

Managing transitions - integration of higher educational institutions in sustainability education in Norway



Universitetet
i Stavanger

Department of Media and Social Science

Master in Energy, Environment & Society

MEEMAS thesis, spring 2023

Written by: Birgitte Ås, cand.nr 257778

Supervisor UiS: Dr. Rer. Pol. Thomas Michael Sattich

Abstract

Context.

This thesis audits the development of sustainability competencies in higher educational institutions (HEIs) within sustainability education. It examines how HEIs effectively cultivate competencies aligned with sustainability goals, by analyzing educational policies defining HEIs' boundaries, and exploring students' and alumni experiences as sustainability managers.

The study illuminates the complex relationship between institutional initiatives, curriculum development, and competency attainment. It examines both accomplishments and obstacles, exploring how effectively higher education institutions promote a sustainable future.

Study objective and research questions.

The research objective is to investigate how transition managers should be educated, thus presenting three research questions: (i) Are today's educational policies suited to support the sustainability transition through the development of competencies and skills?; (ii) How are competencies and skills developed in today's sustainability education?; and (iii) What needs to be improved in order to make higher education a better vehicle for fostering the transition?

Methodology.

Based on case studies from Norway, the research uses a comprehensive approach that combines content document analysis, descriptive statistics surveys, and in-depth interviews. The methods utilized complement each other to gain multiple perspectives and enhance the study's validity.

Key Findings.

1. Policy documents lack explicit sustainable competency definitions, resulting in vaguely described initiatives for future development. There is a consensus gap regarding a framework describing future competence needs, hindering action as institutions and businesses lack clarity on the next steps.
2. Students generally agree on the extent to which they were taught sustainable competencies but differ in their understanding of practical application. "Happy" students grasp the 'how' and exhibit 'action competency,' while 'unhappy' students do

not. This points to an institutional shortfall due to inadequate integration of sustainability competencies and insufficient real-world learning opportunities.

Implications and contributions.

This research enhances the discourse on sustainability education by comprehensively understanding its impact within the Norwegian context. Bridging the gap between theoretical aspirations and practical outcomes, the study contributes to educational policy, theory integration and practice, promoting a more robust approach to sustainability education.

Conclusion.

The study concludes that for HEIs to become better vehicles for fostering the sustainable transition, several areas must improve:

1. Accelerating the transition requires involving small-scale actors, such as HEIs, rather than relying solely on a top-down approach. Incorporating HEIs empowers education to create sustainability managers at the ground level, necessitating their increased role in educational policy formation.
2. Agreement on a detailed framework describing sustainable competencies and skills is essential for effective development, as the current lack of consensus impedes progress.
3. To fully realize the potential of sustainable competencies, real-life learning opportunities must be incorporated into sustainable education, going beyond theoretical knowledge.

Keywords: Education for sustainable development - Higher Educational Institutions (HEIs) - Key competencies - Sustainability Management - Transition agenda - Responsibility - Sustainability problem solving

Table of contents

Abstract	1
Acknowledgements	3
Table of contents	4
List of figures	6
List of tables	7
Section 1 - Introduction: Demand for Progress	8
Section 2 - Background: Higher education as a pathway to sustainability	14
2.1 Education in the UN SDG agenda.....	14
2.2 Higher Educational Institutions (HEIs) and sustainability.....	17
2.3 Putting words into practice: skills and competence development through education..	18
Section 3 - Problem statement and research questions	21
Section 4 - Research approach and methodology	23
4.1 Rationale and research aim.....	23
4.2 Data gathering methods.....	24
4.2.1 <i>Document Content analysis</i>	24
4.2.2 <i>Survey</i>	26
4.2.3 <i>Interviews</i>	27
4.3 Strengths and limitations.....	28
4.3.1 <i>Sampling bias and representativeness</i>	29
Section 5 - Theoretical concepts and frameworks	31
5.1 The big picture: theories on sustainability transitions.....	31
5.1.1 <i>Market dynamics versus policy driven innovation</i>	32
5.1.2 <i>The Multi-Level Perspective (MLP)</i>	34
5.1.3 <i>Transition management</i>	37
5.2 Sustainability on the micro-level.....	39
5.2.1 <i>Implementation of sustainability on corporate level</i>	40
5.3 <i>Competence framework for teaching sustainability</i>	42
Section 6 - Literature review: education for sustainable development	46
6.1 Educational policy: who creates who?.....	46
6.2 The responsible university.....	48
6.3 “GreenComp” - why we need sustainability competencies.....	50
Section 7 - Case study on sustainability education in Norway	55
7.1 Case study approach.....	56
7.1.1 <i>The case of Norway - the Government’s Green Industrial Initiative</i>	57
7.1.2 <i>The case of MEES - Master program in Energy, Environment & Society, University of Stavanger (UiS), Norway</i>	59
Section 8 - Results and findings	60
8.1 Political logic of Norway.....	60
8.1.1 <i>Competencies</i>	60

