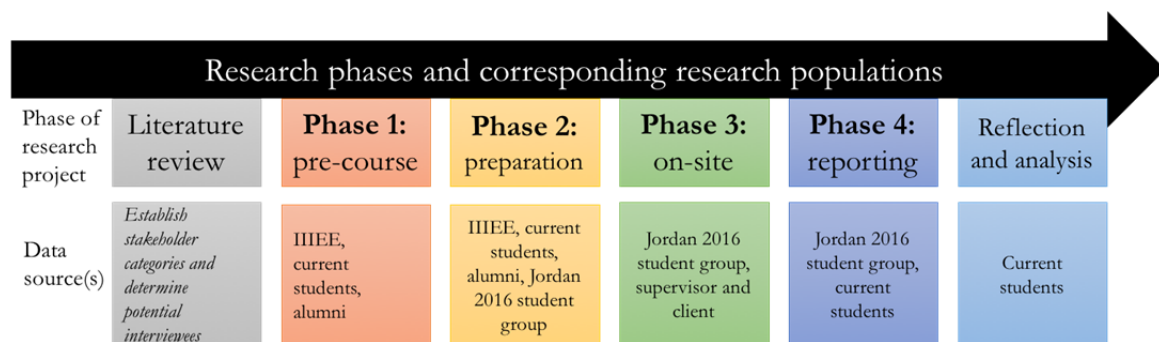
This merged or amalgamated framework, referred to in this thesis as *participatory sustainability research education* (PSRE) was designed to understand the process and outcomes of a collaboration between distinct stakeholders with distinct but related objectives. The data collection was designed to capture data from all three stakeholder groups, and the analysis utilized the three frameworks to organize and present the data.

### 3.2 Data collection and Processing

Data collection phases were adapted to match the phases of the course in its implementation in 2016 and included the following methods: literature review, surveys, interviews, observation and participation. Each method was adapted to fit each stakeholder group or sub-group, based on level of accessibility or interaction. For example, several methods were used to collect data from current students, such as in-situ observation, which wasn't possible for alumni or clients. The figure below (3-2) displays Phases 1-4, as well as the pre-phase for literature review and the additional reflection and analysis which was distinct but overlapped with Phase 4.

Participation and observation occurred during Phases 1-4, the defined phases of the course delineated by the education program. Interviewing took place during the observation phases with former participants, in order to incorporate reflective perspectives into the data collection. All methods were designed to understand the process of the course, current and previous. All methods were also designed to simultaneously collect information about outcomes including questions about learning and effects of the projects. The literature review was informative on both process and outcomes, as was the additional phase outside of the course syllabus, implemented for current students to reflect on their experiences. Within this chapter are sections with a description of all the methods used for data collection.

Figure 3-2 Research phases and corresponding data sources



### **3.2.1 Literature review**

A literature review was the initial method used to develop the theoretical and conceptual background in sustainability education, stakeholder and client engagement in academia, and the case study of SED as described in academic articles published by the IIIIEE. The following paragraphs provide an outline of the types of sources used, the initial scope of the literature review, the adjustment of the review's initial scope, and further details on several key sources.

A number of written sources were analyzed including internal organization and planning documents, drafts or published student-written reports from 2002-2015, PowerPoint presentations used during 2005-2015, and the organization's recent annual public reports. These sources were used to categorize basic information about the history of the course and create several foundational databases. These databases contributed to the identification of key informants, gaps of knowledge and areas of interest for further research.

At the initial stage of literature review, the research questions were more broadly focused on education for environment or education for sustainability. There is an extensive body of academic literature published on education which is related to the environment and a number of pedagogical approaches, evaluation of programs, and a range of academic levels from early education to higher education. In order to create a scope which would apply to the case study (a course in an applied, interdisciplinary Master's program in Environmental Policy and Management) the literature review was narrowed to a) higher education (undergraduate or graduate), b) practical and applied pedagogical approaches, c) sustainability challenges and environmental topics. The studies mainly exemplified pioneering programs, evaluation of applied pedagogies, and use of evaluative frameworks. Throughout the implementation of the research design, it became evident that further literature review was needed. The second stage of literature review focused on a) client-based learning, b) stakeholder engagement, and c) participatory sustainability research. Initially the literature review maintained an education-based or pedagogical angle, and these concepts provided an added perspective on how societal actors engage in academia. Therefore, the background expanded to multiple perspectives found in types of engagement sustainability issues: academic actors such as student or an institution for higher education and non-academic actors from various societal sectors or domains.

There were several key sources for this research found in the literature review. A key resource was several related articles published between 2011-2016 by Arnim Wiek and his associates. Three articles were selected as guiding conceptual frameworks. Another key source was an article originally published in 2015 by researchers from the IIIIEE which served as a main point of reference for academic research on the SED course. The final key area of knowledge expanded was understanding the framework and activities of past SED projects through the review of student reports written for course assessment and in some cases publication from 2002-2015. From 2011-2015 (excluding 2013) there are joint reports available with chapters on each student project of that year, and before 2011 there are drafts or final versions of individual reports for each project.

### **3.2.2 Interviews**

Primary data collection was largely based on qualitative interviews which took place throughout the research stages, from exploratory interviews in parallel with the literature review to follow-up interviews at the conclusion of the data collection stage. Interviews were conducted throughout all stages of research.

A total number of 41 qualitative interviews were conducted with representatives from all three stakeholder groups. The total number of interviews represent only structured communications conducted under the agenda of a formal interview or meeting. This number does not include informal conversations or email exchange. Of the 41 interviews, 21 participants were representing students, 8 represented a perspective from the academic institution, and 9 represented the clients or societal stakeholders. A number of interviewees represented multiple stakeholder groups based on their past participation in the course. One interviewee had been a member of each stakeholder group over time, three clients were also alumni, one client was a long-time associate of the institution, and several academic staff were alumni. (see Appendix D – Interview List). Most interviewees were interviewed one time, while others were interviewed two to three times.

Interviews were conducted either in person, on Skype with a video connection or via the phone with no video component. All individual interviews and focus groups were audio or video recorded with permission by interviewees. The length of the interviews for alumni, clients and staff was usually proposed at 15-60 minutes depending on the interview, and were realized at 40-120 minutes. The length of interviews for current students was considerably shorter at 5-20 minutes, due to regular exposure to the students and continual opportunity for the in take of information. All interviews were conducted based on an interview protocol template created for each stakeholder group and modified for each interviewee based on their role or position and personal history with the SED course.

The methods for selecting interviewees were: a) identify key informants with unique insight into the phenomenon of the course, and b) semi-randomly select informants to create a diverse range of stakeholder groups, time periods, SED project sites. For example, informants who have played different roles in the course were further sought after for added perspective. Besides this, in many cases the snowball selection method was used, and there were minimal criteria besides ensuring that interviewees were moderately distinct from each other in project year and site.

Finding informants from the IIIIEE staff and administration (institution perspective) began with identifying individuals who have a long or significant history in implementing the course and regarding them as key informants or experts, some of which provided information additionally outside of the interviews (see Appendix D – Interview List). The majority of informants from this group were integral or have been highly involved in the implementation of this course, with only several informants otherwise.

The identification of potential interviewees from the client stakeholder group was entirely reliant on the IIIIEE staff who had inside perspective and contact information. Initially, a systematic review of all past SED projects was conducted and transferred into a database in order to identify all previous projects and clients. The information came primarily from final or rough drafts of student reports, which do not have consistent information available, and didn't necessarily identify specific agencies, organizations, individuals, or entities and were not adequate in identifying key informants of the clients or project partner research area. Several guiding criteria were outlined based on the database and information from exploratory interviews to find clients including; clients who have hosted multiple projects, clients who have personal connections to staff of the IIIIEE, clients who were considered "successful" or "exceptional" by the staff, and clients who have also been EMP students. These criteria were expressed to staff members of the IIIIEE and in some cases, the staff provided an email address or sent an introductory email – in some cases no information was provided. Though these interviewees are not fully representative of SED projects, it was



deemed adequate based on the fact that the SED projects are quite diverse regarding sector, domain, style, task, etc. There are no definite criteria for forming a partnership with a client for an SED project, therefore the use of networking and inside information to find interviewees was deemed representative of the way SED projects themselves are established.

The majority of potential interviewees who were contacted were interviewed, with a small number who didn't respond. Seven interviewees initially agreed but the interview didn't occur for practical reasons, scheduling difficulties, or lack of follow up on either side.

### **3.2.3 Survey of alumni and current students**

The survey method was selected to collect both qualitative and quantitative data from current and former students of the program. A survey was deemed appropriate only for researching the student perspective and the data collection for the institution and client stakeholder group perspectives were excluded from this method. This was based on the scope of the research project, in consideration of the deficiency in accessible contact information for clients and the researcher's substantial degree of access to key informants in the IIIEE.

Three variations of the survey were disseminated to two distinct groups of students, with the second group receiving both a pre- and post-survey designed for a response before and after the on-site phase of the course. The first version was sent to alumni of the EMP program who have completed the program. The second version was modified for the current batch of students (Batch 21). A third version was modified as a post-survey to be taken upon the completion of the preparation phase and after the on-site phase for current students.

All three versions were structured online questionnaires with question formats mainly as open answers and matrix grids with related questions and a linear scale. The survey template for all three was similar and divided into four sections which reflected the sequential phases of the course; introductory information, experience before departure, on-site interaction and learning experience, and self-assessment of learning outcomes.

The **surveys for current students** (pre- and post) were divided into sections: *introductory information* (basic information about the project the subject participated in and their background in the topic), *experience before departure* (perceptions of the preparation phase such as support from IIIEE), *on-site phase* (pre only: expectations and self-perception of preparedness), *self-assessment of learning outcomes* (pre and post: course learning outcomes and key competencies in sustainability) and *recommendations for the course* (pre and post feedback). The sections in the **survey for alumni** were the same for *introduction*, *experience for departure*, *on-site phase*, *self-assessment of learning outcomes* and *recommendations for the course* with the questions adapted for former rather than current students and without the pre and post design. The questions and sections were designed to collection information both about process (e.g. in section *experience before departure*) and outcomes (e.g. in section *self-assessment of learning outcomes*).

The survey for alumni was open for over five weeks from March 24 – May 2. The pre-surveys for current students were open for over one week relative to the short period of time for the course, from March 31 to April 9, which was the official day of departure for the on-site phase. The post-surveys for the current study were opened April 29 after the final reporting phase and remained open until May 20, three weeks after returning from the SED project site.

The electronic contact information which was needed to disseminate the second and third version to the current students was easily attainable and guaranteed to include all possible

informants from the sample (31 students). The surveys were sent initially to university email addresses and response was encouraged through a second round of dissemination using social media communication, namely Facebook. The dissemination of the first version to all, while intended to ensure participation and reliable results, was not optimal due to inadequate or up-to-date information, i.e. no alumni database. The email list had several issues: a) it included emails without corresponding names, and b) it did not differentiate between the two Master's programs of the IIIIEE, one of which does not participate in course being studied in this research. In order to reach as many alumni as possible the survey link was then sent through Facebook and LinkedIn alumni groups and was designed to be logical for only EMP students to respond to. Two emails were sent to alumni, several weeks apart, two Facebook posts were made in an alumni group, and endorsement by a member of the alumni executive committee brought attention to the online post.

### 3.2.4 Participation and Observation

The SED course is generally run from February to April in the spring of every year, so the timing of this research (Feb 1-June 6 2016) aligned in a way which allowed full observation of the course from beginning to end. The opportunity to go beyond passive observation and make active interventions was seen as a supplementary technique to experiment with outcomes. It was beyond the scope of the research to design substantial interventions, but some interaction with current students' course was possible, mainly through giving iterative feedback to staff members, joining an SED project and facilitating several sessions with current students (in either small groups or with the entire cohort).

Action research allows the researcher an "insider opportunity" to experience a phenomenon and is commonly used by practitioners, and is common in education (McNiff, 2002). In this thesis, there was the opportunity to gain insight "on the ground" that would have been limited to other researchers coming from a staff position. Adding a participatory component to this methodology is reflective of the educational approach of the course being studied; Master's students should apply their knowledge in a real-world context. The research imitates learning outcomes of the course (see section 4.7). For example, in order to "systematically intervene in a real-life complex system (course learning outcome #2)" was translated into being an active and contributing member of the group. The "professional client" (course learning outcome #3) was the institution or the students which helped justify the research impacts on the current implementation of the course.

The participation and observation can be classified using several criteria: the intended beneficiaries (participant or researcher or both), the intended result(s), what the scale of effect on the participant group was (individuals, project sub-groups, full group). As seen in Table (3-1 and 3-2) below, different interactions were intended to have distinct but overlapping results and benefits. The types of interaction or events were representative of components of the course which are sporadically but not systematically addressed, and generally represent needs which have been identified in initial research. For example, the activity of keeping daily logs was introduced after discussions with key staff informants that de-briefing and reflection on the research process is often. The decision to keep daily logs was made in agreement with group 'liaisons' who voluntarily participated in the research methods throughout the process. Keeping a daily log was a way to collect information for research but also intended to empower an individual from each group to take initiative to actively shape or contribute to the group process, provide a platform for the sub-groups to reflect and exchange while on site and develop a group culture, work ethic and/or norms.

*Table 3-1 Summary of participatory research methods: scale of effect, beneficiaries, intended results*

<b>Method of interaction/ event</b>	<b>Scale of effect</b> <i>(individuals, sub-groups or full group)</i>	<b>Primary beneficiary</b> <i>(researcher or participants)</i>	<b>Intended result(s)</b> <i>(primary)</i>	<b>Secondary beneficiary</b> <i>(researcher or participants)</i>	<b>Intended result(s)</b> <i>(secondary)</i>
<b>Liaisons</b>	Individuals, sub-groups	Researcher	Streamlined contact with all groups	Participant (liaison)	Platform for cross-group interaction, opportunity for reflective thinking.
<b>Surveys</b>	Individuals	Researcher	Gain feedback on course framework, discover themes and patterns, insight into perception of competencies	Participants	Stimulate critical thinking; reflect on course learning outcomes and personal objectives
<b>Pre-course interview</b>	Individuals	Researcher	Gain insight into expectations and motivations	Participants	Stimulate critical thinking; reflect on personal objectives
<b>Informal conversations</b>	Individuals	Participants	Stimulate critical thinking and reflection, instigate interaction with peers, instigate knowledge exchange	Researcher	Integrate/gain access to individual and group processes, understand individual perspectives, knowledge exchange
<b>Daily logs</b>	Sub-group	Participants	Stimulate group process and participation, group reflection, opportunity for structured discussion	Researcher	Gain insight into meta-process of different group projects for comparison, data triangulation
<b>Post-course reflection session</b>	Group (full cohort)	Participants	Provide structured “de-orientation” to process, share, reflect and discuss experience: deepen and solidify learning	Researcher	Gain insight into individual reactions and results post-course, influence of students on each other

*Table 3-2 Participatory research areas, participants and methods*

<b>Area of research</b>	<b>Participants</b>	<b>Methods used</b>
Jordan 2016 (single project group)	4 students, 1 supervisor	Regular reflection and debrief, participation in assignment, informal discussions, feedback exchange, final reflection session with Batch 21
Current students (2016) (set of 7 project groups)	31 students (including Jordan group), 8 supervisors	Point of contact (liaison) for each group, follow up discussions, daily logs, final reflection session

The methodology was based on the participatory action research model to “plan, act, observe and reflect” as an iterative process. In the preliminary research stages, several themes were identified for exploration – key staff members of the institution expressed the need for structured reflection and the need for better follow up with clients; several alumni expressed the need for more clear communication about the course structure and objectives and more clear communication on the defined roles of the clients and supervisors in the entire project.

All interactions were based on an overarching plan meant to identify several basic needs, experiment using straightforward methods to address them, and reflect on the effectiveness to contribute to the larger research. Data collection was based on the scope of the entire research project and the intention with the current students overall and in many specific instances was to gain broad insight rather than in-depth knowledge.

Interventions were “participator controlled” meaning that decision-making power was given to the students on some level (McNiff, 2002), while the course coordinator used his position to inform the students that there would be an “embedded researcher” without including them on the decision. The students had choice in some activities or action while in others they were subject to higher decisions. Care was taken in framing interventions as non-mandatory, to disclose the intentions and objectives of the research, to incorporate researcher reflection, and to request student feedback on the preferred methods. According to Karlsen (1991) “in both the research process and the action process there is a need for time to reflect on what is taking place” and structured time was taken for reflection for students and the researcher.

#### **3.2.4.1 SED project participation: Jordan 2016**

In order to gain insight into the experience of participating in an SED project, I was integrated into a project team of four students travelling to Jordan to work with the United Nations Development Program (Middle East and North Africa region [MENA]). In order to set the terms of my integration and participation there was an initial discussion with the course coordinator and the supervisor who was responsible for the Jordan group. With their approval, I reached consensus with the four students assigned to the group that I would join the process and that my level of participation would be revised in a participative way throughout because it was agreed that actions taken which impact participants should be informed, committed and intentional (Karlsen, 1991). My general approach was to collect action research data through both my factual accounts (transcripts of meetings, summaries of data) and subjective accounts (personal reflections by participants) (McNiff, 2002).

#### **3.2.4.2 Current students: daily logs and reflection**

In order to gain basic information about the process of concurrently running SED projects, I requested that a representative from each of the seven projects be responsible for keeping a daily log (field notes). Two templates were distributed for streamlined and straightforward data collection – one using Google Forms and the other in a spreadsheet. The format included the input of basic information such as name, group, date, time, type of day (work or day off), and two separate questions to invoke a) a description of the daily activities and b) corresponding reflections. The description of daily activities was prompted with “please briefly describe the events and details of the day” and the reflection was prompted with “please describe your impressions, reflections, feelings or thoughts based on your description.” A final input area requested the writer to cite where the information came from (for example, regarding if it reflected the writer’s individual views or are they representing the group based on collaborative discussion). All six project groups (excluding Jordan) delivered some form of a daily log as requested, and all adequately followed the format of description and reflection. Two groups utilized Google Forms, three utilized the offline Excel spreadsheet, and one group established their own customized format by recording a series of video blogs. All groups except one delivered the log within one week of returning, which implies some retroactive updates to the logs.

A group reflection or debrief has never been a core component of the course and was not presented to the students as part of the course structure ahead of time. However, a session

was built into the schedule with some advance notice, and was explained in more detail to the students several days before it took place. The format and facilitation was not determined until two days before it occurred, when the course instructor and I discussed the opportunity and I took the lead in developing the session.

As was explained to the students in an initial email and during an introduction at the beginning of the event, the objective of the session was to implement a final phase which can be known as “transference,” “de-brief” or “reflection.” Other synonymous words often used are reasoning, thinking, reviewing, problem-solving, and reflective practice (Moon, 2000: Kitchener 1983). These terms or approaches are all representative of a phase which comes after a process or experience, intended to allow the participants to analyze their own experience - in this case together with other participants who had a common experience. The session was explicitly framed as a structured and guided opportunity to communicate in a variety of formats in a specified amount of time, which makes it distinct from other platforms for communication (on-site discussions, informal chats, etc.). I introduced it as a form of ‘collaborative inquiry’ in which the group together raises their consciousness about an issue (Moon, 2000). While it doesn’t have to have formal structure, it was important to frame the objective with the students based on their feedback that they need more transparency. The stated objectives given to the students were: to help clarify; a) what/how do you want to communicate about the experience; b) what meaning did it have; and c) how to implement the lessons learned. The final part of the introduction was to re-emphasize the position of this reflection session in my research and my personal research objectives.

As the facilitator, I utilized a PowerPoint presentation to provide maximum structure to the session and a road-map to help the students relate to the purpose and process. I explained that I would divide the group into small groups and ask guiding questions which they would discuss with their group for a specific amount of time. The structure of each short discussion was up to them – they could allocate specific amount of time to each person, determine an order for speaking, or flow naturally as they wished. Five different slides with a set of related questions or “prompts” were displayed (see Appendix:

Table C-3 Overview of group reflection session *exercises*) read aloud, and remained on the screen for reference while students took 5-10 minutes to discuss each prompt.

The prompts included topics about roles and relationships with supervisors and clients, expectations and challenges, and group dynamic. Holistically, they were designed to prompt participants to provide positive feedback to each other and focus on strengths, to take on others’ perspectives such as those of the supervisors and clients, and to critically assess the positive and negative aspects of the experience. The format of switching groups between meeting with their familiar project group, moving into a mixed group, and then reconvening was designed in order to meet a variety of needs from different participants – some wanted more time to discuss within their groups and others wanted to hear the perspectives of other groups. These needs were determined through an informal, in-person survey of approximately 1/3 of the entire group the day before the session from people who were present, accessible and willing to give feedback. Certain groups or individuals were engaged in various degrees of reflection throughout their course experience and there was potential for delivering an ineffective or redundant methodology in such a session, therefore “putting a finger on the pulse” was necessary not to overwhelm or burn out the participants, and was designed with this in mind. The session took place directly after several days with compacted and stressful deadlines for key course deliverables and before an informal course tradition of meeting for the cultural sharing of food, drink and a photo contest.

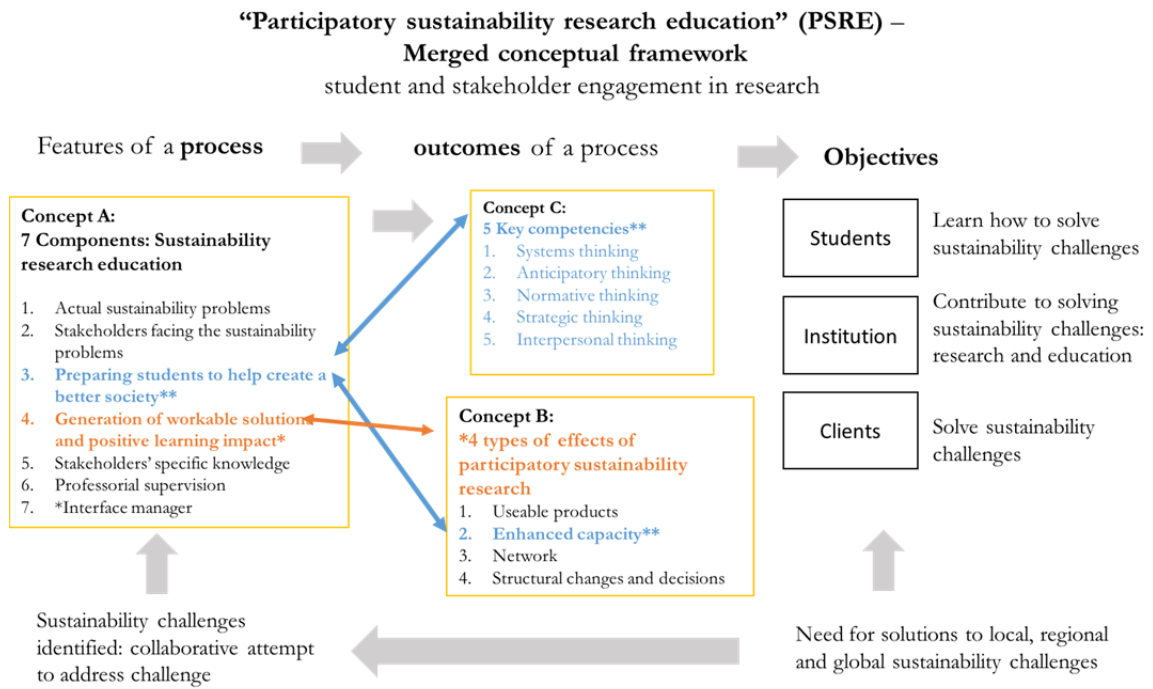
### 3.3 Development of Conceptual Framework

The conceptual framework used in this thesis is a combination of three related concepts which are individually described in further detail in Section 2.4: Introduction of Relevant Conceptual Frameworks. The conceptual frameworks used are meant to provide structure and a basis in literature to describe and analyze, rather than to critically assess the frameworks themselves.