8.1.2	<i>Future skills needs</i>	62
8.1.3	<i>Training and continuing education</i>	63
8.1.4	<i>Competence development and future competence needs</i>	64
8.1.5	<i>Responsibility</i>	66
8.2	Creating an overview: summary value and variances of MEES students and alumni.	67
8.2.1	<i>Alumni</i>	67
8.2.2	<i>Enrolled students</i>	71
8.3	Going deeper: in-depth interviews and open-ended survey questions.....	74
8.3.1	<i>How 'unhappy' students and alumni relate to MEES</i>	74
8.3.2	<i>How 'happy' students and alumni relate to MEES</i>	76
Section 9	- Discussion and analysis	77
9.1	Are today's educational policies supporting the sustainability transition through the development of competencies and skills?.....	77
9.1.1	<i>Does interventionist logic exist?</i>	77
9.1.2	<i>Is the idea to produce people who actively create change?</i>	80
9.1.3	<i>Integration of Higher Education Institutions</i>	81
9.1.4	<i>What competencies are suggested for higher education?</i>	83
9.2	How are competencies and skills developed in today's sustainability education?.....	85
9.2.1	<i>What are competencies and skills?</i>	85
9.2.2	<i>What are students supposed to develop?</i>	86
9.2.3	<i>Did students of the MEES program acquire competencies relevant for implementing sustainability?</i>	88
9.2.3	<i>Are the competencies actively being used in alumni's work?</i>	95
9.3	What needs to be improved in order to make higher education a better vehicle for fostering the transition?.....	96
9.3.1	<i>The cap on interventionist logic</i>	97
9.3.2	<i>Better incorporation of educational policy</i>	98
9.3.3	<i>Do we have a competence framework?</i>	99
9.3.4	<i>Teaching key sustainable competencies and skills</i>	100
Section 10	- Piecing the puzzle	102
10.1	Educational policies.....	102
10.2	Sustainable education in practice.....	103
Section 11	- Conclusion	104
Literature	108

List of figures

Figure 1. *How SDG Transformations contribute to the achievement of the SDGs.*

Figure 2. *Sampling bias.*

Figure 3. *Multi-Level Perspective on transitions.*

Figure 4. *Framework conditions and activities influencing the implementation of integrated strategy.*

Figure 5. *Key competencies in a problem-solving framework. By Wiek et al. (2011)*

Figure 6. *The Integrated Problem Solving Competency Framework. By Brundiens et al. 2020.*

Figure 7. *GreenComp areas, competences, and descriptors.*

Figure 8. *Real-world learning opportunities.*

List of tables

Table 1. *“To what degree do you feel like the MEES program taught you the competencies described above”*

Table 2. *“How did you learn this?”*

Table 3. *“Which of these competencies do you wish were more focused on in the program?”*

Table 4. *“Which of these competencies did you learn outside of MEES and to what extent?”*

Table 5. *“Do you actively use the competencies you learned in MEES in your (daily) work?”*

Table 6. *“To what degree do you feel like the MEES program taught you the competencies described above?”*

Table 7. *“Which of these competencies do you wish were more focused on in the program?”*

Table 8. *“Have you learned any of the competencies outside of MEES and to what extent?”*

Table 9. *“If not learned, do you feel like the key competencies would be relevant for your work in the future?”*

Section 1 - Introduction: Demand for Progress

Achieving sustainability is an important societal issue. How is this engagement taking place across the world? Right now, there is no progress. On the contrary, we are going backwards.

The SDG progress report of 2022 shows that years or even decades of development progress have been halted or reversed. This regression is not only putting the “very viability of achieving the Sustainable Development Goals by 2030 at great risk”, but the confluence of the crisis “threatens our very own survival” (UN General Secretary, 2022, p. 3; see also UN, 2022, p. 1). We need to get the world on track to sustainability. The severe challenges we are up against demand "changes on a scale not yet seen in human history" (UN, 2022, p. 3).

Achieving sustainability is crucial. However, how to achieve sustainability is uncertain among experts, policy makers, practitioners and so forth. The UN argues The Sustainable Development Goals can act as a roadmap out of crisis. To make them work requires urgent action on a global scale, before the window to avert closes (UN, 2022). This entails adopting low-carbon, resilient and inclusive development pathways which will reduce carbon emissions, conserving natural resources, transforming the food systems, creating better jobs and advance the transition to a greener, more inclusive and just economy (UN General Secretary, 2022, p. 3).

To a large extent, this means to change the economy and our industrial methods. Transitioning to a climate-neutral and circular economy requires a radical altering from what we have today. This shift will lead to strengthened competitiveness and resilience, but to be able to grab these benefits, we must take action. If not, the world may experience declining growth, investments and income due to lack of capacity and opportunity to keep pace with innovation (OECD, 2019).

The SDG report of 2022 portrays a somewhat gloomy world outlook. The 2030 Agenda for Sustainable Development is in grave jeopardy due to cascading and interlinked global crises and conflicts. This is predominantly due to destructive impacts of the COVID-19 pandemic - now in its fourth year - , the war in Ukraine exacerbating the food, energy, humanitarian and refugee crisis, while a full-fledged climate emergency continues to paint the backdrop (UN, 2022; see also UN General Secretary, 2022).

Still, efforts have been made. For decades now, the international society has become increasingly connected through supranational agreements and treaties in order to create a global effort to advance sustainability. In 2015, the United Nations Member states approved the 2030 Agenda for Sustainable Development and adopted 17 Sustainable Development Goals (SDGs). The Agenda is considered to be the first of its kind, as world leaders pledge common action and a collective path across a broad and universal policy agenda. The global action plan promotes sustainable development across five areas: people, planet, prosperity, peace and partnership (UN, 2015).

It is clear there is high demand for progress. However, it is not clear how to achieve said progress. According to the literature, different possibilities to speed up the sustainability transition exist.

To provide a broad overview, we can divide the two major perspectives into state driven logic versus market driven logic. The state-driven logic emphasizes the role of governments and policy interventions in promoting sustainable development. It recognizes the need for coordinated efforts, commitment, and inclusion of multiple actors at different levels and domains to achieve sustainability goals (Frantzeskaki et al., 2012). This perspective acknowledges that transitions involve societal processes of fundamental change, encompassing not only technological shifts but also changes in structures, cultures, and practices of societal systems (Frantzeskaki et al., 2012). It recognizes that societal cohesion and equity should be considered alongside sustainability objectives.

On the other hand, market-driven logic emphasizes the role of market forces and economic incentives in driving sustainability transitions. This perspective considers the causes and drivers of innovation from a neo-classical and neo-Schumpeterian perspective (Kuzemko, Keating & Goldthau, 2016). It explores different understandings of innovation as exogenous or endogenous, disruptive or sequential, and as a process or product (Kuzemko et al., 2016). The market-driven logic recognizes the importance of radical new innovations and the role of actors outside the incumbent regime in bringing about transitions (Geels & Kemp, 2007).

To deal with these grand challenges, it is insufficient to focus strictly on supply-side (market-driven) innovation policies. For example, according to the OECD, it is needed to address demand side characteristics like "consumption patterns, firm strategies, new business

models and regulatory aspects" as well as improving governance and co-ordination between levels of government and various policy domains (OECD, 2019, p. 14). In line with this perspective, it has been made clear by several scholars that policy is an important means of driving change. Sovacool (2016) still argues transitions are caused by market innovation, but agree that it can happen quicker if they are managed or incentivized. The question thus becomes how policies are being put to use, if at all.