A merged framework was used for several reasons. Each separate concept frames unique aspects of the course, for example through defining process procedures or categorizing outcomes. The concepts were developed by the authors through literature review of existing comparable educational approaches, therefore representing the wider discourse. The combination allows for acknowledgement of both student learning, societal impact and additional value. The course is fundamentally a learning exercise, so the merged framework incorporates the five key competencies concept to frame student learning. Each concept has been written as a scheme or tool and can be used for practical evaluation.

Figure 3-3 below shows the relationship between the three concepts used. *The key competencies in sustainability* conceptual framework (Concept C) suggests five key ways of thinking which students should develop while studying sustainability-related topics and to potentially set and measure learning objectives and outcomes. *Key competencies* fits into the enhanced capacity component of *participatory sustainability research (PSR)* framework (Concept A), which accounts for student learning but also provides a scheme to evaluate the societal effects of transacademic partnerships. The final framework, *sustainability research education (SRE)* (Concept B), aims to assess the process undertaken in transacademic partnerships while integrating student participation and education. This framework also accounts for student learning and enhanced capacity in several components. Enhanced capacity is the common link between all three frameworks, while *key competencies* provides more nuance and depth into types of capacities, and *PSR* accounts for societal gains. The merged framework aims to capture features of the process, outcomes of the process and link them to the objectives of a “PSRE” or participatory sustainability research education” program.

Figure 3-3 Merged conceptual framework (PSRE)



Source: (Brundiers & Wiek, 2011; Arnim Wiek et al., 2011; A. Wiek et al., 2014)

## 4 Case Study Description: the SED course

### 4.1 Introduction to the institution: IIIIEE

The International Institute for Industrial Environmental Economics (IIIIEE) was established in 1994 as part of Lund University in Lund, Sweden. The IIIIEE is involved in academic research and education and teaching in order to address global sustainable development challenges ([IIIIEE], 2015). The founding principle that “prevention is better than the cure” motivates the continued approach towards preventing rather than reacting to environmental problems.

### 4.2 Master’s in Environmental Management and Policy (EMP)

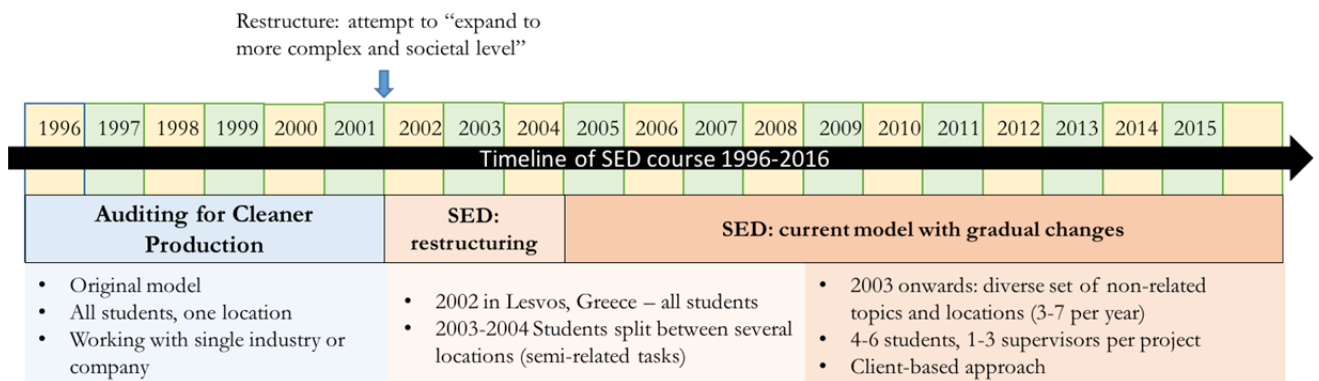
The Master’s course in Environmental Management and Policy (EMP) is the main education program run by the IIIIEE since the establishment of the institution and students join for two years. The program structure provides an online learning component for the first year before students arrive on-site in order to allow students to gain practical experience before relocating to Lund for their continued studies ([IIIIEE], 2016b). The coursework is designed towards “proactively creating solutions in preventative environmental management” which is reflective of the institution’s principles and is exemplified in the SED course ([IIIIEE], 2014, 2015, 2016b). For an overview of the program timeline, see Appendix A-1.

Students join program from around the world, often in order to learn from the Swedish experience regarding various sustainability issues. A typical cohort of 20-30 students has 15 nationalities represented, with an average age of 27-28 years old, and some of whom bring professional experience (Lindhqvist et al., 2015). As of 2016, there are estimated to be over 500 alumni from around 90 countries (Oloffson, 2016).

### 4.3 Historical context

Understanding the current model for the course (a current description is found in Section 4.4) requires a historical briefing of the early visioning and implementation. The course has evolved gradually, with small changes happening from year to year. There has been one significant overhaul from the original model, with a period of gradual restructuring to it’s form now (see Figure 4.1 below). Some characteristics have remained unchanged throughout, such as working with an external client, a solution-oriented approach to an environmental challenge, and exposing students to a professional working environment.

Figure 4-1 Evolution of SED course 1996-2016



Evolution of the Strategic Environmental Development (SED) course 1996-2016



*Source: by author ([IIIEE], 2003, 2004, 2014; Kisch, 2002; Kogg, 2016).*

According to original documentation, the course was established with the goal to “further integrate education, research and practical implementation” ([IIIEE], 2004). The exercise originated when an external stakeholder who had personal contact with IIIEE staff members approached the institution with a potential joint research opportunity and the staff decided to involve students (Lindhqvist, 2016). For the initial seven years of the course, from 1996-2002, it was known as Auditing for Cleaner Production (ACP) and the students typically worked on tasks related to environmental problems in industrial processes.

Subsequently in 2003 the course was shifted into Strategic Environmental Development (SED) (Heiskanen et al., 2015) as it continues to be known as today. The new model was tried on a project in Lesbos, Greece which was established through the academic connections of staff and an alumnus. 20-30 students traveled as a group to Lesbos and worked on complementary sub-projects. A team of in-house or associated researchers accompanied the students as supervisors, similar to the previous model. Most information about this shift comes from an internal discussion document entitled “Building the Strategic Environmental Development Programme” which introduced a vision and discussion on the immediate and long-term potential actions for the course. It was the most comprehensive written document available for this analysis. Further written information comes from a document from 2002 which the course coordinators published for student use and included a detailed description of each component of the course and its rationale. ([IIIEE], 2003).

A year after Lesbos, in 2004, the course shifted to allow the availability of diverse set of projects and topic areas from different regions and with different regional actors. The exercises were run concurrently “in order to increase the diversity and intensify the cooperation between the Institute and local partners” ([IIIEE], 2004). A number of non-related cooperative projects were established in different locations and did not necessarily carry over year to year, although some were related or involved returning regional partners. The students continued to work in small groups of 4-6 students to address an identified context-specific issue, but generally the concurrent projects each year did not have related topics, regions, themes, etc. The course goals and objectives continued to be focused on education, research and regional development and the course structure still emphasizes “theory and practice” and “action.” Further explanation for how to allocate time for coursework was included in the 2004 syllabus, and the schedule was simplified from its original detailed form to include expected in-class hours and unscheduled hours. Financing mechanisms were further elaborated on, such as who pays for travel and accommodation costs, which remains in-flux as of 2016 dependent on a number of variables.

This shift in 2004 was in part due to the successful results in early years and so a more “ambitious” program was envisioned as part of a partnership with the European Partners in a Network of Excellence ([IIIEE], 2003). There was an attempt to expand the course to “a more complex and societal level” based on the concept of sustainable development and “the need for comprehensive development approach in which environmental, economical and socio-cultural aspects are considered” (Kisch, 2002). The new model of the course was an opportunity to “explore practical application,” “test approaches” and “learn where to intervene” (Kisch, 2002). The SED was intended to connect to other institutional activities (including the educational experience throughout the M.Sc. program) including research and furthering cooperative and outreach projects (Kisch, 2002).

A shift towards sustainable development was justified through an analysis of regional projects for sustainability which had been implemented in the European Union (EU) in the preceding decade (before 2002). Staff researchers of the IIIIEE analyzed projects based on their a) objectives, b) methods used, c) outputs and d) investigated interrelationships in order to inform the development of the SED course. They learned several lessons such a how sustainability terminology tends to be defined inconsistently, and that types of interrelations lack distinction from one another (Kisch, 2002) which informed further course visioning.

Based on the APC course model and the lessons learned from regional projects, several more opportunities for improvement were identified. For example, it was deemed important to identify tools and approaches for creating change in order to help clients take action. A number of key points were made for developing the course: to create a working methodology for participants of the course; to be selective in establishing realistic projects; to consider the outputs and deliverables for societal actors: to use principles from systems and evolutionary theory and to allocate responsibility among senior staff (Kisch, 2002). At the time this document was written, a number of actions and decisions regarding the course still had yet to be made such as developing a working framework, identifying and scheduling the details of the program, identifying cases and regions, identifying new local partners, developing a funding strategy, roles and responsibilities, overall co-ordination, logistics for upcoming years, etc. A long-term project plan was proposed for further development which was called “the Mediterranean Link” and proposed activities for the initial six years in Greece, Italy and Spain.

From 2005, the only available documents for review were PDF versions of the introductory PowerPoint presentations used to introduce students to the course each year. These presentations remained essentially the same from year to year with only small changes, mainly on the proposed projects.

Only small changes were each in the subsequent years from 2003 until the present, the period of 2002-2004 was significant in re-defining and re-directing the course towards its current implementation. Since 2005, the course has been retained its approach and structure with small, gradual modifications and as of 2016 is run in a similar way.

#### 4.4 Course description: SED

The SED course is one of the final courses of the program and directly precedes the individual thesis module (see Appendix A-1). The course aims to provide students an opportunity to apply their previous academic experience in the degree program in a real-world context (Heiskanen et al., 2015). Each spring, the students in their second year of the program (~20-30 per student “batch”) are divided into small teams and assigned a task associated with an organization outside academia such as a company, municipality, non-profit, international organization etc. The task manifests as a short-term cooperative project which deals with a complex, real-world environmental challenge faced by the stakeholder in their local context.

Over the 20-year history of the course, projects have mainly occurred in Europe but recently have expanded in geographical scope to include countries in the Middle East, Asia, Central America and Africa (see Appendix A for a full list). After a short preparation phase, the students leave the university setting to spend to work in a new location in cooperation with a local stakeholder for 1-2 weeks, who is referred to as the client, and then return to Lund for a reporting phase to finalize their research findings. The use of the term *client* demonstrates the framing of the course as short-term consultancy project, in which students apply global

lessons and theoretical knowledge to propose solutions for challenges set in a local context (Lindhqvist et al., 2015).

The course is colloquially referred to as SED, and is registered at Lund University as a course in Applied Research Methods. It fulfills 9 ECTS credits out of the 120 needed to complete the EMP program. It is compulsory in the third semester of the program and students must have completed the first two semesters of the program in order to participate, and applies knowledge and skills which were accumulated during previous semesters ([IIIEE], 2014).

Appendix A-1 demonstrates country diversity and years visited and frequency in each country. While this does not provide details on the specific clients, it gives an impression of the geographical scope, range and diversity of projects. The topics and areas of research for student projects have not been limited to the specific expertise research of the IIIIEE –for example, past projects topics range from solar PV deployment to sustainable tourism. The IIIIEE and key staff members dedicate significant attention and resources to maintaining the course, despite barriers such as the time investment needed by supervising staff and financial costs of global travel (Heiskanen et al., 2015).

#### **4.4.1 Timeline and phases**

The course is divided into three phases; preparation (on campus), a site visit (away), and reporting (on campus). The preparation phase occurs at Lund University at the IIIIEE and typically overlaps with assignments from other ongoing courses. During this phase the students work as a team to plan logistics and define the task. Activities may include identifying stakeholders, setting up meetings, conducting background research and communicating with the client in order to maximize efficiency during the on-site phase.

While on site, the students spend an average of 5-10 working days in a local context set by the client and proposed terms of the defined task. This period is designated for gathering relevant information and primary data, typically through conducting interviews with local stakeholders, getting to know the client and eventually beginning the analysis and presenting initial preliminary findings to the client and other stakeholders (Heiskanen et al., 2015).

When the students return to Lund for the reporting phase, students from all groups convene to produce a joint report with findings from all projects for publication. During this phase the students are expected to continue working on a separate report for the client, the joint report, and any other deliverables assigned that year. The course concludes with presentations and a cultural sharing event.

A figure in Appendix A (A-2) demonstrates the three phases of the course and includes an additional pre-course phase to show the activities which occur before the official start of the course work. During the pre-course phase, students attend an introduction session and within the following week express their preferences for projects, and are shortly assigned to a group and project. In the preparation phase, students begin working with their supervisor, group-mates and clients and present their initial plan and findings to their peers before leaving. While on-site, the students collect data and present initial findings directly to the client and other relevant stakeholders. Upon return, the students engage in the reporting phase to complete all deliverables and exchange information with their peers.

In each implementation of the course, approximately 5-10 staff members are involved. A course coordinator (or two) and other key staff members who have been involved over the years work together to utilize networks and find projects. The course coordinator is

responsible for managing the course activities and sessions, communicating with students, finalizing projects and clients, and overseeing assessment. The supporting staff members, some of whom have been a course coordinator in previous years, are generally further involved in assessment or as supervisors.

Each project has at least one supervisor, sometimes more, who is a member of the IIIIEE research staff or a Ph.D. student. In previous years, there have been supervisory teams composed of a senior and junior supervisor, but in recent years there is usually one. The supervisor may be associated with the client or have expertise in the topic, but not necessarily. In some cases, an additional staff member accompanies the group on the project voluntarily and doesn't have an official role, because of personal interest in the project or region. The supervisor may play a role in establishing or finding a project, but it is not a fixed part of their responsibility. Many staff members have utilized personal or professional connections around the world to establish projects.

The role of the coordinators, supervisors or other involved staff are not systematically defined and there are no guidelines for supervisors to follow in their style of supervision of their group. They are allocated 55 hours in their job description but generally are obliged to exceed that amount of hours in order to be involved in all phases of the project.

Supervisors are selected in an ad-hoc manner, based on their experience with the course, their availability, communication with the coordinator, their connections or network, their expertise or field of study, the nature and number of projects, and other variables. The selection is part of an iterative process related to what projects end up being established.

#### **4.4.1.1 Additional supporting roles**

In some cases, supportive roles were built into the on-site interaction, based on needs such as language translation or contextual guidance. These roles were filled by people who were somehow associated with the project or the client such as local students, employees or civil servants, etc. In several cases an additional researcher has accompanied a group, such as an external (non-IIIIEE) Ph.D. student who was involved with the project in another context. The responsibility taken in these supporting roles has been context-dependent, and in many cases has provided support which the project would have failed without, such as language interpretation in interview in a non-English speaking area.

#### **4.4.2 Learning outcomes, course deliverables and assessment**

The learning outcomes are specified by the course syllabus which was updated in autumn 2014 and is available online ([IIIIEE], 2014), but is not disseminated directly to the students. According to the syllabus; the students should have the ability to:

- Apply sustainability concepts, tools and strategies in a real-world context;
- Systematically approach, analyze and intervene in a real-life complex system;
- Perform a task for a professional client;
- Show fundamental skills in professional conduct in performing a task for a client;
- Describe the steps involved in putting together a report for a non-academic audience.

The students are assessed through a series of deliverables (e.g. written reports, presentations) and their 'general performance' in all three course phases. They must produce a) a written report for joint publication with their peers; and b) two oral presentations to be delivered to their peers and teaching staff. In some cases, (and for all cases in 2016) the students are

required to produce a different version of the written report to be submitted to their client. In addition, many groups will produce a separate report to be delivered to the client and conduct a presentation, workshop or seminar while on-site.

Assessment and grading is based on the deliverables and the supervisor's appraisal of the student's performance in relation to their group and is further influenced by a peer-grading scheme. According to the course syllabus, a top grade is achieved by students who can; 1) demonstrate thorough understanding of the situation studied and its related problem; 2) make effective use of relevant knowledge for the selection and formation of appropriate suggestions as well as means for their realization; and 3) combine his/her individual efforts properly with those of the fellow group members thereby assisting the quality assurance of the final outputs. In the past there has been contention surrounding the peer-grading scheme and criteria for assessment and therefore the method has been revised several times.

## **4.5 Stakeholder groups**

The course has three main stakeholder groups: a) students, b) the academic institution and c) non-academic stakeholders. The common term for these groups which are used in this thesis are a) students, b) IIIIEE, and c) clients. These groups are also reflective of the three areas which were defined in the early vision of the course in 2002, despite that the full vision wasn't implemented. The corresponding areas of the envisioned program were a) educational, b) research and c) regional development. (Kisch, 2002).

Appendix Table B-1 shows the stakeholder groups, their common names, and the types of stakeholders who can be grouped together. Appendix Figure B-1 shows the relationship between stakeholder groups and sub-groups. An important distinction is that stakeholders can be an entity (e.g. a company) or an individual (e.g. a client representative). In these cases, its likely that the individual represents the entity. When an impact or effect is referred to in this thesis, it may be on the organization itself, or an individual who was involved in the process.

The stakeholder groups have different roles, responsibilities and expectations. Members of each group engage in distinct activities and fulfill different tasks in the research or project. There have been individuals who have been members of two or all of the groups and can relate to more than one perspective. In this thesis, the most common differentiations made will be between: a) current students and alumni (former students), b) the IIIIEE and the IIIIEE staff members, and c) the collaborating organization and the individual who is responsible for hosting the students on site (client and client liaison).

### **4.5.1 Students**

Students are either current (2016) or alumni (studied between 1996-2015 in the EMP program). From 1996-2015 approximately 500 students completed the Master's program, with another 31 expected to graduate in fall 2016 and 29 in fall 2017. Each yearly class typically has between 20-30 students, with the 2016 class of 31 as one of the largest in the program history. Most alumni have completed the SED course.

The students are the primary stakeholder group because the phenomenon being studied is an academic Master's course, is framed as such by the IIIIEE and ideally is understood by the clients as a student learning exercise. For students, the SED course is an opportunity mainly to learn, gain experience, and collaborate with practitioners outside of academia and the course yields a number of impacts which will be explored in this thesis. The role of the

students is to learn, enhance competencies, and deliver reports according to client and supervisor expectations. The students additionally anticipate cultural and personal learning, new experiences, and professional experience to be added to their CV/résumé.

#### 4.5.2 Institution (IIIIEE)

The IIIIEE is an academic research institution (see 4.1: Introduction to the institution: IIIIEE) and has an organizational identity which is composed of various activities and programs, including the Master's program and the SED course. There are individual staff members who have been involved in the course organization and implementation for many years, and other staff members who have participated only occasionally.

This stakeholder group, secondary to the students, also has high stakes in the course as the institution which oversees, supports and stands behind all course activities and projects. The name and reputation of the institution are significant in the course being successfully implemented each year (Rodhe, 2016) because it increases credibility, accountability and a trusting partnership. The institution itself has a vested interest in the course process and outcomes, in addition to individual staff members whose stakes are related in maintaining connections in their professional networks, professional development, personal learning, fulfilling job responsibilities, etc. The role of the IIIIEE is to determine projects with clients, interface between the clients and the students in the early stages, to provide supervision and logistical support, to coordinate course sessions, and oversee the publication of the report.

#### 4.5.3 Clients

The term client refers to either the client organization (e.g. Volvo Trucks) or the organizational department or individual who is liaising with the IIIIEE for each individual project. This term is proposed and used primarily by the IIIIEE and not necessarily by the actual client themselves, especially because no formal contracts or agreements are made. Other terms used are 'host' or 'partner' which is indicative of the diversity in types of collaboration made and relationships formed throughout the history of the course. This thesis will use the term *client*, differentiating between the individual and collective as *client liaison* and *client organization* or *client*.

Client liaisons can hold any role within the cooperating organization, such as the mayor of a municipality, a department managers of a company, or an academic faculty member at a university. The client organization has most often been a municipality (local government) or private company, or some associated department depending on the context and structure. The client liaison has usually been the main point of contact for the IIIIEE and students, and was either assigned the role within the organization or was the person who co-established the project in cooperation with the IIIIEE. The client generally commits to the project as a one-off, short-term engagements (similar to consultancy) with no long term commitment. In recent years, it has become more common for the IIIIEE to seek funding from the clients (also similar to consultancy) to host the students, at least for travel and accommodation.

The role of the client generally involves some amount of financial support, logistical support for travel and accommodation, local support in utilizing networks and helping arrange interviews, and sometimes introduction to regional issues through site visits. It is common for the client to take at least partial responsibility for defining the task, providing information and resources, setting the scope of the project, and facilitating access to relevant sites and people. The level of interaction between the client liaison(s) and student varies – it may include informal activities such as touring and meals, and the client liaison(s) may spend very

little or almost all of their time with the students while on site. The interaction also occurs before and after the on-site phase, through digital communication and the client may give feedback or further information to assist students in their writing process.

## 4.6 Overview of SED projects

There are over 100 projects which have been implemented by the SED course since 1996 (Heiskanen et al., 2015) however, basic information about all projects is not widely available or centralized. Information can mainly be accessed through personal accounts or documents maintained by previous supervisors and course coordinators, or found in student reports. Four years of student reports from 2011-2015 (excluding 2013) are available on the IIIIEE website and versions of separate or joint reports from 2002 onwards are retrievable from the IIIIEE shared file system.

The main information known for each SED project are: **location** (town, county, region or country); **report title** (formal name of project); **topic** (e.g. sustainable wine-making); **topic category** (e.g. sustainability in industry); **sector: general/specific** (municipality, private company, etc.); **client organization** (primary partner organization); **task** (defined in cooperation); **summary of activities** (main activity); **results**; **supervisors** (names); **students** (names); **association with alumni or affiliates** (yes/no).