The way forward needs to be managed. Meadowcroft emphasizes that sustainable development is primarily a political project, necessitating state intervention and governance reform (Meadowcroft, 2011; Bromley, 2016; Kern & Rogge 2016; Kohler et. al. 2019). This can be done through politically engineered development trajectories. A managed transition will also ensure a smooth and just transition, where the world can work towards medium- and long-term goals (OECD, 2019, p. 113). This follows the argument that politics is fundamental to sustainability transitions. Hence, the state's involvement is crucial in shaping these transitions through policy interventions, governance reform, and support for innovation and niche development.

Transition management is largely studied on the national and political level. This leaves out the lower levels (i.e. firm or individual levels) where sustainability needs to be implemented in the end. The state has various tools to facilitate the transition, albeit some are more thoroughly studied than others. Although using education as a tool for transition is not a new concept, it remains underexplored in the transition literature, albeit being connected to transition management.

There are some government efforts, but they appear to lack specificity, perhaps because the intention is to allow the market to function freely (by creating opportunities, relying on its own dynamics, etc.). One example of government efforts is Kompetansebehovsutvalget (KBU) (Eng: Committee of Competence Needs) which was appointed by the government in June 2021. KBU stresses there is little empirical research on what a transition to a low-emission society will mean for the industry's needs for competencies. While the "economic" logic suggests leaving the search for sustainability to individual companies, there is also an overlap between what companies do as well as how they operate on a daily basis, and government activities. In other words, the daily operations of companies are influenced by state measures.

A middle ground is measures which the state uses to influence daily operations of companies, for example through industrial policy. The state interferes with the daily operations of companies in various ways, directly and indirectly. Generally speaking, state policy generally carries the idea of a market economy, and thus is soft when it comes to direct engagement in the economy. However, there are examples, where the state defines to some extent what companies do and how they operate. Educational policy is an example in that regard. In this case, it is by supplying people with skills/competencies/knowledge which they will use later-on in their working life. Thus, education is one example of the state determining the functioning of the economy.

This raises the question whether there is untapped potential for the state to drive the sustainability transition through education. From the side of companies, more focused engagement by the state in this area might be a win. If companies do not step up in the shift towards a climate-friendly development, they risk being outcompeted. Companies that succeed will gain advantages in the global low-carbon economy. Also, with measures to speed up the transition, there is potential for new jobs that can lead to economic growth. However, these new jobs may require new skills and may also require higher educational requirements. This points to the critical challenge of upgrading skills and supplying the right kind of training for future skills needs (OECD, 2019).

Against this background, more engagement by the state could be seen as engineering a managed middle ground between more direct involvement in the economy and a logic where the market economy is assumed to deliver the transition through demand and supply. The challenge for policymakers then lies in answering the question of how to use education for advancing sustainability. In that regard, the question of competencies for sustainability has been addressed in various policy documents at the national and international level. The idea is to strengthen “appropriate competencies and resources for innovation at the firm level, to encourage local actors to engage with innovation processes and to ensure broad networks, strong interaction and knowledge exchange between actors across different policy domains” (OECD, 2019, p. 22-23).

A specific kind of job that is being discussed in this context is ‘sustainability managers’ at the company level. These positions emerged with the recent leap in demand for sustainable development. However, the required competencies and skills of this kind of position are yet to be defined. We do not yet know what competencies are needed to fulfill

these positions. Since it's not clear what 'sustainability managers' entail, it poses a challenge for the state to 'create' these positions. By defining these through requirements and guidance for higher education institutions, the state might get leverage on the economy, and hence the transition towards sustainability.

The creation of these competencies need to be understood as an interdisciplinary challenge. Competence frameworks do exist, but little in terms of case studies: what competencies are needed in specific economic contexts. Additionally, institutional differences and other varying perspectives bring the question of competence into more debate and not so much to conclusion. These issues need to be looked into in order to find suitable ways to educate people for achieving sustainability.

This further indicates that education potentially is an important piece of the sustainability puzzle. The intention of this paper is to study this in more detail.

Thus, this thesis will study the field of education and sustainability in the case of Norway. For Norway, achieving the climate goals will involve a "comprehensive restructuring" of the national economy, yet the "next ten years will be decisive for our ability to succeed in the following fifty" (Ministry of Trade, Industry & Finance, 2022, p. 21). Here, general framework conditions are crucial for the efficiency and speed of adaptation, such as access to suitable sites, infrastructure, knowledge, technology, markets, and basic input factors like renewable energy, raw materials, capital, and labor (MTIF, 2022, p. 25).