Since 2003 when the course model shifted towards sending students to different clients rather than a single site, there have been 75 SED projects. Additionally, from 1996-2002 were seven locations for the APC course where all students traveled together but worked on different areas or aspects in small groups. The APC course was conducted in seven different countries: Sweden, Poland, Bulgaria, Czech Republic, Russia, Lithuania and Lesvos, Greece. The course has brought students to 31 countries in five regions of the world (Europe, Africa, South America, Asia and Middle East) with Sweden, Poland and Italy being the most frequently visited and Europe as the dominant region of destination. (See Appendix Table A-2 and Figure A-1).

Topic areas, which were self-defined in the student project reports, include a wide range such as: waste management, regional development, urban sustainability, biomass fuel, climate neutral transportation, biogas, energy urban design, water management, energy security, port sustainability, green growth, and sustainable local food production. See Appendix Table A-3 for a full list of topic categories.

Tasks have been varied in many ways, such as scope, type of environmental problem, research approach, etc. Appendix Table A-2 displays a sampling of projects and titles. Undertakings on-site which were described by students in the reports included broad activities such as: visiting sites, conducting interviews, reviewing literature, and evaluation of new business opportunities. Some specific activities have been described as: to investigate social inclusion issues, to participate in a seminar at a university, and to interview company representatives, public authorities and local citizens.

### 4.6.1 Current projects

In Spring 2016, the IIIIEE arranged seven projects for 31 students (see Table 4-1). The combined project was themed as a collection of tasks meant to identify opportunities for transformative action based on the Conference of Parties for the United Nations Framework Convention on Climate Change goals in 2015 (COP21). Two projects were sent to previously-visited destinations to work with repeated clients; a long-term but informal

partnership has hosted multiple student groups in Zabzre, Poland, and 2016 was the second year for an alumnus to initiate an SED project in Alentejo, Portugal. Two of the seven projects involved students in the planning: Kagere, Tanzania and Monterrey, Mexico.

Table 4-1 List of 2016 SED projects

Location	Project (report title)
Estonia: Tallinn	From Trash to Trend: Upcycling in Estonia and the European Context
Jordan: Amman	Bridging the Gap: Building Energy Resilience in a Crisis Context
Tanzania: Kagere	Coffee at a Crossroads: Climate Change Adaptation Strategies for KPD in Tanzania
Mexico: Monterrey	Linearity to Circularity: FEMSA Comercio Opportunities
Poland: Zabzre	Green Wave for Zabzre: A Sustainability Mobility Strategy
Sweden: Gothenburg	Volvo Electric Trucks: The Future of Commercial Urban Transportation
Portugal: Alentejo	Communication of Sustainability Efforts in the Wine Industry: A Case Study of Alentejo Region, Portugal

Source: ([IIIIEE], 2016a)

#### 4.7 Pedagogical approach proposed by the IIIIEE

The SED course delivers a semi-structured, practical educational experience which “immerses students in real-life, solution-oriented consultancy projects” with the aim to “develop critical sustainability change agent skills and confidence using them” (Heiskanen et al., 2015). The course engages university students in “real-world change processes” and aims to heighten motivation and knowledge retention, and enhance learning outcomes such as “critical thinking, problem-solving, social responsibility, self-efficacy and confidence” (Brower, 2011; Heiskanen et al., 2015). Such educational approaches and intended learning outcomes are found in many programs, including non-sustainability related education (Brundiers & Wiek, 2013) .

Staff members of the IIIIEE have published literature which includes a description and analysis of the course such as ‘Educating sustainability change agents: the importance of practical skills and experience’ by Heiskanen et al. (2015) and ‘Diversity in Education: Crossing Cultural, Disciplinary and Professional Divides’ by Lindhqvist et al. (2015) These articles provide a basis to establish a more defined theoretical context for positioning and evaluating the course.

A 2015 article was authored in part by IIIIEE staff members who have been involved in the course for the majority of its history, and addressed the competencies needed to become “sustainability change agents.” The primary reference used to justify the methods used are to real-world learning methods, and the application of problem-based and project-based learning. The article refers to other “real-world” approaches such as service learning, action learning, transdisciplinary case learning and consultancy or community-based learning. This provides evidence for the benefits of real-life experience and consultancy projects as measured during the educational experience (Heiskanen et al., 2015). The article broadly refers to the course as a “real-life consultancy experience in education” and specifically as a course which “immerses students in a real-life consultancy project, often overseas” (Heiskanen et al., 2015). According to data collected from the alumni perspective there are several aspects of the SED which enhance its value – real-life work experience, practice of project-management skills, international exposure, and practice of interpersonal, action and leadership skills. These are aspects which help define the course in its unique form.



According to Lindhqvist et al. (2015), authentic learning tasks are central to both Master's programs taught at the IIIEE. These tasks focus on the meaning which is derived from a student activity, such as a problem, case or project including classroom-based learning, field-visits, and projects with clients. The latter engages external, often non-academic partners but requires persistent upkeep for a fruitful collaboration. Authentic learning is considered to be useful when working with real problems or projects with external experts. This learning is authentic, real-world and relevant and "requires students to use and engage with progressively higher order cognitive processes, are well aligned with each other and the desired learning outcomes; provide challenge, interest and motivation to learn (Meyers and Nulty, 2009; Lindhqvist et al., 2015).

The pedagogical approach to guiding the students in authentic learning task is to allow the students to initiate and drive the project while working in teams, which can be set up by the teacher but eventually depends on hands-off supervision. According to Lindhqvist et al. (2015) "learning [at the IIIEE] is always inquiry-based, highly interactive and complex and situational" and objective knowledge is not the focus and will vary within groups." The pedagogical theory of problem-based learning underpins the IIIEE's approach of authentic learning and is applied in the 5-credit "Corporate Environmental Management Program" course and the 9-credit SED course, as well as the thesis research (Lindhqvist et al., 2015).

This thesis attempts to position the course in relation to existing concepts and theories, to strengthen the understanding of the course itself and provide background for the application of the proposed evaluative frameworks (see Chapter 3: Case Study Description and Chapter 4: Methodology). The most definitive aspects of the SED course are: real-world and location-specific learning; cross-sectoral/cross-discipline; client engagement, collaboration and partnership; interpersonal experience; and context of wider research (see the following section 4.8).

## 4.8 Literature review and SED

This thesis proposes six defining characteristics of the SED course which will be put in the context of the literature review in this section. Those characteristics are 1) real-world and location-specific learning; 2) cross-sectoral, cross-domain, cross-discipline; 3) client engagement and collaboration; 4) interpersonal learning experience; 5) contribution to building solutions; and 6) global and international. The implied objective of the SED course is to generate 'change agents' as described in Section 2.2 who can face sustainability challenges as professionals. The SED course applies several pedagogical theories used in sustainability education (see section 2.3.1). The SED project has elements of project-based, applied, experiential, and authentic learning approaches (Brundiens & Wiek, 2013). To what degree the course fulfills all the learning objectives of all these approaches is beyond the scope of this study. The students are working towards environmental solutions to real challenges, and are attempting to contribute to societal change (Brundiens & Wiek, 2011) )In approaching sustainability challenges faced by non-academic stakeholders, the students are engaging in inter-disciplinary and transdisciplinary learning. Client engagement is used to work with real projects for mutual benefit (Parsons & Lepkowska-White, 2009). The table below (4-2) gives examples of concepts and theories that relate to the course characteristics, as well as the two main chosen conceptual frameworks.

*Table 4-2 Defining aspects of SED and relevant theories and frameworks*

Defining aspect of SED course	Literature Review – introduced concepts	'Participatory sustainability research'	'Sustainability research education' aspects
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	<b>and theories</b>	<b>aspects</b>	
Real-world and location-specific learning	Problem-or project based learning (PPBL), applied learning, experiential learning, transformative learning, authentic learning	Research addresses real societal issues associated with sustainability in a localized context and intended to be relevant to society	“problem and solution-oriented,” preparing students to help create a better society.
Contribution to building environmental solutions	PSR, SRE, client-based learning	Intentionally designed, ideally continual, measures nature and quality of a research process	“engages students in contributing to sustainable changes in society” and actual sustainability problems, generation of workable solutions
Cross-sectoral, cross-domain, cross-discipline	Interdisciplinarity, authentic learning	Cross-discipline and cross sectoral collaboration	Actual sustainability problems
Client engagement and collaboration (non-academic stakeholder engagement)	Client-Based Learning (CBL), stakeholder engagement, authentic learning	Collaborative research projects with participation by external stakeholders	Stakeholders facing the sustainability problems and stakeholders’ specific knowledge
Interpersonal learning experience (working in teams)	Group work, intercultural learning, reflection, intercultural group work, authentic learning	Includes values, goals and norms, room for reflection, deliberation and negotiation, mutual accountability, ownership and leadership	Calls for facilitation and mediation of interface between students, academics and non-academic stakeholders
Global and international education/research	“Global Learning”, international education, intercultural learning	n/a	n/a

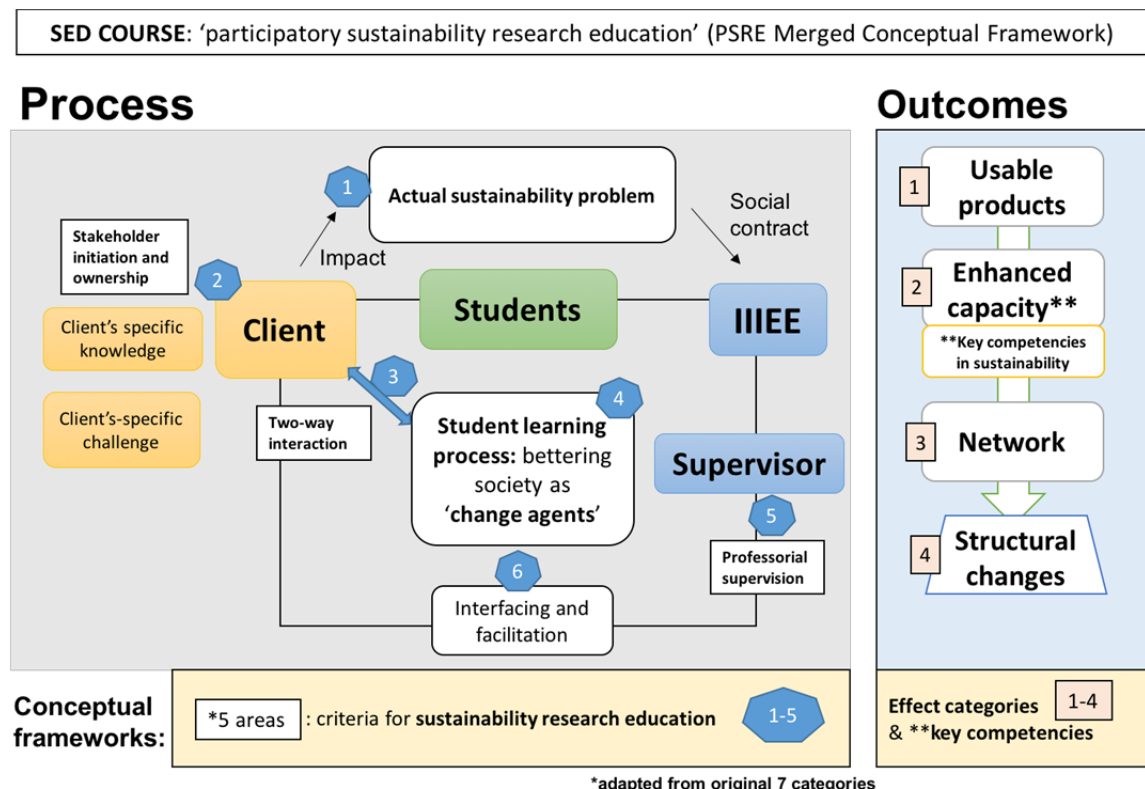
## 5 Results and Analysis

This chapter is structured according to the conceptual framework discussed in Section 3.3: Development of a Conceptual Framework. The data set contains perspectives from multiple SED projects, with special attention to the Jordan 2016 project, and both will be presented in this section. As discussed in Chapter 4: Methodology, the processed results are presented and interpreted in this section. The purpose of the conceptual framework is to structure the results and to describe and analyze the process and outcomes (see Section 1.3).

There are two main sections in this chapter according to the research questions: section 5.2 will provide a description and analysis of the course *process* using criteria for **sustainability research education** and 5.3 will provide a description and analysis of the course *outcomes* using the types of **societal effects** and **key competencies**. Each of the three concepts which make up the merged conceptual framework will focus on an overview of the SED course using multiple project examples, with details from the Jordan 2016 project.

The figure below (5-1) demonstrates the frameworks components and relativity between the distinct frameworks which are merged for use in this thesis (see original frameworks in Appendix F). The **process section (5.2)** has six sub-sections which are adapted from the following seven components proposed by the authors (Brundiars & Wiek, 2011): 1) topic and task: actual sustainability problems; 2) stakeholder initiation and ownership; 3) two-way interaction with stakeholders; 4) preparing students to be change agents; 5) professorial supervision; and 6) interface facilitation. The **outcomes section (5.3)** will have four sub-sections: 1) usable products; 2) enhanced capacity (including key competencies); 3) network; and 4) structural changes. In the figure below (5-1), the *student learning process* is at the center of the collaborative process which composes the SED course.

Figure 5-1 Merged framework: demonstrated for structuring results and analysis



*Source: by author, adapted from two original frameworks: Brundiers & Wiek, 201 and Wiek et al., 2014 (see Appendix F).*

The following results give an impression of the SED course based on a selected set of individual projects through the perspectives of various stakeholders. A variety of diverse projects and people are represented and vary in detail provided according to the data set available (see Chapter 3: Methodology). The results and examples given about the projects from 2016 represent not only individuals' perceptions obtained through interviews and qualitative surveys but also the researcher's interpretation based on the participatory methods used. The individuals who participated in the surveys and interviews represented a wide range of projects; for list of projects mentioned in the results, see Appendix A-2.

Results from the Jordan 2016 project have been further triangulated due to the researcher's presence which resulted in a more expanded data set, and so will have a more weighted representation in data presentation and analysis which leads to the discussion and conclusion. The SED Jordan 2016 project, which was later entitled "Bridging the Gap: Building Energy Resilience in a Crisis Context: The Experience from Jordan," included four master's students of the IIIIEE EMP program 2014-2016, one supervising professor who is a permanent staff member of the IIIIEE, and one embedded researcher (the author of this thesis). The stakeholder, or "client" which was confirmed several weeks after project team's formation in February 2016, was the United Nations Development Programme (UNDP) regional hub in the Middle East and North Africa region (MENA). The client liaison was a Regional Policy Advisor for the country of Jordan and currently works as the Regional Sustainable Energy Advisor in the Climate Change and Disaster Risk Reduction Team for UNDP. The goal of the project was to consider the integration of humanitarian response and sustainable development using renewable energy, with a focus on solar energy, and especially in the context of the increased demand on the energy infrastructure due to the influx of refugees from Syria over the past five years ([IIIIEE], 2016a).

## 5.1 Process: 7 areas of participatory sustainability research

This section contains results which are demonstrative of the steps, actions, procedures, practices, dealings, techniques, methods of the course implementation. The conceptual framework for participatory sustainability research suggests seven program components with specific criteria for evaluation (see Figure 5-1). The seventh suggested area (*generation of workable solutions and positive learning impact*) is excluded from the merged framework because it is addressed in the corresponding framework in section 5.2: Outcomes: 4 effect categories. For the original framework diagram, see Appendix F.

### 5.1.1 Topic and task: actual sustainability research

*Does the SED course address actual sustainability problems? (e.g. long term-dynamics, cause-effect structures, cross-sectoral, cross-domain and cross-scale complexity, urgency, harmfulness).*

The course by definition allows exploration of a wide range of sustainability problems, which are typically self-defined by the external stakeholders with some assistance by the IIIIEE staff or student group. The tasks chosen to address the problem should be "opportunities for action" [IIIIEE], 2016a). According to a student report, a diverse selection of regional and organizational contexts allows the students to "explore complex systems with different socio-economic and cultural considerations" ([IIIIEE], 2016a) and learn about environmental challenges in many sectors and domains.

No definite criteria or protocol is used by the course instructors to ensure that the project centers on an “actual sustainability problem” and some meet more of the framework’s criteria than others. The conceptual framework proposes sustainability problems to be associated with *long term dynamics, cross domain and cross-scale complexity, cause-effect structure, specificity, urgency, or harmfulness* and some SED projects easily criteria while others do not.

For example, the criteria of *long-term dynamics, cross-scale and cross-sectoral complexity* can be commonly identified. *Long-term dynamics* are often an underlying motivator in a selected project. In the case of Jordan 2016, students learned in the context of humanitarian response which involves short-term thinking because solutions for refugees and displaced persons are typically not built for permanence (Gitonga, 2016). The problems studied in Jordan 2016 required coordination between the government, the private sector, international aid organizations, and local organizations (*cross-sectoral complexity*). Social, economic and environmental domains (*cross-domain*) are impacted; human lives and livelihood are at stake, natural and economic resources are under pressure. As a client and task which had a humanitarian and development focus, this problem was somewhat unique as an SED projects and was declared as such, although student teams have worked on energy issues in the region before.

Students and teachers acknowledged the need to consider *cause-effect structures* in problem solving their tasks. According to a student on SED Zabzre 2014 the forward-thinking vision of Zabzre is set in the context of the current population attempting to move forward from an unsustainable industrial past and not all residents are ready for a change. The students who went on SED Tanzania 2016 proposed solutions to a community dependent on agriculture but whom are affected by climate change, demonstrating an understanding of complex structures of cause and effect.

A student who went to Minsk, Belarus in 2008 discussed the *specificity* of the problem being addressed, also on municipal waste: “I never thought about municipal waste before, coming from Canada where it works well.” The problems defined by SED projects by nature are set in a place-based context, working with specific stakeholders. Some projects provide the students an excellent learning platform about very specific environmental problems, such as taking students to Tallinn which is “the place to be in the EU to look at a textiles issue” and Zabzre, which used to be known as the most polluted city in Europe and has a history with coal mines and steel works. Specificity is a generally reliable criteria met my many projects.

Perhaps the least fulfilled criteria by individual projects or cumulatively are *urgency and harmfulness* despite that modern sustainability challenges are increasingly defined as such. A good example of fulfillment was SED Jordan 2016, which addressed energy resiliency under the pressure of regional conflict and displacement of Syrians. In contrast was the team working with Volvo Trucks in Sweden, which proposed solutions under a much longer timescale while the UNDP in Jordan operated based on urgency and potential harm.

In the alumni survey, 14 out of 40 comments on ‘course aspects that should remain unchanged’ contained a reference to having a real-world experience. Many survey comments were directed towards having “actual problem” rather than “actual sustainability problem,” meaning that there was minimal critique from the student perspective indicating that real-world is perhaps more important than the exact specifications of problem being addressed.

### 5.1.2 Stakeholder initiation and ownership

*Do stakeholders approach the researchers to address their sustainability problem? Does a process of collaboration and negotiation lead to joint ownership of the problem?*

According to Brundiers & Wiek (2013), stakeholders who initiate and take ownership of their problem have more willingness to implement solutions, and organizations are obligated to take joint responsibility for their problems and the solution-building process (Leal Filho & Brandli, 2016). Based on the way SED partnerships are established, usually through existing networks who are somehow associated with a sustainability institution like IIIIEE, it means most clients have some level of interest in actually addressing and solving their environmental problems. It's important to cultivate stakeholder ownership of a project, but who initiates does not seem to indicate success.

The initiation of SED projects has occurred in various ways but has often been through an already-established or developing professional relationship. Professional associates have been long-time professional or personal contacts of the IIIIEE staff, a representative of an organization who has some level of exchange with the IIIIEE, or a former student. In some cases, an SED trip has occurred because a staff member or student who has an interest and initiates contact with a new client who has no previous knowledge of the IIIIEE. It has been more common for a project to be initiated or suggested first by the IIIIEE, but with more alumni establishing themselves in professional positions they have increasing opportunities to host a project.

The range of projects in April 2016 exemplify the different forms of initiation and problem ownership of an SED. One project was initiated by a student who came across information on an Engineers Without Borders project in Tanzania. According to the course coordinators, this is not a typical form of initiation. However, it may be beneficial to the students to become more involved - according to Pfeifer and Rosback (2016), students need to have the skills for targeting and finding information to understand complex problems, which can be acquired and practiced during the research but also in initiating projects. Another student team in 2016 returned to Zabzre, Poland through the well-established research platform for which had been agreed upon at least six months prior. A team worked with Volvo Trucks because of a previously established connection with the company -joint ownership will increase client interaction, which has a high value for students. Other students worked with an alumnus in Portugal who had initiated and coordinated a project two years in a row.

The importance of client initiative, problem ownership and engagement was emphasized by the course coordinator. The level of engagement of the client can be determined by experience of the client in sustainability issues, the client's workload, the supervisor, if the client knows the reputation of the IIIIEE, and who initiated the partnership. One example is a case in which an alumnus approached the local government in his hometown and initiated and oversaw a partnership with the municipality, who was the actual client and had ownership of the project results. The municipality was motivated to participate in order to augment their public image by engaging in sustainability projects. Alumni initiation, either as an interfacing facilitator or the actual client, is considered by all stakeholders' as a good way for project partnerships to get started. With an already-established relationship it is also easier to navigate the process of shifting and balancing ownership. Another alumnus and former client said that a client's ownership is based on whether the client is convinced of his own practices or open to external input. A client may also be balancing other responsibilities and so is less engaged with students, and is willing to host but doesn't take ownership.

The importance of having a client who knows the IIIEE was brought up by different types of stakeholders from different years. For example, a former student (Jordan 2014) said, “there was an alumna that knew the capacity of the IIIEE and that was important to the outcome of everything,” and a former supervisor reiterated the thought, “it’s hard to communicate to clients if they don’t know the institute.” Students, staff and clients all mentioned that working with alumni as clients is a positive circumstance with additional benefits, which can lead to problem ownership being more clear. Finding and establishing projects takes a lot of working hours and effort by the staff, and this type of partnership facilitates the issue of ownership.

In the case of Jordan 2016, the initial topic was identified by an IIIEE staff member, the future supervisor of the SED project, who was overseeing a related initiative in Sweden at the time. The supervisor, who has personal and professional connections in the Jordanian context, made contact with potential project partners in search of a “client” or “host” in Jordan (*initiation*). The dialogue with potential partners extended past the expected deadline for finalizing SED projects, therefore was the only project (out of seven) in 2016 to have the topic area decided before a client was identified. The client liaison, in the initial phone meeting, gave background to the problem and instructed students to continue background research, narrow their interests, and further define the research project thus transferring the responsibility to the student team (*ownership*), with opportunities for feedback from the supervisor. The students were expected to take ownership as a student learning exercise, which guided the decisions of the client and supervisor, but meant that students struggled with taking ownership of an unfamiliar topic while in proximity to more knowledgeable people. The main challenge the process of transferring ownership to the students once the client and IIIEE representative have set the basic terms for the project in a way which is clear, within reason, and retains some stakeholder ownership. When students miss out on the first few weeks of a project being initiated and then must assume ownership, there is the issue of missing important information or not understanding previous decisions which were made.

### **5.1.3 Two-way exchange with stakeholder (client)**

*Do stakeholders and scholars jointly negotiate, revise and synthesize knowledge and take decisions? Does the project involve stakeholders during all research phases in a way that goes beyond extraction and exchange of information?*

According to Filho and Brandli (2016), successful engagement with stakeholders requires dialogue and two-way communication, understanding of needs and leadership, resources, and systems thinking. An SED project does not always achieved successful stakeholder engagement – in many cases more clarity is needed on the roles and responsibilities and goals and scope of a project. The issue has often been a lack of clear communication and the fact that necessary “two-way communication” actually needs to be balanced between multiple parties: the students as a team, one student representative, the supervisor, the staff member who coordinated the course, and client liaisons who were involved in the project.

According to the course coordinator, the course is primarily a student learning experience and any result (societal or otherwise) beyond that is added value, including the students’ perception of clients’ needs. The *extraction and exchange of information* is the typical manifestation of an SED project based on the short-term, usually one-off nature of each project. One client articulated the exercise as “a type of intellectual exchange” and another acknowledged that “some projects are more for students than for us, but it depends on the individuals and leader of a project.” Another alumnus who later became a client referred to

information sharing and spreading ideas as the clearest outcome of the interactive process. The two-way interaction between the students and the clients has been dependent on many variables including the nature of the relationship with the client, the level of involvement of the supervisor, the team dynamic, the engagement of the client liaison, the type of task, the sector, and many others.

Dialogue has often been inconsistent in the early phases of collaboration and students often enter the on-site phase uncertain of the goals or expectations of the client. When asked in the pre-survey before going on site if it was clear what the client wanted from the students, the answers were widely spread. One student from 2016 said, “our relationship with the client is not clearly defined yet, we are lacking communication with him and it makes it a little bit difficult for us to adapt” and another said “we wasted so much time waiting around for a meeting with him that could have been spent effectively if we had earlier contact.” A student who went to a rural project in Tanzania said “even though our client didn’t have much contact before, when we arrived everything was well-planned” and explained how important the involvement of the client was in making the project move forward. Initially the client perceived the accompanying supervisor to be the point of contact on site, but he explained the students were the ones responsible for the work.

Based on the communication leading up to the on-site phase, some students didn’t know what to expect regarding client involvement in the project tasks and whether the client would wish to go further than knowledge exchange, towards utilizing that knowledge in *negotiating, revising, synthesizing and taking decisions*. Decision-making has often been in context of defining the scope or how to conduct the research, such as identifying which stakeholders to interview or deciding upon a conceptual framework for analysis. The two-way exchange on such decision-making has been dependent on the project – in some cases like Zabzre the students make fewer decisions whereas a project like Jordan 2016 requires a great deal of decision-making on behalf of the students. In some interactions the students have been required by the client to define and scope the task. The student responses and literature show that this additional responsibility has added learning value for some and detracted from the experience for others. The trade-off is between spending more time working on the problem versus actually identifying the problem (Parsons & Lepkowska-White, 2009; Pfeifer & Rosbach, 2016). It seems to be important to allow students decision-making power to promote skill-building, but it must be implemented with adequate support from the client who should bring the “place-based knowledge, preferences, and practical experience” (Brundiens & Wiek, 2011a) which is essential for the students to perceive progress.

For the Jordan 2016 project, the client liaison was involved at least briefly in all phases of research, which occurred remotely while the students prepared in Sweden, to facilitating the students’ time in Jordan and providing feedback during the reporting phase. The client mainly determined the terms of involvement and exchange, withstanding student requests for feedback and guidance. The client liaison communicated that he would be satisfied with any results of the project, as a platform to build collaboration long-term, because “all information can be incorporated into the response we make to build resilience.” His expectation was that students provide 1-2 recommendations from their learnings based on an outside perspective.

Because of the nature of the SED as a short-term research project, it is understandable that the main form of interaction in a collaboration has been knowledge exchange, leaving stakeholders to take responsibility if they will put recommendations into practice. Interaction should go beyond knowledge exchange (Brundiens & Wiek, 2011) but often in SED, such as in Jordan 2016, the students do come to understand and identify with the clients’ problems



through knowledge exchange (Pfeifer & Rosbach, 2016) and undergo valuable learning. To go beyond this could mean more positive effects but a higher number of established partnerships and a revised course structure would be required, and this depends on the goal of the exercise.

#### **5.1.4 Preparing students to be ‘change agents’**

*Are the students undergoing an effective learning process and gaining the competencies to address corresponding specific and generic sustainability knowledge, to link knowledge to action, to apply problem-solving techniques, and develop effective interpersonal skills?*

This section discusses the student learning experience and therefore uses a different framework than other sub-sections of Chapter 5.1. This section, 5.1.4, begins with an overall assessment of the course according to the framework criteria listed above. It is then divided into sub-sections for each of the key competencies (ways of thinking) proposed by Wiek et al. 2011: 1) systems; 2) futures; 3) normative; 4) strategic; and 5) collaborative. This structure allows a categorization of types of learning which is meant to add more structure and intention by education programs in delivering sustainability education. The SED course answers a call for students to become capable change agents for sustainability (Brundiers & Wiek, 2011) by initiating a process that allows student to engage in systems, strategic, normative, futures and collaborative thinking. Working with clients increases students’ abilities to understand concepts and apply solutions (Pfeifer & Rosbach, 2016) and requires many ways of thinking which are reflective of competencies needed for sustainability professionalism.

The course learning outcomes (see section 4.4.2) were not explicitly measured or analyzed but are broadly related to the key competencies. For an overview of how IIEE institutional documents represent or reflect the five key competencies and ways of thinking, see Appendix E-4. In a survey, when alumni were asked if they felt they had successfully addressed the course learning outcomes, there was a range 67-71% agreement for all of the five outcomes, and only a range of 4-6% did not feel successful. The results were similar for current students when they completed the course – there was a range of agreement of 73-86% for fulfilling each learning outcome. The course learning outcomes are phrased broadly and are not considered concrete, and do not refer to specific skills or competencies.

Overall, the SED process presents the most consistent opportunity for collaborative learning, despite all other variables, and perhaps the least consistent is normative thinking. Normative thinking is utilized in working with stakeholders, but could be highlighted more through further development or humanitarian projects such as Jordan 2016 and Tanzania 2016 which would consider the concept of environmental justice. Certain environmental topics have been outside the scope, such as animal rights or conservation in a social context – these topics would also challenge students on normative thinking. Collaborative thinking is required in every step of the process, and learning occurs although more opportunities to maximize collaborative learning is needed. In addition to interacting with stakeholders and the supervisor, student group projects are known to be motivating and a good learning experience (Parsons & Lepkowska-White, 2009). However, on the SED there have been missed opportunities – students entered the project with minimal preparations or tools for problem-solving, conflict resolution or group management despite their previous experience in group work. Students would benefit from having some training or introduction to basic tools for facilitating a meeting or dividing tasks.

The special context of the SED means the thinking required for the type of projects and tasks also takes place in an international context – “to succeed in a globalized world, students need to be capable of working across cultures, recognize cultural context and draw upon a pool of internationally-applied ideas that can be adapted or transferred to local context” (Wiek et al., 2013). The students learn most sustainability concepts in the Swedish context during the other courses in the program, which is known for best and innovative practices in many areas, and when they experience similar problems in the Polish or Spanish context it challenges their competencies further. However, their involvement in the project is short-term which in some ways limits learning. For example, when a student has helped envision a new city district but knows they won’t be involved in any future stage of visioning, planning or implementing so it might inhibit future thinking because the future is ambiguous.

In the case of Jordan 2016, creating the circumstances for the students to work on a real-life problem with a client in an international context was the foundation for preparing students to be agents of change for a better society. The process was both the creation of this platform for learning and the series of decisions which shaped the experience for the students. The IIIIEE chose to prioritize a project topic without having a secure client because of its relevance and connection to a fledgling research program. This project was highly popular amongst students which resulted in turning down a large number of people for their top preference. Several students who were not assigned to the Jordan project felt they were missing a significant, once-in-a-lifetime learning opportunity.

While on site, the students had a range of experiences which contributed to their learning and which was reflected in ongoing reflection sessions and post-project interviews. Value was found in a range of activities, from interviewing local practitioners in a professional setting to visiting tourist sites. The students spent a total of two weeks in Jordan, with eight days based in Amman hosted by the client liaison at UNDP followed by a report-writing phase based in the southern city of Aqaba. The students chose to build in free time to their schedule and took the opportunity to visit world-renowned natural and cultural sights of interest such as Wadi Rum and Petra. The students prioritized getting to know the local context of their studied region, of which they had no previous experience or knowledge (*specific and general knowledge*) which they felt was important to related to understand the local context. The supervisor leveraged his position to get permits for the team to visit the two refugee camps where ~20% of the Syrian refugees in Jordan live, which allowed the students a unique experience to witness conditions first-hand and was an important learning moment. They witnessed the living conditions in the camps as well as the innovative ways the residents of the camps have implemented bottom-up solutions when their needs have not been met (e.g. siphoning electricity from the national grid). The students interacted with representatives of major international organizations such as the Norwegian Refugee Council (NRC) and the United Nations High Commission for Refugees (UNHCR), which motivated their understanding of important actors, existing systems, the complexity of implementing solutions, and the social and economic mechanisms at play.

The following subsections include a brief analysis of what types of thinking (key competencies) are used or developed by students, either as directly stated by the students or implied through the coursework they have produced.

#### **5.1.4.1 Systems thinking**

*Students should be able to: “analyze sustainability problems cutting across domains, sectors, scales and applying systems concepts including ontologies, cause-effect structures, cascading effects, inertia, feedback loops, structuration” (Wiek et al., 2015).*

Various concepts associated with systems thinking are identifiable in SED projects, as well as methods used to generate and interpret results. For example, even when students are not responsible for defining the project task in many cases they contribute to identifying relevant stakeholders and might use stakeholder and network analysis or institutional analysis. They typically use concepts such as systems and problems ontologies, cause-effect chains, structures and dynamics across multiple scales and domains, and institutions and structuration. For example, several projects have address production and supply chain issues such as Portugal: Alentejo 2016 whose work included looking at gains in supply chain efficiency with members of the regional sustainability program for wine merchants. The team who went to Estonia (Tallinn) in 2016 investigated possibilities for upcycling textile waste, and conducted a policy and market to investigate business models.

The students engage deeply on regional problems that are both place-based, but also often global issues such as sustainable production, environmental management of industries, sustainable tourism, impact of climate change on small communities, and others. Some students implied individual lessons or skills gained which can be applied beyond the learning context, such as “wine industry knowledge and the difficulties of marketing in a nascent sustainability industry,” “sustainable production best practices,” and “a greater understanding of a particular aspect of environmental management.” Two alumni mentioned the feeling of satisfaction in becoming an expert within a short period of time, even eclipsing the client on situational knowledge. One of those alumni continued work with the client organization after the SED, which led to a job related to the experience she gained on the specific topic area.

Two examples of learning objectives which are found to be typical of a project are a) analyze how sustainability problems have emerged, b) describe in detail how different professional activities contribute to, or solve/mitigate sustainability problems. For example, the students on SED Mexico 2016 identified opportunities to streamline retail production and waste management processes for the largest retailer in Latin America. A student who visited Zabzre, Poland to work on waste management recalled that being there in person is helpful to understand the city’s ability to step forward from a history of coal mining.

#### **5.1.4.2 Anticipatory (futures) thinking:**

*Students should be able to: “anticipate how sustainability problems might evolve or occur over time (scenarios), considering inertia, path dependencies, and triggering events, as well as creating and crafting sustainable and desirable future visions, considering evidence-supported alternative development pathways” (Wiek et al., 2015).*

Moving outside the academic domain to work with professionals on SED is meaningful way to promote this type of learning such as developing basic narratives about problems, creating visuals and diagrams, and anticipating how professional activities contribute to or mitigate sustainability problems. This is clearly seen by the number and range of interviewees who responded positively to real-world learning and working with a client. Using *futures thinking* a student should also be able to anticipate their own career trajectory which is strengthened by putting students into the real world and experiencing how to deal with sustainability problems in a specific domain or sector. One intention explained by the course coordinators was to place students on projects which will build upon their thesis or career interests, so therefore the students are allowed to express their preferences before being placed on a project. There is an emphasis on applied learning, making recommendations and presenting findings for the client to put to future use. A main objective of many students’ groups is to gain enough knowledge to recommend a course of action. A supervisor cautioned that

students sometimes see the practical opportunity and become overambitious, wishing to save the world with a single SED project.

Certain anticipatory methods which are used by students are constructing scenarios and visioning (such as back casting). One survey respondent in the alumni survey said “we had to learn visioning tools as part of our SED task (on our own) and this was particularly relevant to the criteria outlined above. It might not be the same for all tasks and was particular to our task. It was an extremely useful way of approaching the task and communicating to stakeholders.”

#### **5.1.4.3 Normative (values) thinking:**

*Students should be able to: “specify, compare, apply, reconcile and negotiate sustainability values, principles, goals and targets, informed by concepts of justice, equity, responsibility, in various process including visioning, assessment and evaluation.”*

Certain concepts associated with normative thinking are highly relevant to the SED course and IIIIEE areas of interest, such as sustainability and sustainable development, sustainability principles, goals and targets, and tradeoffs and win-win synergies. For example, a team of students worked with rural coffee farmers in Tanzania in 2016 to identify strategies for promoting local sustainable development and empower local knowledge and awareness about climate change impacts. A number of projects have investigated reaching certain targets in a local or regional context, such as a European electronic waste directive in Belarus and two projects helping a museum in Lesvos, Greece move towards the adoption of the European Charter for Sustainable Tourism.

Understanding concepts of justice, fairness and responsibility as part of sustainability requires taking on multiple viewpoints. This type of learning which was referred to by students, clients and institute staff relatively often e.g. “I learned how to communicate, to take different viewpoints,” “I was forced to change perspective”. By interacting with real stakeholders, students must empathize and assess sustainability challenges which impact different stakeholders in different ways. For example, one student had been working in companies for many years before coming to the program so wanted to go on a trip with a development/humanitarian rather than corporate client in order to gain a new perspective on sustainability from a different domain. However, normative thinking is not highly present in many of the projects.

#### **5.1.4.4 Strategic thinking**

*Students should be able to: “develop and test systemic interventions, transformational actions and transition strategies towards sustainability, accounting for unintended consequences and cascading effects’ (Wiek et al., 2015).*

As demonstrated in the effects categories section of analysis, the research by students produce public and client-specific reports, some of which contribute to larger plans. For example, the students research in Åre, Sweden contributed to a sustainability vision of a municipality. It is typical for students to apply strategic thinking in the style of reports which are often meant to be solution-based and action oriented for clients’ actual use, which is the result of working with real-life clients. Students are not necessarily involved in the application of strategies or plans, but usually are identifying barriers and carriers, coming up with adaptation and mitigation strategies, and gaining a strong understanding of regional stakeholder networks. For example, students worked with the Zabzre, Poland municipality in 2016 to come up with a strategy wheel to identify key reform areas in sustainable mobility

and propose unique projects associated with each. The Portugal 2016 team contributed to marketing and communication strategies for a regional sustainability program of vineyards. The team who went to Tanzania in 2016 prioritized three adaptation strategies for local sustainable development for coffee farmers in a region under pressure from climate change – use of bio char, farmer education, and ICT solutions. In 2013 a team of students identified barriers and opportunities for applying sustainable waste management strategies on the island of Gran Canaria, Spain. Important concepts applied were theories of change, viability and feasibility, barriers and opportunities, power and politics, and decision-making. Examples of methods used in these cases and others include transition management approaches (use of strategies and tactics), behavioral change approaches, and program planning and evaluation. For example, several groups have worked with municipalities and tourism organizations in countries like Sweden, Turkey and Greece and researched how to promote more sustainable tourist behaviors.

#### **5.1.4.5 Collaborative (interpersonal) thinking**

*“Initiate, facilitate and support different types of collaboration, including teamwork and stakeholder engagement, in sustainability efforts” (Wiek et al., 2015).*

The objective for students to be able to “incorporate and complement experiences and expertise of others when working in or leading teams in professional settings” concisely summarizes what students are expected to do in the SED course. The exercise is fundamentally collaborative as students cooperate with clients and other stakeholders from various domains and sectors in order to achieve their tasks. The concepts and skills of cooperation, team work, effective communication, leadership styles, cross-cultural collaboration, etc. are relevant for both working within a student team and working with the client and supervisor. When asked about learning expectations of the experience in a survey before leaving for the on-site phase, some 2016 students wrote about their anticipation of group work and professional engagement. One student wrote, “I will learn to from the experience to work with a real client. I will also improve my skills to work in a group and to coordinate group work.” Another student wrote “our team needs to work effectively and currently I don’t know how effectively we can work. We really need to polish our team work as well as individual input much more. This can be a positive or negative experience, depending on the responsiveness of people in the team.” The students anticipated not only working in a group, which was a familiar format of learning throughout their degree, but doing so in a real-world situation; “It will be a great challenge to work as a team and go through the project together,” “working in a high-stress situation closely with other students, learning to deal with stress,” and “learning how to work in teams made of people with various origins and backgrounds, learning to work in a condition of a consultant on a short period.” When asked ahead of time if they expected their student team to work well together, the vast majority agreed they would.

Afterwards, students in the study expressed that one of the main lessons learned was how to work on a student team; “the course was dependent on proactive and good group collaboration,” “it was difficult to involve all team members,” “the SED is not only about learning environmental management, but also team work, leadership and consultancy,” and “I learned a lot about being a leader and a team member,” “I learned how to reach general consensus with a working team, the importance of organizing the group and roles before departure.” In the reflection and debrief session with current students from 2016, there were a number of comments about teamwork being a predominant part of the learning experience (see Appendix E-2 for a full table of themes). Other comments included; “it took a lot of time and effort to facilitate the group process and maintain a stable/appreciative working

environment, especially when working under pressure,” “I learned how a group can evolve and group together in a way that I hadn’t expected before,” “the outcomes about the difficulties of teamwork in a stressful context, but also on the fact that interviewing relevant stakeholders can prove to be very interesting and very valuable,” “teamwork, communication skills,” “the group dynamics developed in such a good way that we were pushing each other and performed in a way that I haven’t seen before.” Some students made suggestions on how they could be more prepared for such an interactive experience; “It could have been good to have previous SED team work experiences introduced and guidelines for successful team work.” In the daily logs by current students (see Appendix E-1) interpersonal learning was a main theme, which further confirmed their reflections in the group session.

In the alumni survey, the different types of interpersonal relations and interactions brought up in the survey included between students, between the clients and the student group, between the client and the supervisor, and the supervisor and the students. 11 out of 40 respondents who commented on the most important aspects of the course which should remain unchanged mentioned ‘group work’ or ‘team work.’ Some elaborated on the circumstances of group work; “group size was adequate,” “team work in a completely foreign environment” and the “flexibility, self-sufficiency and responsibility of student teams.” Other comments referred to the networking opportunities such as “contact with local EMP students” and “using the extensive networks of the IIIIEE.”

Other students referred to the nature of interacting with clients and other stakeholders; “we had a rather uncooperative client who did not define the task nor communicate their objectives,” “we were really working on our own with little contact from the client,” “the on-site component was important for me to learn about consulting with a client and provided me real-life experience in interacting with a diverse group of stakeholders.” Students learn about professional skills “conducting a meeting, asking questions in ways that do not upset the client, cultural sensitivities.”

Many learning methods for navigating the interpersonal aspect of the process, such as how to initiate and structure debrief sessions or facilitate group meetings. The team members of the Jordan 2016 project, with external guidance, introduced semi-formal communication techniques for nightly check-in sessions and nominating a group facilitator for the report writing phase. The students from Zabzre 2016 created a personalized structure and rating system for synthesizing and reflecting on daily learning while at the project site. Several students from the current cohort in 2016 expressed an interest in receiving more training, tools and methods for facilitating interpersonal and collaborative processes.

#### **5.1.4.6 Perception of competencies gained**

Overall, the alumni were more conservative in expressing agreement than current students were. The results are more spread across the scale when the alumni have responded, with a general higher percentage of disagreement or partial disagreement. In feeling confidence about competencies related to all five types of thinking, the current students had slightly higher agreement than alumni; the vast majority of current students agreed or partially agreed before and after the project implementation. Alumni seem to have less confidence in their capabilities, which may be because they have entered the professional world and see the reality outside of classroom expectations.

The highest level of confidence expressed was to “agree” with a statement, based on a Likert scale with four options. The percentage of students who chose “agree” decreased on six questions and increased on nine questions after having been on the SED trip. This shows

some increase, at least marginally, in agreement for the majority of abilities. There was also less variation across the scale for many questions for current students, which may also be a result of the small sample size and the fact they were currently experiencing the learning.

For all three surveys – alumni and pre- and post- current students – the students were most confident about normative thinking, interpersonal thinking and futures thinking. The specific questions the alumni were most confident about were “vision, assess and evaluate environmental challenges” (normative), “account for social, environmental and economic implications” (systems), and “understand the future as open as something I have power to influence” (futures). Before the trip, the current students’ level of confidence in “agreement” never went over 60%, while it reached 69% after the trip. The questions they were most confident about were all three normative questions, “pursue collaborative approaches for problems solving” and “facilitate group processes” (interpersonal), and “assess available resources” and “develop strategies or action plans” (strategic).

There was a large jump in agreement for current students for futures thinking, such as “anticipate how sustainability problems might evolve over time” and “outline basic scenarios of the future” which were implied learning outcomes of the course based on the parameters of the assignment. Interpersonal thinking also demonstrated a significant jump in agreement for all three questions, from 9-16% (as opposed to 3-4% which was more typical). The questions with the largest decrease in agreement were – “design and test interventions or transitions” (strategic) and “understand environmental justice, fairness, equity” (normative) with more than 15% decrease as opposed to an average of 2-4% change. This can probably be explained by the fact that students are generally not involved in the actual implementation of the solutions they come up with during research, and that many SED challenges are not explicitly framed around justice or equity. However, the students are obliged to take on other’s perspectives which would imply, though not explicitly, that they consider justice and fairness. This is an area which is worth further study, especially regarding the phrasing of the question that they “understand” where other questions test “considering” or other action verbs.