To study this in more detail, this thesis looks into how competencies and skills are developed at Norwegian higher education institutions. I take the case of the MEES programme - the Master in Energy, Environment and Society at University of Stavanger, Norway. The case is chosen because MEES is an example of a program that aims at producing transition managers by equipping students with the competencies and skills needed to accomplish a green transition (UiS, 2023). Through "learning for sustainability", students are expected to be able to "actively work with sustainable development and the energy transition" after completing the master's (UiS, 2023). The program website lists learning outcomes, general competencies, and special knowledge and skills the students are expected to learn. It is the knowledge and skills considered distinctive to sustainability education that make this a suitable case, because they can tell how such skills and competencies are developed in students.

The aim of this thesis is to explore the relationship between education and sustainability in the context of Norway, focusing specifically on the Master in Energy, Environment and Society (MEES) program at the University of Stavanger. The thesis seeks to investigate how competencies and skills for sustainability are developed through this program and examine the role of higher education institutions in preparing students for the green transition.

Given the pressing need for comprehensive restructuring and achieving climate goals in Norway, understanding the connection between education, competencies, and sustainability becomes crucial. The thesis aims to analyze the MEES program as an example of an educational initiative that aims to produce transition managers equipped with the necessary knowledge and skills for driving the green transition. The study will shed light on the characteristics of sustainability education and how these competencies are fostered in students by examining whether today's education policies are adequate to support the sustainability transition through the development of competencies and skills, and how competencies and skills are developed in today's education. In addition, the study will highlight how higher education can become a better vehicle for promoting the sustainability transition.

To achieve this, the text is divided into ten main sections. To provide some background to this topic, section 2 goes into how literature describes higher education as a pathway to sustainability. Section 3 presents the problem statement. Section 4 explains the research approach and methodology. Section 5 presents the theoretical concepts and frameworks in which the discussion will be based upon. Section 6 provides a comprehensive literature review over education as sustainable development. Section 7 explains the case study of Norway and MEES in greater detail. Section 8 presents the results and findings. Section 9 holds a discussion and analysis of the research questions. Section 10 pieces together the main arguments in this text. Lastly, a conclusion follows in section 11.

Section 2 - Background: Higher education as a pathway to sustainability

Education has been discussed in literature and policy documents on sustainability.

Universities are recognized as drivers of regional transitions, bringing new knowledge to local innovation ecosystems. The potential of higher education as a vehicle of sustainability is strong. Education is a fundamental modular building-block for achieving the Sustainable Development Goals (SDGs), promoting economic growth, poverty elimination, and reducing inequalities. The expansion and transformation of higher education, along with innovations, research, and public-private financing mechanisms, play pivotal roles in driving economic growth and facilitating the adoption of sustainable practices. In this section, we will dive into the need for discussing ways of educating people.

2.1 Education in the UN SDG agenda

Even though the world has undergone three industrial revolutions and thus major changes in regional economies, transitioning successfully is difficult. Workers may experience their knowledge and skills become outdated, as the nature of jobs change. Regions have previously struggled to upgrade the skills and modernize their workforce. Such upgrades are necessary so that regions in industrial transitions are prepared for the future of work. Hence, the same upgrades can be opportunities or threats to workers. If the state is proactive and uses the educational system as a tool, then workers will be granted opportunities rather than experience a threat. For that reason, it is imperative to look deeper into this dynamic.

Universities are highlighted as major drivers, *if* their potential is being well used. Universities are stressed as “knowledge generators” that support the regional transition by bringing new knowledge and networks to the local innovation ecosystems. This can actively support the transition from old to modern. However, if research institutions are not sufficiently strong regional innovators themselves, they might be too slow to respond to current trends (OECD, 2019). Therefore, it is necessary to manage the link between academia and business so that teaching activities are adapted to the requirements in the changing labor market. The notion of education as a fruitful way to implement change, aligns with one of the six “transformations” that Sachs and colleagues stress are needed to implement the 17 SDGs.