### **5.1.5 Professorial supervision**

*Do the professors advise students’ academic thinking, convey basic academic practices, and supervise their academic performance?*

The role of the student supervisor should be primarily assisting students in their critical thinking academic research skills and need to adapt their approach according to the students’ needs (Brundiers & Wiek, 2011). When interviewed for this research, the course coordinators described the role of an SED project supervisor in relation to their responsibility to both the student and the client, each effecting the other. According to their description, the accompanying staff member doesn’t have a fixed level of involvement, it varies with each project. However, in general a supervisor should “ensure the deliverable is clear,” “convince the students they have value,” and guide the students in a way that allows them to step up and take a leadership role. An alumnus/client who was interviewed showed his understanding of the approach; “the teacher sometimes doesn’t say anything on purpose, it’s a very hands off approach” and a current supervisor said that he had changed his approach over the years to become more hands off because he feels less ownership of a project with more experience he gains.

The students’ perception of the supervisor’s role varies, according to whether the supervisor is there to advise and inform a research process, serve as a liaison to the client, or whether

they are responsible for logistics. In the course introduction session, a current student asked “who are we taking instructions from?” in order to understand if the supervisor or the client should be guiding the students. The course instructor advised the students that this dynamic should be decided upon together with the client and the supervisor. Shortly before the departure, the students continued to question the role - a current student said, “I would like to see strong engagement from the supervisor but I don’t know whether this will happen. The engagement of the supervisor can really enhance the learning process – I see that as his role” and another said “in an academic environment, it seems like the supervisor should be providing at least some guidance and insight to the project.”

In a focus group interview, a veteran supervisor and course coordinator expressed that his style is to give the students as much responsibility as possible, and intervene only when necessary.” There was general agreement that supervision style is relative to the student group and dynamics and the client expectations. In addition to responsibility for providing academic support, the supervisor may take part in planning, logistics and serve as the main point of contact to the client. Another current student described the supervisor’s role as an observer who gave valuable feedback but was more neutral than expected, “mainly arranging logistics and contact with the client.” He perceived the the supervisor’s role as content and quality assurance. Several students made comments about the interpersonal relationships they had with their supervisors. Some found added value in the interaction when supervisors were very accessible, physically or remotely and engaged with the students in informal settings demonstrating interest in the students. An alumnus reflected that “the supervisors’ role needs to be articulated,” and “more specification could be provided around the roles for the supervisor and students but this can be a valuable learning experience also.” There was some uncertainty from students on what to expect from the supervisor – one supervisor provided feedback only when explicitly asked, and others were perceived as the decision-maker who kept contact with the client.

A number of remarks were made on how supervisors are guided or trained to take part in a project and what influences their approach towards supervision. Several current students perceived a gap between “higher up” and the supervisors and made comments such as “[the role] was never discussed or communicated from the staff running the course” and “probably didn’t get proper guidance from higher up, and never gave us an answer what his role was.” In 2016 there were no established guidelines given to supervisors, including to the four supervisors who were fulfilling the role for the first time and without an accompanying senior supervisor. A supervisor who has been on multiple trips over many years said that some meetings and guidelines have been used in the past, and are a potential improvement for the future; “if we had time and resources to train PhD candidates to work as supervisors and that is probably to produce some kind of experience-based guidelines that they can use simply – do’s and don’ts of practical experience. We used to have a number of meetings between the supervisors before the take-off, sharing experiences and what could be of use.” The course structure used to pair senior supervisors with new supervisors which allowed supervision of the supervisors.

When asked about supervision in the survey after the current course finished, the results were spread on questions like “my team was well-supported by the supervisor,” “and the structure and information provided by the staff during the preparation phase was helpful.” When asked if the supervisors helped in defining the task, 11/15 said “no, but it would have been helpful” (other options were “yes, it was helpful” and “no, but wasn’t needed” and “not sure.”) In the daily logs from current students (see Appendix Table E-1) themes related to supervisors were common but complex. One group felt that the role was unclear, but also



that expectations were discussed with the supervisor. Another group said there was a need for more cohesion between supervisor and students, but also that the supervisor gave valuable guidance. The other teams did not have supervision as a main theme.

In the case of Jordan 2016, the supervisor had experience in many previous SED projects, from multiple stakeholder perspectives; as a student, a supervisor and a client. The supervisory role was self-defined and informed by previous experience, and so was intentionally 'hands-off' and allowed the students' room to approach and define the task themselves and to take the lead in shaping research questions, conducting a stakeholder analysis, arranging an interview schedule, and analyzing the data collected. The supervisor was present for selected group meetings, a number of interviews on site, but did not attend all activities which the students' attended. The time for group work was reserved for students unless a consultation with the supervisor was needed. The supervisor advised the students in structuring the research and the report, extracting important information from the interviews and identifying themes and patterns within the research (*academic thinking*).

The students underwent an iterative process in designing the research and writing the report, which involved some struggling and at a certain point the supervisor made an intervention in order to deliver the outcome he hoped for to the client liaison. The students were challenged by the 'hands off' supervisory approach and early on in the process expressed a need for more guidance and appreciated the intervention. Some students wished for more explicit communication or directions, some wished for more face-to-face time and access to the supervisor, who was simultaneously fulfilling other personal and professional responsibilities. The opportunities to meet with the supervisor, including having informal interaction such as dinner in the evening, were thus limited and when they occurred made the students believe more interaction would have been beneficial for them. The supervisor retained the hands-off approach until he found intervention to be critical and believed it was ultimately the students' role to cultivate leadership and trust within their team to avoid such interventions.

### **5.1.6 Interface facilitation**

*Criteria: Does an interface facilitator provide the services of translate of scientific knowledge and integration of scientific with practical knowledge, coaching, and project management that is satisfying for all parties involved?*

The concept of interface facilitation indicates translation between areas of knowledge which don't naturally correspond. Interface facilitation is adapted from the original framework for transacademic interface manager, who translates between scientific and practical knowledge. In SED, the course coordinator plays the role of interface facilitation as the persons who is responsible for communicating the learning objectives and course goals to the students. There is a university-approved syllabus available online for students, but it was not disseminated and the only students who read it were the Jordan 2016 students in a session with the researcher. The facilitation of the course is the main link between all stakeholder groups, and is responsible for coordinating all students and staff members.

Important themes which came up related to having a role which interfaces or coordinates between all participants were several. The coordinator must utilize networks and insiders and student see that its an impressive feat that the course happens each year, because securing 5-7 projects is difficult. The coordinator relies on several key staff members to help with securing projects, who are paid for extra working hours. There are advantages to working with alumni as clients or supervisors, which eases the work load of the coordinator. The style of coordination currently doesn't allow for formalized agreement with clients. The

coordinator needs to have a keen perception of the students' abilities and personalities in order to balance needs and interests.

The course coordinator runs the few sessions in which the students convene on campus before and after the on-site period. In the introduction session one student asked, "what core competencies are you expecting us to develop, or to brush up on?" and the course coordinator explained that the students are expected to be able to act according to a client's needs, prepare them with something they can use which is professional rather than academic. Several alumni and student respondents expressed that there needs to be more formal communication between the supervisors, students and clients, especially in balancing expectations. When asked if they received clear instructions from the course coordinator, 11/15 answered "no, but it would have been beneficial," three weren't sure, and one said yes. The same number, 11/15 said that the logistical support was adequate.

## 5.2 Outcomes: 4 types of societal effects

The "outcomes" section contains results which are demonstrative of outcomes, effects, and impacts which resulted from the process on the Jordan 2016 project and the SED overall. The four sub-headings are adapted from the evaluative framework for participatory sustainability research: **useable products, enhanced capacity, network effects, and structural changes.**

### 5.2.1 Useable products

There are common useable products which are produced for essentially all SED projects, such as the student report, and other useable products which are case specific. The common and consistent product is the public report which is written for a non-academic audience to be combined for joint publication in a hard and electronic form. In many cases, the students submit a more detailed or specific report to the client. The written reports function as a) a form of academic assessment, b) the synthesis of results for the client, c) knowledge for public consumption. Based on the task and topic of each project, the written reports have been fully or in-part action plans, road maps, visions, manuals, frameworks or tool-kits – some are ore like non-academic publications while others had a specific aim for action. An example of action-based products includes the Portugal 2015 project, which produced a Cleaner Production manual for water efficiency for wine producers in the region which was disseminated to all members of a collective. The following year the same client requested a "road map" for communications on sustainability issues for internal organizational use. In some other cases, the report functioned more as an evaluation or assessment with less emphasis on recommendations or plans.

In the study, there was minimal reference to resulting academic publications although the potential has been brought up. An academic publication is likely only as an eventual effect based on certain circumstances, for example a continued or existing research partnership, and based on the course framework is not likely to be a primary product.

Another common useable product has been photos, radio coverage and videos, which were used for public relations, marketing, media reports and communications by either the institution or the client. Media has been a supplement rather than a main product, and has been generally perceived as an added value. The most well-known example of using media to communicate the project is the case of Zabzre, which has hosted a number of different projects. Almost every year the students have appeared either on local television or are mentioned in a radio broadcast.

*Table 5-1 Useable products- course overview, all stakeholders*

<b>Useable products effects</b>	<b>Identifiable effects</b>
Products (goods), services	<ul style="list-style-type: none"> <li>• Empirical data</li> <li>• PR material: photos &amp; video</li> </ul>
Action plans	<ul style="list-style-type: none"> <li>• Numerous examples of visions, road maps, plans or recommendations                             <ul style="list-style-type: none"> <li>○ E.g. Are vision 2020</li> <li>○ E.g. Portugal 2016</li> </ul> </li> </ul>
Non-academic publications	<ul style="list-style-type: none"> <li>• Public joint report – single chapter</li> <li>• Client report</li> </ul>
Academic publications	<ul style="list-style-type: none"> <li>• Inclusion in this thesis research</li> <li>• Academic articles by IIIIEE staff members on SED</li> </ul>

### **5.2.2 Enhanced capacity:**

Enhanced capacity is the effect category with the highest number of examples from data collection. The different types of effects are described below, mainly but not exclusively from the *client perspective*.

Two types of potential effects, ‘acquired knowledge’ and ‘understanding’ were the most frequently perceived effects, with examples also for organizational learning, improved research capacity, know-how of technologies, anticipatory competence and saved resources (see Table 5-2 below). Acquired knowledge encompassed many types of learning, ranging from gaining communication skills in a cross-cultural context to an increased awareness of sustainability issues. Client learning was often referred to in the general context: “new ideas from universities where ideas are generated,” and “a chance to learn in-depth something you’ve never heard of before.” In other cases, the client described what they learned: “I personally learned a lot about working with such projects and modern solutions about waste management and energy,” and “how different cultures approach data and collection.” Some also referred to the method of acquiring knowledge: “we always meet specialists in different areas” and “the exchange with the students is a discussion” and “oral feedback is where you really make an impact, it sinks in.”

The clients conveyed enhanced *understanding* as a capacity beyond acquiring knowledge, or stated that ‘understanding’ is a motivation for the cooperation on the project; “the point of view for us in the municipality changed, at least for me,” “at the end of the day we are trying to bring together the perspectives of the students, the supervisor and myself (the client).”

‘Know-how of technologies’ was referred to by clients with projects that involved implementing new solutions or technologies which have been successful in the Swedish context. For example, the case of Zabzre has been exposed to various technology solutions from biomass to. However, there were few explicit examples from primary data collection, it is rather the case that technical learning is implied through the fact that reports and other useable products were produced for use by the clients.

*Table 5-2 Effect category: enhanced capacity*

<b>Enhanced capacity effects</b>	<b>Identifiable effects on all stakeholder groups</b>

Acquired knowledge: individual or collective (distributed knowledge)	<ul style="list-style-type: none"> <li>• Intellectual engagement and exchange</li> <li>• Cultural practices and behavior</li> <li>• Increased awareness on global issues in regional context</li> <li>• Subject or content:</li> </ul>
Understanding (vocabulary, perspectives, preferences, etc.) (*normative thinking)	<ul style="list-style-type: none"> <li>• New perspectives gained (two-way)</li> <li>• Terminology</li> <li>• Interpersonal, dealing with people</li> <li>• Significance of gaining multiple viewpoints</li> </ul>
Organizational learning	<ul style="list-style-type: none"> <li>• Professional development e.g. how to present to visitors (clients), how to represent organization</li> <li>• Contribution to grant proposal</li> <li>• New ideas generated e.g. financial mechanism evaluated</li> </ul>
Improved research capacity	<ul style="list-style-type: none"> <li>• Contribution to a development organization which is fundamentally an implementing organization rather than research organization</li> <li>• Contribution to wider grant proposals</li> </ul>
Know-how of technologies	<ul style="list-style-type: none"> <li>• Students and supervisor -increased basic knowledge renewable energy technology e.g. decentralized solar</li> </ul>
Anticipatory competence (**futures thinking)	<ul style="list-style-type: none"> <li>• Increased understanding of future scenarios in Jordan under refugee influx at status quo</li> </ul>
Saved resources	<ul style="list-style-type: none"> <li>• Re-allocation of saved resources (personnel or financial)</li> </ul>

### 5.2.3 Network effects

The clients expressed a high frequency of comments about expanding or creating network(s) and community, building trust, and inferring accountability. (see Table 5-3 below). Clients who have also been students at IIEE and experienced different roles in the SED demonstrated motivation to contribute to the international network of stakeholders associated with these projects. For example, a client who has hosted two projects one year after the other, expressed his willingness invest extra effort into hosting in order to “give back” to the institution where he was a student. The same client perceived alumni as critical to the implementation of SED projects and estimated that “from the top of my head, 70-80% [of projects] are hosted by former alumni” and that for a SED project to succeed, “a connection the Institute is needed, whether that is good or bad.” Another alumnus voluntarily initiated an SED project the year after graduating from the program in his home municipality where he utilized his connections to establish a project. A current Ph.D. candidate who was a supervisor in 2015 estimated that “less than 10%” of SED projects have no “connection.”

The importance of ‘expanding networks’ and (therefore having an already established network) was acknowledged by several interviewees. For example, another alumna worked for a client organization and according to a student on the SED project “the alumna knew the capacity of the Institute and that was important for the outcome of everything.” Another client thought that “students were engaged in part because of the staff members’ connections” and a key staff member said that “networking is instrumental in the setup” and “its easier to work with people that you know.” Some SED projects are occurring at a later stage in an already developed partnership, such as the projects with the Municipality of Zabzre and the Polish-Swedish Energy Platform.

A client from a current 2016 project emphasized the importance of long and extended engagement by saying that he was motivated to “try and create a partnership with the Institute itself rather than the SED. SED is a blatant expression.” Another client from 2016 said that he views this as the starting point of a relationship.

A staff member of the institute offered the perspective that “the interesting part is that whole course delivers quality to a number of clients,” which infers the motivation to network through various and simultaneous partnerships of various lengths.

In the case of Jordan 2016, network effects were identifiable for client, the IIIIEE, the supervisor and the students. The effects occurred throughout the process starting from the supervisor searching for a partnering organization. Knowledge exchange was a fundamental part of the process when students interviewed various stakeholders, which was an exercise in expanding networks. The project itself was a collaboration between an agency and an academic-research institution and was intended for future networking. The students leveraged the networks of the supervisor, the client, myself, and their own as they began meeting people in person. Network effects, as a result of this project process, were observed mainly as short-term and there was an indication of long-term effects, such as interest in future projects.

*Table 5-3 Effect category: Network effects*

<b>Network effects</b>	<b>Examples of identifiable effects</b>
Network(s) created or expanded	<ul style="list-style-type: none"> <li>● Initiating further cooperation</li> <li>● Working with local students</li> <li>● Long-term partnership</li> <li>● Shared research platforms</li> <li>● Staff-initiated projects</li> <li>● Follow-up visits/study tours</li> <li>● Initiating thesis projects</li> </ul>
Community created or expanded	<ul style="list-style-type: none"> <li>● Alumni “giving back” to the IIIIEE as clients</li> <li>● Enjoying company of students</li> <li>● Implementing “local knowledge” component for students</li> </ul>
Trust	<ul style="list-style-type: none"> <li>● Client perception that students “always doing their best”</li> <li>● Client willingness to engage in SED projects more than once</li> <li>● Trust in IIIIEE reputation and anticipated student performance</li> </ul>
Accountability	<ul style="list-style-type: none"> <li>● Client respect and trust in accompanying supervisor</li> <li>● Willingness to provide funding for “services”</li> </ul>

#### **5.2.4 Structural changes**

It is difficult to provide evidence of any structural changes and decisions for the public based on the perspectives of SED participants, especially from the student viewpoint. As previously stated, follow up with clients after the project has been completed is rare and if it happens not systematic and likely a result of a personal relationship. Therefore, the students and supervisors have a much lower chance of knowing if structural changes, which are likely to take more time, has occurred. There is also the issue that the students work may have contributed to structural changes but is one small aspect and the result cannot necessarily be

traced to the SED. For example, a client from a small municipality in Sweden who has been involved in several different projects said that he can trace a thread between discussions with students and the environmental strategic vision of the city which is now published online. Another client from an international organization cited his organization’s strength being implementation and hoped that research would validate taking action which would support the government and local communities. Regardless, there is some evidence of larger changes in particular within the organization, rather than reaching further to public effects.

The idea that the students’ work is “chipping away” at something larger is a common and an opinion which is held from representatives of all stakeholder groups. This refers more to structural changes and decisions, such as implementing an environmental management system in a company. However, an important variable of a large change being made is the readiness and willingness of the client and how advanced or motivation they are already before the students’ recommendations. Some student tasks are designed to assist a change which is already in process. In the cases where the stakeholder has played a larger role in defining the task, it seems to be more likely that a structural change can occur. In other cases, the project is designed as part of a larger European Union (EU) funded program and has a higher likelihood to be implemented because of the monitoring process already in place. However, this also depends on the level of responsibility and power a client liaison has in presenting ideas and implementing them under higher-level management.

The most tangible public structural changes are often examples of when SED projects collaborate with municipalities or regional councils, either as the primary client or one of the collaborating partners because the effects are being implemented in the public sector. The multiple projects which have taken place in Zabzre, Poland have been cited as effective in various ways, including structural change. A client liaison with repeated participation said the students’ reports caused “city authorities to think about a project in a new way” and that “this kind of work spreads for the future, benefits for the city and those people involved. O

Table 5-4 Effect category: structural changes and decisions

<b>4a. Structural changes and decisions</b>	
<b>Socio-economic (public) effects</b>	
Potential effects:	<ul style="list-style-type: none"> <li>• Identifiable effects</li> </ul>
Economic benefits	<ul style="list-style-type: none"> <li>• unknown</li> </ul>
Policies	<ul style="list-style-type: none"> <li>• unknown</li> </ul>
Decisions made	<ul style="list-style-type: none"> <li>• Client for Tanzania 2016 seeking project support for development based on students’ ideas</li> </ul>
Solutions implemented	<ul style="list-style-type: none"> <li>• E.g. construction of biofuel plant</li> </ul>
<b>4b. Structural changes and decisions</b>	
<b>Organizational effects</b>	
Potential effects	<ul style="list-style-type: none"> <li>• Identifiable effects</li> </ul>
Changed context for on-going or future work	<ul style="list-style-type: none"> <li>• Contributed to improvement of net-metering scheme design in company</li> <li>• Environmental Management System implemented</li> </ul>
New organizations	<ul style="list-style-type: none"> <li>• Formation of city planning team in municipality</li> </ul>

## 6 Discussion

### 6.1 Implications of findings: scientific context

The research gap being addressed in this thesis, as described in detail in the Section 1.1: Problem definition, is the need for further knowledge of the impacts of real-world, stakeholder-engaged education. In part, this gap is defined by a need to understand how specific educational approaches fulfil or fall short of the objective for sustainability education to be effective in cultivating future change-makers. The gap is also characterized by insufficient knowledge about the impact of these approaches on societal stakeholders. The purpose of this research was to describe and analyze the approach of a course which implements real-world learning and engages external stakeholders in order to understand the wider implications for sustainability education. There has been a call for a reform in education regarding sustainability (Crow, 2010) and the need for sustainability in higher education is now widely accepted (Thomas, 2009). The following table summarizes the main points according to each process category and a subsequent discussion on or connection to the outcomes identified in this research. While these are not the only findings which came about during the research, they are the most significant within the scope and utilized framework.

Main points	Corresponding discussion on outcomes and causal links
<b>Topic and task: actual sustainability problems</b>	
Diversity of projects allows experience in stakeholder-defined sustainability problems.	Allows students to consider and follow individual interests and increases <i>enhanced capacity</i> .
Students are motivated by <i>urgent and harmful</i> problems.	While such motivation doesn't guarantee project success, <i>enhanced capacity</i> (e.g. understanding) occurs.
Value is placed on gaining real world experience with little attention to defining the problem as a sustainability problem.	Real world experience was understood to lead to <i>enhanced capacity</i> (e.g. knowledge, understanding) and <i>network effects</i> (e.g. subsequent cooperation on students' thesis)
<b>Stakeholder initiation and ownership</b>	
Varied level of engagement and initiation from client for different projects results in varied perceptions.	Links between the client's style of engagement and student learning are unclear, but indicated that <i>network effects</i> (e.g. continued partnership, follow-up) are improved when initiation/ownership is spread between staff, students and client.
Important that client be familiar with academic institution to set realistic	Students feel more valued and effective and clients are more satisfied when there are

expectations.	realistic expectations, increasing <i>network effects</i> .
Potential for increased involvement of students in project initiation/ownership.	Students who were involved in more planning or initiation stages were involved in additional skill-building e.g. fundraising, professional communication, peer leadership ( <i>enhanced capacity</i> ).
<b>Two-way exchange with stakeholders</b>	
More clarity on roles and responsibilities is needed throughout the process.	Learning and <i>enhanced capacity</i> can improve with more efficient course management to allow students to focus on certain responsibilities with the most learning potential.
Students value clear communication, presence and friendliness given by the client.	The relationship with the client was considered important to the student experience, and increase their engagement in learning moments ( <i>enhanced capacity</i> e.g. organizational learning, understanding)
Knowledge exchange is the primary effect of the interaction.	<i>Enhanced capacity</i> is the key effect/outcome of the SED course, and more tangible societal impact is not a primary focus nor identifiable result. Learning occurs for all stakeholder groups through the basic exchange and interaction with each other.
<b>Preparing students to be ‘change makers’</b>	
Interpersonal and collaborative learning is one of the main results of such a learning exercise, and students were retrospectively surprised by the impact the group work had on their own experience.	According to Pfeifer and Rosback (2016) experiential learning is best done in teams to further enhance skills needed for sustainable development education. Students tend to reflect more on such learning ( <i>network effects/enhanced capacity</i> e.g. learning to collaborate outside a classroom) rather than on content or specific concepts.
International context of projects has added value but doesn’t necessarily provide higher learning. More important is connection to place and obtaining local knowledge through in-situ learning.	Students expressed appreciation and added learning when able to improve their <i>network effects</i> or <i>enhanced capacity</i> set in a local context (e.g. visiting refugee camps in Jordan). This affirms the value of sending students to new places, but the gap between personal learning and academic learning should be further explored.



Students are the most confident about interpersonal, normative and futures thinking overall, becoming more confident about interpersonal and futures thinking afterwards.	Based on an initial analysis which needs further study, interpersonal learning ( <i>enhanced capacity</i> ) is the most consistently anticipated and improved upon competency. More study is needed on individual competencies.
Students who have completed the course recently are more confident in their learning and ability to fulfil course objectives.	Learning does seem to loosely correspond to the stated course learning objectives, e.g. in gaining professional capacities (network effects, enhanced capacity) but are vaguely stated and need more systematic study with current students throughout the process.
Alumni have a wider range of confidence levels in their abilities than current students.	What perceived learning occurs varies greatly over time. After time passes, a greater emphasis is placed on intangible skills (e.g. interpersonal) or impressions (trust, community) rather than specific details, outcomes or success of a project
<b>Professorial supervision</b>	
Explicit and clear communications and instructions are critical success factors for students as they navigate their tasks, but are not delivered consistently.	Continually emphasizing expectations, boundaries and roles is perceived by them to be useful for their learning experience while at the same time giving them freedom and responsibility. (Mintz & Tal, 2013). Even among student teams who were less dependent on the supervisor, more clarity was desired.
Having and utilizing networks, as well as leveraging new potential contacts, is essential for establishing such ad hoc projects.	The institutional staff relies on <i>network effects</i> to implement the course. Students with greater understanding of the networking process gain personal lessons in networking (e.g. how to initiate a project) and can later become alumni who host projects, perpetuating a strong network.
A supervisor's connection to a place, which is useful in leveraging networks and providing students opportunities to meet people they wouldn't otherwise, but can also be a competition for the students' attention if the supervisor is working.	The impact on outcomes is highly dependent on other variables, such as team dynamic, client relationship etc. The supervisor's relationship to the place can either improve or detract from learning, networking, helping produce a good report, etc.
Students perceive that supervisors are not structured or prepared and there is a lack of communication between course implementers and supervisors.	The impact on outcomes is highly dependent on other variables. In some cases, the experience level of the supervisor impacts student learning, but in other cases personality or style is the determinant. A remaining issue

	is that students have pre-conceived expectations of a supervisor’s role.
<b>Interface facilitation</b>	
Critical reflection throughout the learning process is valued by students.	This helps student teams become strong and resilient while working in high-pressure situations. According to Evans (2009) and Alvarez & Rogers (2014), students and academics need to think critically as a key element in sustainability education. Critical reflection or structured dialogue doesn’t need to include an academic staff member, but tools or approaches can be provided by the staff.
Involving alumni as clients or partners can ease interfacing/coordination responsibilities.	Strong causal links are evident that interaction between alumni and students highly increase enhanced capacity and network effects, and have a higher likelihood to induce structural changes depending on the client’s position within their organization.

## 6.2 Practical recommendations

Based on the main findings, I propose three main recommendation areas for a program which is considering a comparable approach to implementing such a program. These can be considered for academic programs when refining or establishing programs with a similar interest in building solutions for environmental problems and empowering students to be effective in addressing them. See Appendix G for a proposed evaluative framework for individual SED courses which supports these recommendations.

Process	Practical recommendations
<b>Topic and task: actual sustainability problems</b>	<ul style="list-style-type: none"> <li>• Early on, gauge student interest in order to deliver engaging and relevant projects for each student cohort.</li> <li>• Equip students with information that helps them make decisions: e.g. what to expect from one project or another when choosing projects, or require supervisors to be present at the course introduction session.</li> <li>• Combine academic institute’s interests with projects for maximum learning for all stakeholders.</li> </ul>
<b>Stakeholder initiation and ownership</b>	<ul style="list-style-type: none"> <li>• Begin efforts to secure project partners in advance enough to allow time for discussion, negotiation and expectations to be set.</li> <li>• For academic efforts to establish new projects, ease reliance on senior staff who leveraging contacts and spread the responsibility in finding partners/clients to junior staff.</li> <li>• Introduce an evaluative tool for the supervisor or students to</li> </ul>

	<p>identify weak and strong points in a project in order to prioritize their efforts.</p>
<b>Two-way exchange with stakeholders</b>	<ul style="list-style-type: none"> <li>• *Establish several medium-term partnerships as needed with an intent to collaborate more than once.</li> <li>• Prioritize finding alumni who work in a professional field and are willing to collaborate.</li> <li>• Facilitate and prioritize direct communication with the client - set a required meeting with the client for every group the first week the project is settled.</li> </ul>
<b>Preparing students to be 'change makers'</b>	<ul style="list-style-type: none"> <li>• Introduce tools for interpersonal and intergroup communication, conflict management, and critical reflection and dialogue which can be utilized by students.</li> <li>• Introduce students to pedagogical theory and clearly frame the intended outcomes of the course and course activities.</li> </ul>
<b>Professorial supervision</b>	<ul style="list-style-type: none"> <li>• Provide written guidelines for supervisors, and secure supervisors who are motivated and qualified for all unique aspects of the project (high level of availability, willingness for interpersonal interaction with students, interest in learning, etc.).</li> </ul>
<b>Interface facilitation</b>	<ul style="list-style-type: none"> <li>• Determine and communicate more specific (rather than general) learning and course objectives and clearly align the course assignments and deliverables according to the prioritization of objectives, as well as transparently aligning grading criteria and process.</li> <li>• Set travel dates with intention, which should allow students adequate time to complete all course phases in accordance to expectations, e.g. amount of time between the on-site phase and report deadline.</li> <li>• Coordinate a shared online platform for communicating and file-sharing to store course documents in a centralized place to spread ownership of relevant knowledge, track progress, and contribute to future research.</li> <li>• Increase transparency about group selection, interaction with clients, grading, expectations, etc.</li> </ul>
<b>Summary</b>	<ul style="list-style-type: none"> <li>• Flexible and dynamic but well-structured implementation.</li> <li>• Combination of one-time projects and medium-term collaborations which occur over several years.</li> <li>• Make information clear and accessible.</li> <li>• Introduce tools for additional skill-building.</li> <li>• **Balance roles and responsibilities between all stakeholder groups, clearly and adaptively.</li> </ul>

\*Types of partnerships with stakeholders:

There are advantages to the current dominant practice of the course in bringing in new projects each year because the academic institution is able to try out potential partnership, learn about current practices in the field, and it results in a wider range of societal stakeholders who gain experience and hopefully benefit. Furthermore, it supports the important finding of maintaining project diversity and students are exposed to a wide variety of real environmental challenges. However, there are many missed opportunities for added value in establishing a more committed partnership if so many projects change from year to year. Finding and establishing some partnerships which can result in more than one projects over the long term could deepen some of the aforementioned benefits, such as learning about what innovations are on the rise in practical application. When a collaborative project is fundamentally a short-term interaction, there are ways to further results by extending the collaboration for 2-4 consecutive years. Slightly longer partnerships, rather than one-off collaborations, could also reduce the amount of time academic staff need for finding projects, but increase the possibility to make societal impact and empower students to connect more deeply to a particular project and its outcomes.

Having a project reoccur over several years doesn't assume the task or topic should repeat, only that the client and academic institution may establish a memorandum of agreement to work together on a broad sustainability challenges which has a number of different angles and areas for problem-solving. Committed partnership also facilitates other eventual collaboration or outcomes such as allowing students to continue related research for their thesis, providing internship opportunities, and expanding a job-search network. Longer term partnership can also induce more systematic follow-up of impacts on the stakeholders, which will contribute to research on how student engagement contributes to place-based sustainability problems. Partnerships with alumni who have moved into the professional sphere should be highly prioritized and systematically sought after, in order to increase trust and motivation, identify shared goals for the future, and encourage reciprocity.

\*\*Balancing responsibility between academic staff, clients and students:

Despite that dealing with uncertainty provides student learning opportunities, this thesis found that many students expressed a need for more methods for direct support from the IIIIEE staff. Even if a task with a client is not clearly defined and allows for uncertainty to be tackled, the expectations of the assignment and the roles for all stakeholders involved should be clear. Tools or skill-building trainings can help students navigate difficult, real-world tasks in a way which makes the learning more efficient. Information and resources should be centralized and easy to locate. Many of the supervisors and support staff demonstrated an ability to adapt to the students' needs and provide the necessary resources, but it was not universal and support staff may need resources of their own to meet the students needs.

### 6.3 Additional areas for research

Further research would benefit both the program and wider discourse on sustainability education. Areas that particularly need further validation based on this research are a more comprehensive assessment of competencies that students gain and what impacts do stakeholders experience. For example, IIIIEE is currently researching the what skills and learning are used by alumni in their professions and several areas for development are possible. The School for Sustainability at Arizona State University in the U.S. and Leuphana University in Germany have recently partnered and received a large grant to study teaching and learning competencies needed for sustainability science, which exemplifies the importance on studying competencies. Other research delves into making advancements in sustainability through stakeholder engagement and combining interests.

*Additional area: more comparison and a wider context is needed.* The course is only one component of an entire Master's program, which needs to be evaluated holistically. A more systematic evaluation of the course relative to other courses, the guiding pedagogies, and the objectives for the program is needed (Vilsmäier & Lang, 2015). There are also small research studies which can be conducted on techniques and tools for teaching and supervision, including the incorporation of guided critical reflection, etc. There are interesting possibilities for conducting comparative cases studies, especially within Lund University for learning about different approaches to sustainability education.

*Additional area: stakeholder and societal impact.* The relationship and impact on stakeholder and what the implications of working with societal stakeholders has potential for a wider implementation of solutions toward environmental challenges (Bock & Randall, 2014; E. Collins & Kearins, 2007). At the moment the short-term approach to partnership has positive effects but its important to study if there is more potential to be maximized for both sides. Conducting a systematic study of the types of partnerships which have occurred over time with SED would be a way to understand what type of partnerships are desired for the future.

## 6.4 Critical reflection: thesis process

My research process was most impacted by having an ambitious scope, my method for sampling the populations of study, my use of the conceptual frameworks, and mixing my methods with elements of participatory action research.

***Scope and design:*** Overall, my scope was ambitious and my design was overly complex including the populations I wanted to gain information from, the temporal scale I chose, and the research questions I designed. Having more clear research goals to design a narrower study would have resulted in more valid results e.g. focus on partnerships and follow OR student learning. My data set was large, especially based on participation and observation, and I was not able to use a lot of interesting information. There was an iterative process trying to determine what information can be used later for the case study organization and what can be used for this thesis.

***Population sample:*** The interviewees and participants of my research were selected through the snowball method and leveraging my personal network, which I justified in the methodology. However, it would have been interesting to have systematically gained multiple perspectives on certain projects from different stakeholder groups. In addition, more interviews with clients as well as staff members who have less insider knowledge would have complemented the viewpoints represented.

***Use of frameworks:*** Merging three frameworks was useful for structuring the results and analysis from a large range of data, all of which could not be put to use based on the scope and time limitations, and there were challenges and opportunities in working with each one. Additionally, the frameworks can be used in different ways, and I did not initially use them for critical analysis. The merging was done in order to incorporate viewpoints of different stakeholders, but it was often complex to ensure that viewpoints used were clear, especially as the data set was not segregated into different stakeholder groups perspectives but arranged by theme. At times, the themes did correspond with a single stakeholder group view.

An early objective in the research design was to use the 'key competencies in sustainability' framework to understand what learnings students experience in the course. The first limitation is that it was not feasible to find or create a tool to assess learning and my data was

reliant on a self-assessment by the students, which does not actually measure learning or progress but the perception of it. It became increasingly clear that in order to effectively measure learning in the SED course it would be essential to relate the research to the wider context of the master's program and even students' previous educational background. An additional challenge was the products of the course, which are the student reports, indicate certain types of competencies – for example, it appears that students would have increased their futures thinking by building scenarios for an eco city. They successfully conducted research and published their work, but this doesn't actually assess learning, just implies it. It also focuses on the student groups as a whole and doesn't target individual students. It would have been useful in this research further analyze the public and client reports as well as the evolution of how assessment for grades has been done. However, overall a much more in-depth and long-term research approach would have been necessary to gain more robust findings. Although the current results show several interesting ideas to follow up on, they do not constitute reliable findings to draw conclusions upon. For example, its clear that “collaborative learning” is a competency that many students, as well as other stakeholders, improve, but more information is needed to understand the specific causal links in a context with so many influencing variables. It would be useful to design a study which assesses the students' competencies later and not while they are still inside the experience and navigating the final stages.

The challenges working with ‘key competencies’ within my research context led me to refocus on the course as a platform for effecting societal change, which is inclusive of learning as an effect. When I coded the data from interviews and field notes, I took an inductive approach while keeping the literature and learning competencies in the back of my mind. While analyzing the data, my approach became more deductive because I naturally began to try and fit my data into the evaluative framework. This was an iterative learning process and if I were to redesign the research I would make sure to be more clear on whether the research is inductive or deductive from the start. However, in my case it actually worked well because the inductive data fit very well into the theoretical framework which I ended up changing to at quite an advanced stage. When I coded the interviews I created seven “mega-clusters” inductively – **course organization, client, institution, student, task and topic, geography/place, and learning and additional values**. They encompass smaller clusters of codes such as “finding projects” in course organization and “role of supervisor” in institution. They ended up broadly, if not specifically aligning with the seven components of sustainability research education:

- actual sustainability problems = **task and topic**,
- stakeholders facing sustainability problems= combination of **geography/place, client and course organization**
- preparing students to help create a better society =**student**,
- generation of workable solutions/positive learning impact = learning & additional values,
- stakeholders' specific knowledge = **client and geography/place**
- professorial supervision=**institution**,
- transacademic interface manager=**course organization**

This amount of alignment facilitated my adaptation of the framework as a structure for presenting the data as results, and justification to combine the results and analysis. This is in part a testament to the framework encompassing important elements of this type of research platform. My original analytical framework was composed of the same theories but did not use the scheme for evaluation as directly, and was structured around the three stakeholder

groups. It would have been less complex and possibly yield more valid results if I had focused on one stakeholder groups and customized an analytical framework – for example seeking more data on stakeholder impact and using the effect categories.

Based on my reflection, this thesis can serve in the following ways: first of all, it is a rich, written description of a phenomenon which has the potential to deeply impact the participants. It is an opportunity for deep learning and has the potential to be transformative learning. Despite all the informants I spoke with, I think there is much more research needed to say what type of learning has occurred but the platform is rich with potential. This descriptive research can serve to inform further research on the course and similar courses. Secondly, there are findings which

***Participatory research elements:*** My approach included using both previous participants and current participants of the SED course as subjects of study, which meant I took the opportunity to use participatory methods with the current students which were not applicable to alumni or former clients. It was a great opportunity for experimentation with pedagogical techniques, but because of balancing the various methods for data collection, it caused on a strain on time management and focusing on the objectives of this research. I was not able to gather methodical feedback from the current students on my impact except for when individuals approached me directly. I intended to have follow-up interviews with the four students and supervisor of the Jordan team who I accompanied on their SED project, but only managed to conduct three with students. The course coordinator included a question on the formal course feedback form related to my facilitation of a group reflection session but the results have not come in time for the submission of this thesis. The implementation and impact of these “interventions” or experiments are also worth reflecting on as a researcher.

In many ways it was similar to ethnography because I was very immersed in the culture and was continuously exposed to the multiple levels in which the students were experiencing and learning from the SED. While accompanying the Jordan 2016 team I was naturally incorporated in as a functioning member, which is related to my personality and style and my already-formed relationships with the students. I had access and was able to introduce conversation topics, such as interpersonal or group learning, that other researchers wouldn't have had. On the other hand, my level of comfort and our natural conversations blurred what we had discussed as my role on the team.

Because I was accompanying the students on a learning experience in which they were expected to deliver upon academically, I was also absorbing a great deal of new material, cultural experiences, and learning which was not the data I was aiming to collect. This was an interesting barrier to overcome because it was difficult to distinguish the importance of learning what the students were learning in order to understand their process, or to try and focus on observing their reactions, interactions, etc. I was the only person on the team, besides the supervisor, who had significant experience in Jordan and in the cultural context. I entered the experience with certain assumptions based on what I have experienced and learned before, and there were numerous occasions where my assumptions were challenged and I had to reframe my previous experience based on newly acquired knowledge. I sometimes provided useful contextual information, but more often than not the students would have solved it and my influence was not critical. The exception is networking – my personal contacts provided several good interviews and this was helpful. This is a personal reflection which brings up further questions about what qualifications a supervisor or additional person on an SED trip should have and how it affects the group. Leveraging

networks is more innately helpful to the students' success than explaining cultural concepts of modesty. It was always difficult to ascertain what impact I was having on students, while either being active or passive. This further affirmed the learning that there are so many variables going into the success of the SED projects that finding a causal link to one is a huge challenge.

It was a personal challenge to remain aware that many learnings the students should be given space to come to on their own, and stepping back would enable them to do so. This made me understand the common approach for "hands off" supervision – students might feel frustration when a supervisor, who is clearly an expert on a topic, doesn't step in or actively guide the research process – but in many cases the students needed to learn by trying. There were occasions where a specific message was delivered to students' multiple times but it was clear they couldn't process it alongside the continuous influx of information. Being a third party allowed me to see the disparity between what information stuck with students and what didn't, and understand from the outside how and what information is actually being passed between different engaged parties.

Furthermore, having so much input of information through observing meant that I could not account for or record all information as methodical data collection. A limitation on my research is that there are bits of "knowledge" that I have gained but cannot present according to academic standards for robust research. There may be points in the analysis, conclusion and discussion which have been influenced by my latent knowledge and be more clear to me than my reader, although I've done my best to account for it.



## 7 Conclusions

This thesis research was conducted based on the hypothesis that engagement with societal stakeholders is a strong platform for furthering local, regional and global sustainability while simultaneously providing opportunities for students to enhance their competencies to become sustainability professionals. The platform or structure for collaboration, such as an academic course, can be designed and implemented to provide mutual benefits and build solutions.

The processes and outcomes of the course studied provide insight into the challenges and successes that can potentially arise from such a collaborative model. The research questions, revisited and answered below (see Table 7-1), sought to identify aspects of the course which can provide lessons for sustainability education.

*Table 7-1 Research questions*

<p>Research Question 1: <i>Phenomenological Description</i></p>	<p>How does the course align with pedagogical approaches to sustainability education?</p>
<p>Research Question 2: <i>Process analysis</i></p>	<p>As an applied research methods course in sustainable development, how does the SED course fulfill the recommended criteria for the <b>'sustainability research education'</b> process?</p>
<p>Research Question 3: <i>Outcomes analysis</i></p>	<p>As <b>participatory sustainability research</b> with an additional education component, what are the societal effects and learning outcomes of the course?</p> <ul style="list-style-type: none"> <li>• What causal links to the process can be addressed to improve the outcomes?</li> </ul>

### **How does the course align with pedagogical approaches to sustainability education?**

The pedagogical approach of the SED course uses problem-based, solution-oriented research projects set in the context of place-based environmental challenges in order to teach students how to apply sustainability concepts, tools and strategies in a real-world context for a professional client. Based on the literature review and case study, this thesis proposes six defining aspects of the course: 1) it is real-world and location specific learning; 2) it aims to contribute to building environmental solutions; 3) it is interdisciplinary, cross-sectoral and cross-domain in nature; 4) it engages clients and non-academic stakeholders; 5) is an opportunity for collaborate and interpersonal learning 6) and offers global context and international learning. The theories and techniques used by the IIIIEE are guided mainly by problem-based and authentic learning tasks, but are also exemplary of other pedagogical theories.

### **As an applied research methods course in sustainable development, how does the SED course measure against the recommended criteria for the *sustainability research education* process?**

The model for *sustainability research education* is a potential platform for students, experienced academic researchers, and societal stakeholders to work together to solve a specific sustainability challenge while experiencing mutual benefit. The SED course is primarily a platform for student learning which takes place in the real world, as described for Research

Question 1, but when considering the collaborative stakeholders and societal interaction the criteria are only partially achieved. Several overarching themes which emerged about course were the processes of organization and coordination, supervision, interaction with the clients, group work, and defining the task. The process varies greatly from project to project but common key findings include the need for: clear and transparent communication, articulation of roles and responsibilities, engaged clients who have previous knowledge of the academic institution, tools and training for participants to assist in building interpersonal skills, follow-up and potential for continued partnership, a dynamic supervision style, structured opportunity for reflection and critical thinking, and place-based learning opportunities. As an entire course, the SED *partially achieves* actual sustainability problems; *partially achieves* stakeholder initiation and ownership; *partially achieves* two-way exchange with client; *fully achieves* preparing students to be change agents; and *partially achieves* professorial supervision and *does not achieve* interface facilitation.

**As participatory sustainability research with an additional education component, what are the societal effects and learning outcomes of the course?**

- **What causal links to the process can be addressed to improve the outcomes?**

The primary type of effect of the practices and implementation of the SED course is enhanced capacity, which includes knowledge transfer, understanding, etc. The secondary type of effect is networking, expanding or creating a network and community. While the course does have the effect of creating useable products, mainly in the form of written reports, it seems to be the process of writing the report and sharing the contents rather than the report itself which has an impact. While some SED projects have created tools, frameworks and businesses models further study is needed to know if these have had a further impact as products. The final type of effect, structural change and decision-making, is the least likely to occur based on the short-term engagement of the project. If structural changes, either organizational or societal are occurring, they are a result of combined efforts and continued work by the stakeholders. The impacts of the course on stakeholder and wider society need further research, while the impacts of the course for the students and the institution is more clear. The students tend to gain the most competency in interpersonal and futures thinking, as well as learn how to work in a professional setting.

While there are many variables, there are certain causal links which can be made. The course lacks structure and methods which has both added value, such as informal networking opportunities, but creates challenges and may detract from learning objectives for students. The continuation of the course seems to be dependent on the willingness of staff to put in extra effort without being allocated the time, therefore lacking structure, but also must develop into a sustainable model which is not reliant on specific staff members and their networks. More procedures need to be put in place in order to enhance the students learning experience, such as streamlined written communication and documentation, articulation of roles, and guidelines for navigating the experience. Better follow up would result in better communication with partners and a further understanding of how to develop partnerships which might be more sustainability. The lack of engagement between supervisors and course coordinators means that knowledge and best practices are not shared and pedagogy is not discussed or improved upon. The lack of streamlined communication between the course coordinator, the project supervisor, the students and the client results in confusion and often wasted time. However, real-world learning and exposure to new cultures, new practices, new challenges result in a strong learning and personal experience. The emphasis on group work and working with a professional client results in students taking the lead, learning how to

communicate and manage a team, and working under difficult circumstances. In Appendix G is a proposed outline for an evaluative tool to be developing taking these aspects into consideration, to evaluate a single SED project in order to identify strengths and weaknesses.