Jeffrey Sachs is included in this thesis because of his renowned expertise as he is often referred to as the grandfather of sustainability. Sachs and colleagues point to education as one in six "modular building-blocks" that all serve as pathways of SDG achievement. The transformational pathways consist of (1) education, gender and inequality; (2) health, well-being and demography; (3) energy decarbonization and sustainable industry; (4) sustainable food, land, water and oceans; (5) sustainable cities and communities; and (6) digital revolution for sustainable development (Sachs et al., 2019, p. 805).

Education is stressed as a contributor to the achievement of the SDGs because it "builds human capital, which in turn promotes economic growth, the elimination of extreme poverty, decent work, and overcoming gender and other inequalities" (Sachs et al., 2019, p. 806). To dive deeper, different sets of interventions to promote education and gender equality to lower inequalities are presented. It is argued the foundational years of primary and secondary school education are the backbone of education, and thus serves an integral part in ensuring quality education. What is more of interest to this text is the expressed need for expanding and transforming higher education (HE). Sachs and colleagues stress HE as "underdeveloped in most countries". Therefore, they point to the need for innovation and to ensure R&D in order to promote economic growth seeing as "the adoption of new technologies can be accelerated through tertiary education; national science funding mechanisms and science advisory bodies; innovation hubs; and the promotion of entrepreneurship through public-private financing mechanisms and incubators" (Sachs et al., 2019, p. 806).

To stress the relationship between education, innovation and SDGs even further, the authors describe the strength between each SDG and the transformation pathway on a four-point scale where "'3' directly targets the SDG; '2' reinforces the SDG; '1' enables the SDG; and '0' has no interaction with the SDG" (Sachs et al., 2019, p. 805):

Transformation	Principal line ministries involved in Transformations	SDG interventions	Intermediate outputs	Relationship with specific SDGs																	
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
1	Education Science and technology Family and social affairs	Early childhood development	Education and human capital	2	1	2	3	3	1	1	2	2	2	1	1	1	1	1	1	1	
		Primary and secondary education																			
		Vocational training and higher education																			
		Social protection system and labour standards	Decent work and income support to vulnerable groups	3	3	2	1	2	1	2	3	1	3	1	1	2	2	2	1	0	
		Research and development	Innovation	1	2	1	1	1	1	2	2	3	1	1	2	2	1	1	1	2	

Figure 1. *How SDG Transformations contribute to the achievement of the SDGs.* (Sachs et al., 2019, p. 807).

Furthermore, Sachs and colleagues highlight the link between education and transition. Like the rest of the transformations, Transformation 1 on education requires "integrated design and implementation of interventions through close coordination between ministries of education, science and technology, and social affairs, or their equivalents" (Sachs et al., 2019, p. 806). The six transformations are described to require "deep, deliberate, long-term structural changes in resource use, infrastructure, institutions, technologies and social relations that must be undertaken in a short period of time" (Sachs et al, p. 811).

We do not have one quick solution to making education a better vehicle of sustainability. Due to this, Sachs and colleagues present a list of points that should be in place to ensure a good direction and design:

1. "First, they must meet the standards of technical feasibility;
2. Second, the Transformations need to address and resolve tradeoffs;
3. Third, they will be financed through a combination of public and private financing;
4. Fourth, they need to accelerate development and deployment of new technologies;
5. Fifth, policy coherence is needed across branches of government (horizontal), between levels of government (vertical) and through time (temporal) to manage trade-offs and ensure timely implementation;
6. Sixth, business can provide co-financing and drive many of the organizational and technological changes required, so each Transformation must engage the business community through a coherent set of policies, market incentives and regulations;

7. Finally, the transformations require civil-society engagement and public debates about sustainable development pathways.” (Sachs et al., 2019, p. 811).

To actively support the transition from old to modern ways, HEIs must become better knowledge generators to support the regional challenges. To a large extent, this concerns bridging academia and business stronger together, so that teaching activities and labor market needs form a better match. In simple terms, supply must meet the demand.

We now know this can be achieved in various ways. We need HEIs to become better knowledge generators and support the regional transition. How can HEIs potential be well used? And what should education actually provide people with?