The setup of the course, as backed up by current literature (see Section 4.7 Pedagogical Approach), is suitable for re-envisioning the SED to more systematically address societal sustainability challenges in equal partnership with non-academic stakeholders. The SED course is a model which is regarded as successful in many ways, but lacks the structure or resources to enrich or maximize the potential. As Wiek et al. (2014) says, another important aspect is that participatory research processes are intentionally designed and not a matter of happenstance through ad-hoc interaction (Wiek et al., 2014). The SED course is a well-established, if rather fluid, platform for applying innovative strategies and approaches in education for sustainability and engaging non-academic stakeholders in sustainability solutions.

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## Appendix A – SED Background and Course Description

Figure A-1 Overview of the program and timing of the SED course

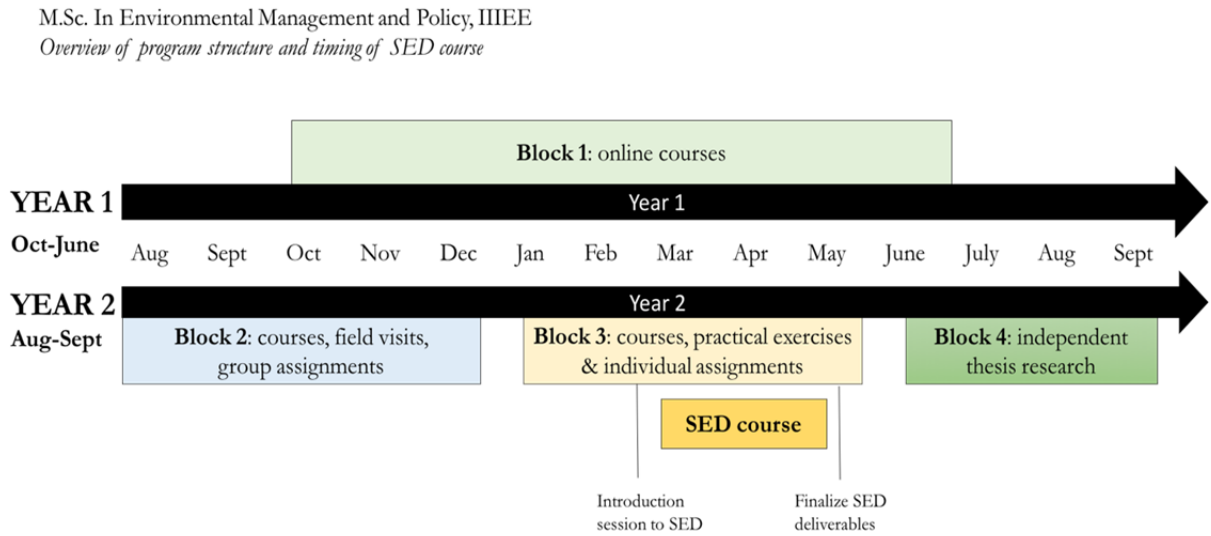
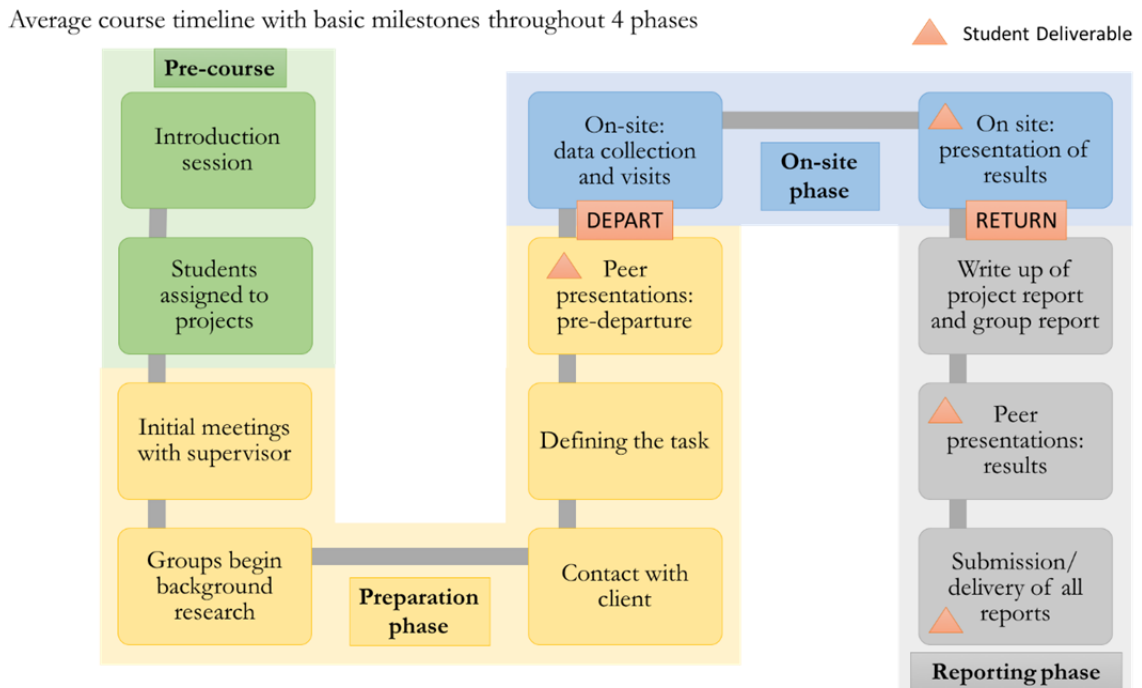


Figure A-2 Course phases and basic structure



Source: by author

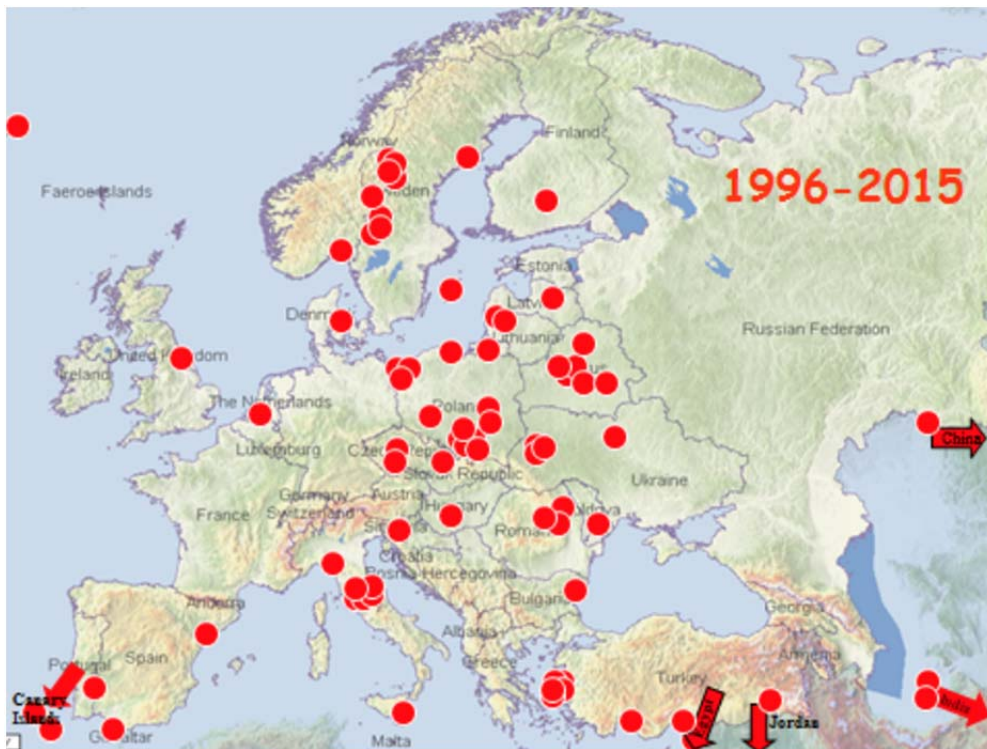
Table A-1 Overview of SED projects categorized by country of destination

#	Country	Number of times	Years	#	Country	Number of times	Years
1	Belarus	4	2007, '08, '09, '10	17	Mexico	1	2016
2	Bulgaria	1	1998	18	Moldova	1	2011

3	China	1	2010	19	Netherlands	1	2005
4	Czech Republic	4	'99, '04, '08, '11	20	Norway	1	2010
5	Denmark	1	2013	21	Poland	13	1997, '06, '09, '11, '12(x2), '13, '14 (x4), '15, '16
6	Egypt	1	2015	22	Portugal	2	2015, '16
7	Estonia	1	2016	23	Romania	2	2004, '05
8	Finland	1	2014	24	Russia	1	2000
9	Greece	5	2002, '03, '04, '06, '08	25	Slovenia	1	2015
10	Hungary	1	2012	26	Spain	4	2011 (x2), '12, '13
11	Iceland	1	2006	27	Sweden	11	1996, 2004 (x2), '05, '06(x2), '08, '09, '11, '13, '16
12	India	2	2012, '15	28	Tanzania	1	2016
13	Italy	8	2003 (x2), '04, '05, '07, '10, '12, '13	29	Turkey	1	2008
14	Jordan	2	2014, '16	30	U.K.	2	
15	Latvia	1	2009	31	Ukraine	3	
16	Lithuania	2	2001, '12				

Source: by author ([IIIIEE], 2016b)

Figure A-2 Map of SED locations 1996-2015



Source: Lindbqvist et al., 2015

*Table A-2 Examples of SED projects represented in this research*

<b>Year</b>	<b>Project/Report Title</b>	<b>Interviewee (s): stakeholder group (s) represented</b>
2015	Towards a New Energy Ideal - Energy Service Business Models in Outdoor Lighting in Egypt	Student
2015	Setting Sail for Beyond Compliance - Opportunities and Lessons Learnt From APM Terminals Pipavav	Client
2015	Energizing Zabrze - From Ideas to Action in Energy Planning in Nowe Miasto	Client, IIIIEE
2015	Cleaner Production in Alentejo - Waste and Water Management in Winemaking	Client
2015	Fostering Eco-Innovation and Green Jobs - Success Factors in the Oresund Region and Implications for Ljubljana	IIIIEE
2014	On the Horizon: Up-scaling Solar PV for Self-consumption in the Jordanian Market	Student
2014	Smart City Zabrze: Building on a Mine of Opportunity	Client, IIIIEE, student
2013	Pilot Biogas System in Zabrze, Poland - A Pathway Towards Producing Renewable Energy and Reducing Organic Waste in Polish Landfills	Client, IIIIEE, student
2012	Energizing the Future of Balatonalmadi	Client
2012	District Heating in Gdynia: Road to More Efficient Management	IIIIEE
2012	Pre-feasibility Study on Biogas Production from Organic Waste in Zabrze	Client, IIIIEE
2011	Sustainable Community Development in the Czech Republic - initial steps for Zakolany village	IIIIEE
2011	Gonzalez Byass	Student
2011	Waste Management in Zabrze - Pathways to a more sustainable system	Client, IIIIEE
2010	Future Waste Management in Belarus: bringing private and public actors together	IIIIEE, student
2009	Implementing EPR for WEEE in Belarus	IIIIEE
2009	Zabrze's first step on the journey of sustainability development (brownfield development)	Client, IIIIEE
2008	Who can be responsible for that smell? Analysis of MSW management in Belarus and implementation of EPR	IIIIEE, student
2008	Barriers to Environmentally Preferable Behavior among Skiing Tourists	Client
2006	Industrial Waste Management in the Municipality of Zabrze	Client, IIIIEE
2006	Managing Growth: Fundamental elements to ensure sustainability in Are	Client
2005	Sustainable Urban Development - an opportunity for creating a prosperous, innovative and livable Stadshavens: An external view on the redevelopment process of the Stadshavens area in Rotterdam	IIIIEE
2003	Sustainable Food and Drink Industry in Yorkshire and Humber: Drivers, networks and capacity	IIIIEE

*Table A-3 Topic areas for SED projects (19 areas)*

<b>Topic areas (categorized)</b>		
Bioenergy	Environmental management	Mobility and transport

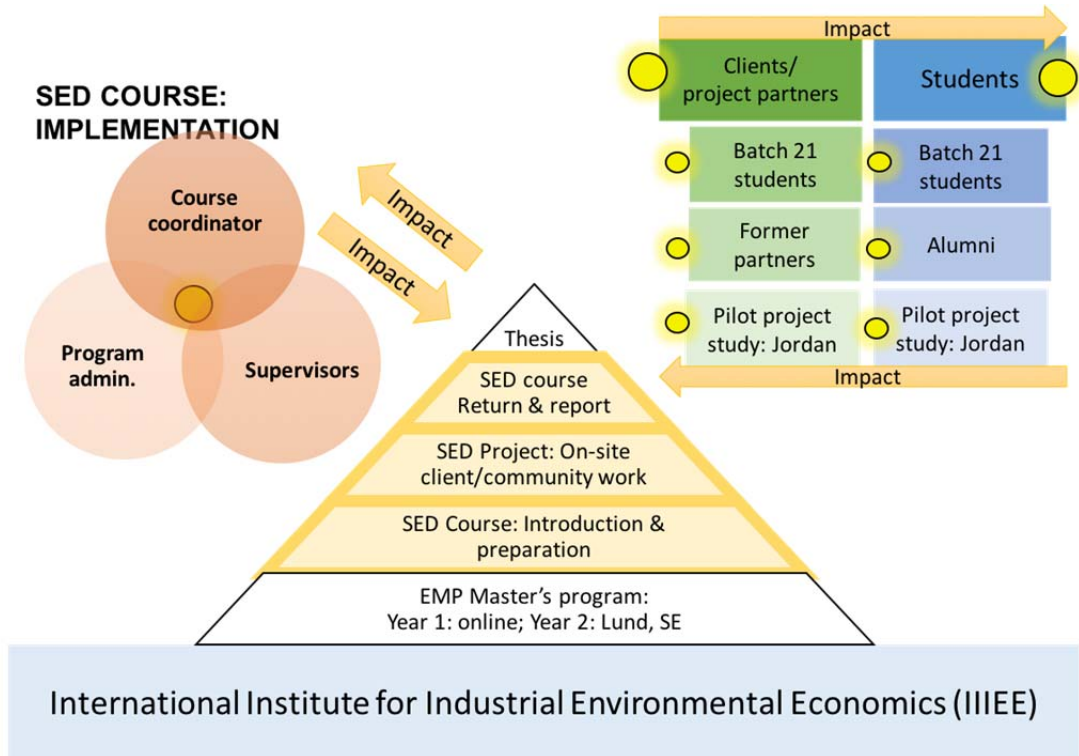
Climate change	Extended Producer Responsibility	Local or rural development
Eco-labelling	Distributed economies	Municipal waste management
Energy security/energy pathways	Food production	Solar energy
Green growth	Humanitarian development/services,	Sustainable tourism
Energy planning or energy efficiency	Industrial waste management	Water management
		Urban development

## Appendix B - Stakeholders

Table B-1 Stakeholder groups

Stakeholder group	Common term used	Stakeholders (organizations/collectives)	Stakeholders (individuals)
• Students	Students	n/a	<ul style="list-style-type: none"> <li>• Current students</li> <li>• Alumni (former students)</li> </ul>
• Institution	IIIEE	<ul style="list-style-type: none"> <li>• IIIEE (institute)</li> </ul>	<ul style="list-style-type: none"> <li>• IIIEE staff members (active role in course)</li> <li>• Director of Education</li> </ul>
• Non-academic stakeholders	Clients	<ul style="list-style-type: none"> <li>• Client organizations (a municipality, company)</li> </ul>	<ul style="list-style-type: none"> <li>• Client representatives/ project hosts (individuals)</li> </ul>

Figure B-1 Stakeholder groups: interaction and impact



## Appendix C – Methodology

C-1: The criteria for evaluating the nature and quality of a participatory sustainability research project can be broadly applied to justify the use of the framework for the SED course. As shown, the criteria for the nature of the process are easily fulfilled whereas the quality assessment must be elaborated upon in the data results and analysis

Table C-1 Nature and quality of process: participatory sustainability research

	Criteria	Broad fulfillment of criteria: SED projects
Nature of the process	Events (number, type, phase, sequence)	Three phases of course: preparation, on-site and reporting
	Stakeholder motivation to participate	Engagement of new and repeating stakeholders for 15+ years
	Stakeholder roles in the events	High level of involvement in on-site coordination for 1-2 weeks, varying degrees of involvement in preparation and reporting
	Perceived importance of the events	Varying degree of importance to 3 stakeholder areas: students, institution and clients
Quality of the process	Representation of all relevant opinions and perspectives	Varies
	Fulfillment of critical participatory roles	Varies
	Adequate level of interaction	Varies
	Consideration and processing of stakeholder input	Varies
	Mapping out and resolving disagreement and conflict	Varies
	Diversity of participatory activities	High level of diversity in sector, topic area, region, type of engagement, activities, goals, output, etc.

Table C-2 Coding clusters

### **1 Course organization** -

- Advance visits
- Alumni connections
- Course structure
- Course value
- Expectations
- Finding projects
- Follow up
- Networks & connections
- Organization & planning
- Potential improvement
- Partnership
- Repeating projects
- Resources & support
- Roles
- Team placement
- Variability

### **2 Client**

- Client motivation
- Client satisfaction
- Client view: follow up
- Potential partnerships
- Results

### **5 Task and topic**

- Business
- Defining the task
- Environmental challenge
- Practical application
- Project diversity
- Real world
- Reporting
- Sectors
- Special projects
- Third party

### **3 Institution**

- Benefits IIIIEE
- Staff diversity
- Staff engagement
- Teaching environment

### **6 Geography/place**

- Culture & language
- Local interaction
- Locations
- Risks
- Sense of place

### **4 Student**

- Student motivation
- Student working experience
- Teamwork
- Thesis

### **7 Learning /additional values**

- Applying theory
- Challenges
- Flexibility
- Fun
- Initiative
- Interpersonal skills
- Knowledge transfer
- Learning
- Multiple viewpoints
- Success and pride



perceptions

*Table C-3 Overview of group reflection session exercises*

<b>SED project group (small group discussion)</b>		<b>Mixed group (small group discussion)</b>	
<b>Prompt 1:</b>	What do you appreciate about your group dynamic and group members? What did you learn from them?	<b>Prompt 3:</b>	What was the main challenge you encountered? What went well? How were your expectations met or not met?
Length for discussion: 5 min		Length: 10 min	
<b>Prompt 2:</b>	Why do you think the clients chose to host you? What did they engage in this project? What do you think is the impact or benefit for all stakeholders involved in the SED?	<b>Prompt 4:</b>	What role did your supervisor play in your project? If you were a supervisor of an SED project, how would you approach the role?
Length: 10 min		Length: 10 min	
<b>Entire group (Reconvening of all participants)</b>			
<b>Prompt 5:</b>	<ul style="list-style-type: none"> <li>• What are the most important lessons learned?</li> <li>• What do you want to articulate to the outside world about this experience?</li> <li>• Was your learning experience professional, academic or personal?</li> </ul>		
Length:			

## Appendix D – Interview List

Table D-1 List of qualitative interviews: individual and group (listed chronologically)

#	Stakeholder group	Position (current) within stakeholder group	Interview approach/ method	# of interviews	Associated project(s), client(s) or location(s)
1	Student A	Current student	Semi-structured exploratory	1/1	Sweden 2016
2	Student B	Current student	Semi-structured exploratory	1/2	Sweden 2016
3	Student C	Current student	Semi-structured exploratory	1/3	Jordan 2016
4	Student D	Current student	Semi-structured exploratory	1/1	Portugal 2016
5	Student E	Current student	Semi-structured exploratory	1/1	Sweden 2016
6	Student F	Current student	Semi-structured exploratory	1/1	Tanzania 2016
7	Student G	Current student	Semi-structured exploratory	1/3	Jordan 2016
8	Student H	Current student	Semi-structured exploratory	1/1	Poland 2016
9	Institute staff A	Head coordinator	Semi-structured	1/3	Multiple, Tanzania 2016
10	Institute staff B	Former supervisor & course coordinator	Semi-structured	1/3	Multiple
11	Institute staff C	Supervisor (former student & client)	Unstructured	1/2	Multiple, Jordan 2016
12	Institute staff D	Project supervisor	Unstructured	1/1	Multiple
13	Institute staff E	Supervisor & course coordinator	Focus group	1/1	Multiple, Poland 2016
14	Institute staff F	Supervisor & course coordinator	Focus group	1/1	Multiple Portugal 2016
15	Institute staff B	Former supervisor & course coordinator	Focus group	2/3	Multiple
16	Institute staff A	Head coordinator	Focus group	2/3	Multiple, Tanzania 2016
17	Student C	Current student	Focus group	2/3	Jordan 2016
18	Student G	Current student	Focus group	2/3	Jordan 2016
19	Student I	Current student	Focus group	1/2	Jordan 2016
20	Student J	Current student	Focus group	1/1	Jordan 2016
21	Student K	Alumni (2015)	Semi-structured	1/1	Egypt 2015
22	Student L	Alumni (2012)	Semi-structured	1/1	Poland 2012
23	Student M	Alumni (2008)	Semi-structured	1/1	Belarus 2008
24	Student N	Alumni (2013)	Semi-structured	1/1	Poland 2013
25	Student O	Alumni (2014)	Semi-structured	1/1	Jordan 2014
26	Student P/	Alumni (2011), client	Semi-structured	1/1	Spain 2011,

	client A	(2012)			Hungary 2012
27	Student Q/ client B	Alumni (2007), client (2015-16)	Semi-structured	1/1	Belarus 2007 Portugal 2015, Portugal 2016
28	Student R/ institute staff G	Student (2010), supervisor (2015)	Semi-structured	1/1	Italy: Val di Noto 2010, Slovenia 2015
29	Institute staff C, client C, student S	Supervisor Jordan 2016 (former supervisor, former client)	Unstructured	2/2	Jordan 2016, multiple
30	Client D	Former client	Semi-structured	1/1	Sweden: Åre, multiple years
31	Client E	Current and former client	Semi-structured	1/1	Poland: Zabrze, multiple years
32	Client F, Institute staff H	Former client, former advisor, collaborator	Semi-structured	1/1	Multiple
33	Client G	Former client (2014)	Semi-structured	1/1	India 2014
34	Client H	Stakeholder in student project, “third degree” affiliation	Semi-structured	1/1	Jordan 2016
35	Client I	Current client (2016)	Semi-structured	1/1	Jordan 2016
36	Student B	Current student	Semi-structured	2/2	Sweden 2016
37	Student C	Current student	Semi-structured	3/3	Jordan 2016
38	Student G	Current student	Unstructured	3/3	Jordan 2016
39	Student I	Current student	Semi-structured	2/2	Jordan 2016
40	Student T	Current student	Semi-structured	1/1	Estonia 2016
41	Student U	Current student	Semi-structured	1/1	Mexico 2016

*Table D-2 Key informants and sources of information (multiple and various interactions)*

#	Name	Position	Interaction with informant
1	Beatrice Kogg	Head of Educational Programs, M.Sc. EMP, IIIIEE; alumna IIIIEE	Multiple consultations and conversations, email follow up
2	Håkan Rhode	Associate Professor and founding faculty member, IIIIEE; course coordinator and supervisor	Multiple interviews, multiple conversations, email follow up, cooperation/facilitation with current course implementation
3	Thomas Lindhqvist	Senior Lecturer and founding faculty member IIIIEE; course coordinator and supervisor	Multiple interviews, follow up conversation
4	Jessika Luth-Richter	Ph.D. candidate IIIIEE; thesis supervisor for this research; alumna	Multiple conversations, emails, fact-checking, provision of internal documents, etc.
5	Arnim Wiek	Associate Professor, School for Sustainability at Arizona State University; lead author on key literature	Three advisory sessions (March and May) and follow-up

## Appendix E – Results

Table E-1 Themes from daily logs: results

Project group (coded by #)	Theme/outcome 1	Theme/outcome 2	Theme/outcome 3	Theme outcome 4
Group 1	Strong emphasis on conducting interviews and meeting stakeholders	Conducting interviews and use of interview guide was a learning process.	Good communication and strong group dynamic	Feeling of progress as the days passed
Group 2 TZ	unknown	unknown	unknown	unknown
Group 3	Satisfaction with and enjoyment of the group dynamic	Supervisor's role is unclear and unsatisfactory	Importance of communication and acting as a team	Conducted open discussions about expectations with client and supervisor
Group 4	Placed high value on many specific interviews*	Logistics and practical matters detracted from the experience*	Need for more cohesion between supervisor and students*	Valuable guidance and supervision from the client*
Group 5	Good team spirit and mood, exceeded expectations	Specific stakeholder visits greatly increased understanding and had high value	Feeling that client and associates put special effort into providing a good experience	Feeling that value was delivered to the client
Group 6	Well-structured group de-briefs and meetings*	Strong team dynamic and flexibility*	Emphasis on summarizing important content	Experienced some time constraints, intense working hours and busy schedule*

Table E-0-1 Synthesis of overall results: final reflection session

Topic/theme	Researchers interpretation: synthesis of student perspective	Example/specific comments
Reaction to supervisor's role	Multiple expressions of frustration, confusion, lack of clarity.	Most groups did not understand what their supervisor was supposed to contribute to the overall experience and many didn't have the opportunity to discuss it. There was a great deal of speculation about whether the supervisors were prepared or trained.
Relative importance of location	Communicated as key takeaway of several students: location of the project is less important than it originally seemed to be.	During the final convening of the full group in the reflection session one student expressed that a lesson to pass on to the next cohort of students is not to over prioritize location as a key factor for a good experience in rating preferences – rather that common elements such as interaction with stakeholders are the richest part of the experience.
Structure of the course	Multiple comments about need for more structure, framing and protocol.	Students understand the limitations of running such a course but see areas for improving structure such as spreading out deadlines or reconsidering the dispersed timing of various

		trips.
Communication	Multiple comments about need for more clear, detailed and timely communication from course coordinators especially regarding deliverables and expectations.	Students see a need for small changes such as the dissemination of a clear syllabus/course document, clearly defining supervisor roles to the students, or communicating roles to supervisors themselves.
Course past and future	Several questions about larger research findings, some curiosity about past and future implementation.	Several enthusiastic remarks about the potential for future projects and long-term partnership with specific clients, reflective of a positive professional experience overall and recognizing potential of the course framework.
Attention to context in implementing changes	Generally agreed that all needs for improvement have multiple influencing variables and therefore many decisions need to be made on a case-to-case basis. For example:	The supervisor's role will be determined by the dynamic of the team – for example, do individual team members provide leadership function, drive cohesion with client, etc. and how do their collective skills and styles impact the project?
Relative usefulness of reflection	Approximately 10 students clearly expressed their appreciation for opportunities to reflect with their groups on site or during this session. Several others expressed reflection was iterative and continual throughout so a final reflection session was semi-redundant. In general, it was perceived that reflection was more integrated into the process than it would have been without the influence of the embedded researcher. The usefulness is also dependent on style, approach and context of a session.	After the final reflection session several students approached me as the researcher/facilitator and said the session was feasible and had value because I am an external party and am not involved in the implementation of the course or grading, and they were willing to be more open because of this.

*Table E-3 - Quantitative results on perceived competencies gained*

Competency					
Normative	Survey	Disagree	Partially disagree	Partially agree	Agree
Consider ethical and moral claims	Alumni	16,98%	11%	43%	28%
	B21 Pre	0%	0%	40%	60%
	B21 Post	0%	0%	44%	56%
Understand environmental justice, fairness equity	Alumni	8%	17%	45%	30%
	B21 Pre	0%	0%	40%	60%
	B21 Post	0%	0%	56%	44%
Vision, assess and evaluate environmental challenges	Alumni	4%	9%	23%	64%
	B21 Pre	0%	0%	40%	60%
	B21 Post		13%	25%	63%
Interpersonal	Survey	Disagree	Partially disagree	Partially agree	Agree
Motivate positive change in others	Alumni	6%	17%	43%	34%
	B21 Pre	0%	13%	47%	40%
	B21 Post	0%	31%	13%	56%

Pursue collaborative approaches for problem solving	Alumni	11%	30%	58%	0%
	B21 Pre	0%	7%	33%	60%
	B21 Post	0%	0%	31%	69%
Facilitate group processes	Alumni	13%	28%	58%	0%
	B21 Pre	0%	7%	33%	60%
	B21 Post	0%	13%	13%	75%
<b>Strategic</b>	<b>Survey</b>	Disagree	Partially disagree	Partially agree	Agree
Assess available resources	Alumni	8%	32%	60%	0%
	B21 Pre	0%	0%	40%	60%
	B21 Post	0%	13%	25%	63%
Develop strategies or action plans which overcome barriers to reach envisioned outcomes	Alumni	15%	43%	42%	0%
	B21 Pre	0%	7%	33%	60%
	B21 Post	0%	6%	38%	56%
Design and test interventions or transitions	Alumni	9%	34%	38%	19%
	B21 Pre	7%	20%	40%	33%
	B21 Post		25%	63%	13%
<b>Systems</b>	<b>Survey</b>	Disagree	Partially disagree	Partially agree	Agree
Identify different intervention points	Alumni	4%	11%	47%	38%
	B21 Pre	7%	13%	27%	53%
	B21 Post	0%	19%	13%	69%
Analyze conceptually how interventions will play out	Alumni	9%	9%	51%	30%
	B21 Pre	7%	13%	60%	20%
	B21 Post	0%	19%	63%	19%
Account for social, environmental and economic implications of a decision or process	Alumni	2%	19%	36%	43%
	B21 Pre	7%	13%	27%	53%
	B21 Post	0%	13%	38%	50%
<b>Futures</b>	<b>Survey</b>	Disagree	Partially disagree	Partially agree	Agree
Anticipate how sustainability problems might evolve over time	Alumni	8%	19%	42%	32%
	B21 Pre	0%	7%	60%	33%
	B21 post	0%	6%	31%	63%
Understand the future as open and something I have power to influence	Alumni	6%	13%	42%	40%
	B21 pre	7%	20%	33%	30%
	B21 post	6%	6%	44%	44%
Outline basic scenarios of future on different timescales	Alumni	9%	13%	43%	34%
	B21 pre	7%	13%	40%	40%
	B21 post	6%	13%	31%	50%

*Table E-4 Description:* The course objectives, aims, methods and approach are written about in several sources such as academic articles and grey literature, such as the strategic plan of the IIIEE. These sources have examples of how key competency areas are addressed from a course framework perspective.

The following table E-4 shows five different sources and provides text examples which demonstrate the approach, objectives or overall results of the course from the perspective of the IIIEE relative to the five key competency areas. The purpose of this table is to highlight which aspects of the course are related to which competency areas. The table uses a simple stoplight indicator system to indicate that a competency area is clearly, somewhat or not reflected in the text example. Each piece of literature reflects slightly different, but often overlapping aspects of the course. This table does not serve as a comparison of consistency, rather uses the outstanding aspects to analyze how key competencies shows up in the course.

*Table E-4 Self-perception of competencies gained in SED: Survey data*

	Examples from academic articles, grey literature and course literature which reflect key competencies ③ clearly reflects ③ somewhat reflects, it depends ③ no clear reflection	System s	Futures (anticipatory)	Values (normative)	Strategic	Collaborative (interpersonal)
Examples from content	Course learning objectives (revised official syllabus 2014): <b>Does the course syllabus reflect specific key competencies?</b>					
		System s	Futures	Values	Strategic	Collaborative
1	Apply sustainability concepts, tools and strategies in a <b>real-world context</b>	③	③	③	③	③
2	Systematically <b>approach, analyze and intervene</b> in a real-life complex system	③	③	③	③	③
3	Perform a task for a <b>professional client</b>	③	③	③	③	③
4	Show fundamental skills in <b>professional conduct</b> in performing a task for a client	③	③	③	③	③
5	Describe the steps involved in putting together a <b>report for a non-academic audience</b>	③	③	③	③	③
Examples from content	Student report 2015: <b>Is there content which reflects specific key competencies from the students' introduction in the joint report?</b> (written based on previous Institute literature)					
		System s	Futures	Values	Strategic	Collaborative
1	<b>Stakeholder engagement</b>	③	③	③	③	③
2	<b>Systematic approach</b> towards environmental management	③	③	③	③	③
3	How to <b>move forward</b> towards green growth <b>strategies</b>	③	③	③	③	③
4	<b>Taking small steps</b> towards making a big difference	③	③	③	③	③
5	How new innovative business models can aid in <b>the advancement of sustainable</b>	③	③	③	③	③

	<b>solutions</b>					
Examples from content	<b>Report 2016: Is there content which reflects specific areas of key competency from the students' introduction in the joint report?</b> (written based on previous Institute literature)					
		<b>System s</b>	<b>Futures</b>	<b>Values</b>	<b>Strategic</b>	<b>Collabo rative</b>
1	<b>Practical application</b> linking student groups with <b>professional organizations</b> for analysis and solution creation (collective).	③	③	③	③	③
2	Explore complex systems with different socioeconomic and cultural considerations (collective).	③	③	③	③	③
3	Environmental degradation has been a topic of discussion for decades, 2015 COP negotiations: more definitive goals and processes to drive action.	③	③	③	③	③
4	SED tasks students and global collaborators to identify opportunities for action.	③	③	③	③	③
Examples from content	<b>Heiskanen et al. 2015: Is there content in the description of the case study which reflects specific areas of key competency?</b>					
		<b>System s</b>	<b>Futures</b>	<b>Values</b>	<b>Strategic</b>	<b>Collabo rative</b>
1	Prepare students for <b>professional challenges (sustainability-focused)</b>	③	③	③	③	③
2	<b>Crossing disciplines</b>	③	③	③	③	③
3	<b>Find, translate and combine info while in the field</b>	③	③	③	③	③
4	Build up <b>confidence and leadership</b>	③	③	③	③	③
5	Experience in <b>accessing necessary knowledge</b> for problem-solving quickly and decisively	③	③	③	③	③
6	<b>Develop a sense of agency</b> through the experience of being capable to accomplish change	③	③	③	③	③
Examples from content	<b>Strategic Plan 2014-2018: Is there content which reflects specific areas of key competency?</b>					
		<b>System s</b>	<b>Futures</b>	<b>Values</b>	<b>Strategic</b>	<b>Collabo rative</b>
1	Strategic area I: <u>High quality innovative education</u> : equip students with knowledge, skills and personal qualities needed to become agents of change and future leaders advancing strategies for sustainable solutions	③	③	③	③	③
2	Strategic area II: <u>Excellence and renewal in interdisciplinary research</u> : advance knowledge on how strategies in business and public authorities could be designed and applied to support the	③	③	③	③	③

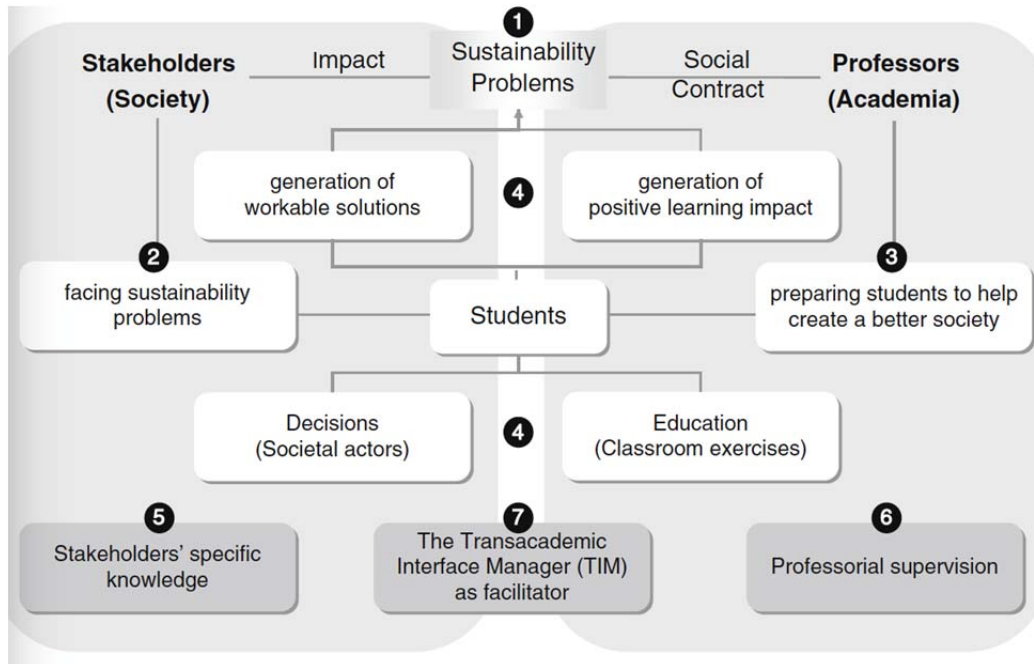


*Building solutions for place-based sustainability challenges: student learning and stakeholder engagement*

	implementation of sustainable solutions					
3	Strategic area III: <u>Effective communication and strong partnerships</u> : aims to effectively communicate its academic identity and make its research findings and educational achievements visible nationally and internationally	③	③	③	③	③

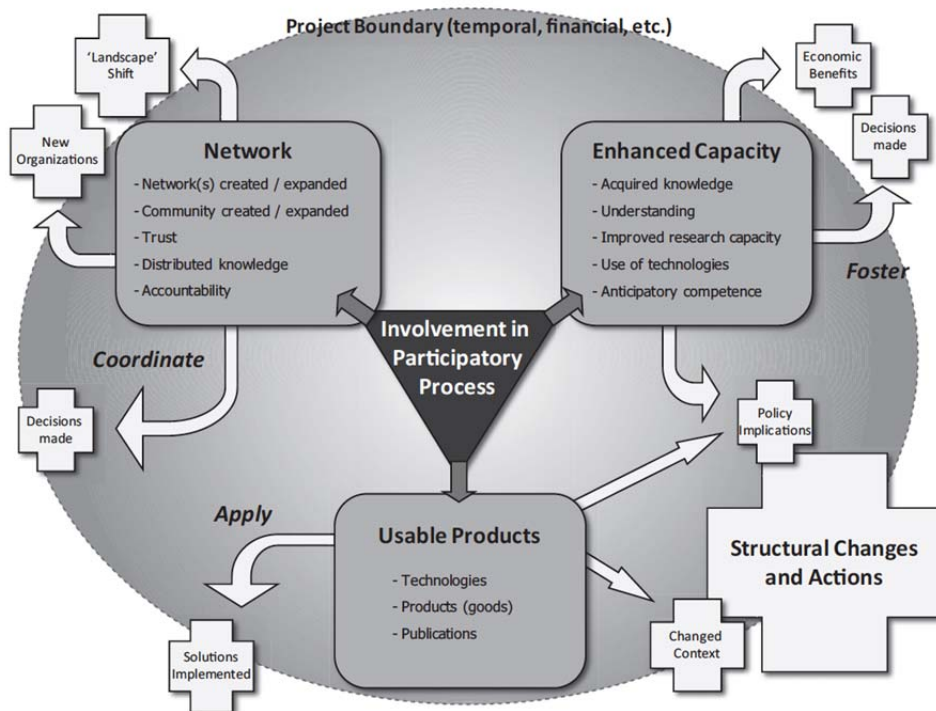
## Appendix F – Conceptual Framework Diagrams

Figure 0-1 Framework of requirements for sustainability research education as derived from literature



Source: (Brundiers & Wiek, 2011)

Figure 0-2 Framework of effect categories for solution-oriented participatory sustainability research, linking all process to products, capacity, network effects, and structural changes/ actions



Source: (Wiek et al., 2014)

## **Appendix G – Evaluative Framework Tool**

This evaluative framework is proposed as basic draft to use as a tool to evaluate an SED project (past, present or future). It can serve to use as a brainstorming tool for supervisors planning a project or a list to review the strengths and weaknesses. This framework is not comprehensive but intended as an initial outline to propose a framework tool. Such a tool could be organized into a more user-friendly format and become more interactive.

- **How was the project identified?**
  - Through existing collaborative research projects
    - Potential for hosting students for thesis
    - Integrating research goals to benefit the research platform
  - Through alumni working in a profession
    - Came about through alumni initiative
    - Came about through outreach or call put out by IIIIEE
    - Follow up from previous project collaboration
  - Through a current student
    - Fulfills an area of interest for student(s)
    - Empowerment and responsibility
    - Does it help or hinder process?
    - Potential thesis topic
    - Students' linking to previous professional work
  - A client with no current affiliation (approached or approaches)
    - Cold calling
    - Distant contact through network
    - Previous SED stakeholder (client or secondary)
    - Follow up to call for action
    - Seeking specific topics or opportunities
- **Topic and task**
  - Is the topic an actual sustainability challenge?
    - Does it fulfil criteria for sustainability challenges?
  - Is it local, global or regional?
  - Is it well-defined or broad and flexible?
  - Can students clearly relate to the challenge as sustainability specific?
  - Does it relate to the students' previous education?
  - Will it provide experience which is relevant and of interest to students?
  - Will it provide experience which is relevant and of interest to staff?
  - Will clients benefit from academic collaboration?
- **Framing the course**
  - Managing student expectations
    - Do the coordinator and supervisors actively manage students' expectations?
  - Introducing the projects
    - Are they well-described, and does the description accurately portray the project?
  - Is the task introduced, or will students later define it?
    - Is this clear to the students?
  - What steps have been achieved so far in each project?
  - What role does the supervisor intend to play?
    - What background does the supervisor have in the topic?

- Are the client's expectations known and explained to students?
- What individual skills sets are needed for each project, and are they communicated to the students?
  - Language
  - Leadership
  - Professional
  - Engineering, math, science etc.
- How is the information communicated to the students?
  - Do they receive written material?
  - Do the appropriate people present information?
  - Do the students have time to process the information before making decisions?
  - Do the students have enough information to make decisions?
  - Are methods used by staff transparently communicated?
- Timing
  - Has the introduction session been given at the appropriate time?
  - Has the project(s) been sufficiently developed?
  - Was the supervisor available to present to the students about the project?
- Course learning objective
  - Are students aware of where to reference them throughout the course?
  - Were they formally introduced and explained?
  - Do the students understand and relate to them?
  - Are they up to date and representative of course activities?
- Enable students' capacity to understand roles and responsibilities
  - Are the roles and responsibilities clearly defined?
    - Who is defining them and communicating them?
  - Do the students have tools to navigate group work and the establishment of roles?
  - Has the supervisor communicated with the students directly about their roles within their specific context?
- Who is responsible for identifying stakeholders and arranging meetings?
  - Are all stakeholder groups aware and agreed about this responsibility?
  - If it's a shared responsibility, is there cross-support between groups?
  - How much time does it take the responsible party, and does the time taken detract from more important objectives?
- Creating student teams
  - Is there a facilitator to oversee the process?
  - Does the facilitator know the students' strengths and weaknesses?
  - What assistance does the facilitator need in the process?
  - Do supervisors have an influence on the composition of their group?
  - Is there a robust and transparent methodology for team composition?
  - What informs the decision, what criteria are in place?
    - Student preference
    - Creating a good team dynamic
    - Students skills matching the client's needs
    - Diversity within a team
    - Mixing up friends or cliques
    - Relevance to students' previous experience or skills sets

- Supervisor preference
    - Thesis potential
    - Class rank or status
    - Personal e.g. health, visa stats
  - How is the allocation and decision-making communicated?
    - Are the students notified in an appropriate and timely way?
    - What appeal process is in place?
    - Do the students know who to approach with questions and concerns?
  - What importance does the course coordinator and course place on team dynamic?
  - Are there tools and training introduced to students to manage teams and team issues?
- **Management of trip setup and logistics**
    - Setting the dates of the trip
      - Is on-site time limited by supervisor availability?
        - Is the supervisor restricted by certain dates?
        - How present can the supervisor be on site?
      - Is the on-site work time limited by the days of the weeks e.g. weekdays, weekends?
        - Will there be free time before, during or after the work time?
      - Do the students have enough time to fulfill all research needs?
        - Scheduling meetings
        - Conducting interviews
        - Processing data
        - Reporting to client on-site
        - Writing the report for joint publication
        - Collating the class public report
        - Submitting a client-specific report
        - Additional tasks e.g. video
    - Arranging accommodation and travel – who is responsible?
      - Supervisor: is this context appropriate for them?
      - Client: do they have more access, knowledge, local context?
      - Student: Are they capable, aware, or interested?
    - Environmental impact
      - Are there sustainable travel options?
        - Supporting local businesses and economy
        - Trains not planes, bikes not busses
        - Organic, local, fair-trade food options
      - Are the students willing to offset carbon emissions?
        - Fundraising
        - Self-payment
        - IIEEE funding
      - Who takes responsibility for checking options?
    - Handling student logistics
      - Who deals with the booking flights etc.?
      - Who deals with unexpected changes?
      - How are the needs organized and addressed?
      - Do the students have power to take action?

- **Managing collaborative relationships**
  - Interface manager
    - Is someone aware and responsible for interfacing between students, staff, clients, etc.?
  - Secondary stakeholders
    - Is there follow up and appropriate interaction with stakeholders who are not the primary client?
  - Local students
    - Is there an opportunity to partner with local students or professors?
      - How is the interaction framed and structured?
      - What expectations do students have?
      - What role will the local students take?
        - Knowledge exchange
        - Translation
        - Networking
        - Local knowledge
  - Follow up
    - Is there someone responsible for follow up with the client?
      - Staff – future collaboration
      - Students
    - Does the client have more needs in addressing the problem?
    - Will they utilize student ideas?
    - How can impact be tracked?
    - How can follow up solidify partnerships
  - Nature of the relationship
    - Is the project a one-off collaboration?
      - Should it remain as one time or be more?
    - Is the project a potential repeating client?
      - How long?
      - Will tasks be related?
      - Is it part of IIIIEE research year round?
    - Is the project with a well-established partner?
  - Future collaboration
    - Is there potential for students to do their thesis with the client?
    - Will future SED trips occur?
    - Is there employment potential?