2.2 Higher Educational Institutions (HEIs) and sustainability

Higher education institutions have a place in driving the sustainability transition. In particular, this concerns learning the specific skills and competencies for implementing sustainability. It is clear that even small-scale actors can help achieve the SDGs and drive large-scale change. To further explain how HEIs assist in this implementation, this subsection looks into two different aspects. There are different sides to how universities can educate people: classroom activities and more practical approaches.

In class activities and literature, there is a new and growing focus on implementing sustainability as a natural part in universities. This has resulted in development of new courses and modules where the SDGs are incorporated in the curriculum itself, or revision of existing curricula to incorporate SDGs to a larger extent. Through universities' contribution to research and teaching, these institutions play a vital role in driving the transition (Filho et al., 2022, p. 1-2; see also Miller et al., 2014; Smith et al., 2018). Additionally, HEIs collaborate across units, meaning opportunities for action are shared, including teaching tools and greater access to research grants to fund SDG-related programmes. Universities also create ‘outreach’ among local communities, businesses and NGOs are webbed in increasing engagement and collaboration with HEIs. These enrich the training students currently receive on sustainability and connect teaching and research with outreach opportunities (Filho et al., 2022, p. 5-7).

On the more practical side, HEIs can also look for opportunities to collaborate within and outside the university, so that students can further engage in sustainability (Filho et al., 2022; see also Pallant et al., 2020; Weiss et al., 2021). By doing so, "[student's] competencies in the process of problem-solving in their regions and work area are developed" (Filho et al., p. 2; see also Álvarez et al., 2021, Chang & Lien, 2020; Kioupi & Voulvoulis, 2020; Willats et al., 2018).

This will create a regenerative society, seeing as HEIs "promote sustainability on a global scale by influencing ideologies and perspectives regarding environmental problems" through combining transdisciplinary work and addressing several specific challenges (Filho et al., 2022, p. 2; see also Collin, 2009).

While it is argued HEIs are well placed to support SDG implementation, several authors stress there is a need to further research the impact and combined effects of universities promoting sustainable development. Therefore, in the next subsection we go deeper into the issue of skills and competencies through practical learning experiences at higher education institutions.

2.3 Putting words into practice: skills and competence development through education

HEIs play a pivotal role in the grand scheme of things. HEIs are influential platforms for shaping the mindsets, knowledge, and skills of students who will become future leaders, professionals, and change agents. In order to address the challenges associated with developing skills and competencies through education, it is essential to explore how real-world learning opportunities can foster the development of key sustainability competencies. The idea of using education for fostering the transition in that way is not entirely new. Different approaches to putting this into practice have been developed on the policy level.

For example, the OECD emphasizes the importance of better anticipating skills needs and engaging local employers in regional skills development initiatives (OECD, 2019). These recommendations highlight the need for a more integrated approach to skills development that aligns education with the evolving needs of the workforce and ensures that graduates have the necessary skills to contribute to sustainable development. Hence, the concept of

"real-world learning opportunities" has emerged as a crucial approach to bridging the gap between theoretical knowledge and practical application in addressing sustainability problems.

Building key sustainability skills to drive development is easier said than done. One practical example of how education can be used to support the transition to sustainability is through workforce skills initiatives. These efforts aim to equip individuals with the knowledge and skills necessary to effectively address sustainability challenges. While specific examples may vary, let's explore one from Norway.

In Norway, there are several notable initiatives focused on improving the sustainability skills of the workforce. One such initiative is the Norwegian Green Jobs Program (Grønn Kompetanse), which aims to develop the green skills and competencies of workers in various industries. This example will be further investigated in section 8. The program provides training and educational opportunities to promote sustainable practices, energy efficiency and environmental management within companies and organizations.

Through targeted training programs, employees gain knowledge and practical skills related to sustainability, enabling them to contribute to sustainable development in their respective fields. The focus on real-world learning opportunities, such as workshops, internships, and case studies, allows participants to apply their newly acquired knowledge in practical settings, bridging the gap between theory and application.

However, difficulties can arise in teaching relevant sustainability content. One challenge is ensuring that academic staff possess the necessary competencies and expertise to effectively teach these subjects. As a multidisciplinary field, it requires educators to have a comprehensive understanding of environmental, social, and economic dimensions, as well as the ability to integrate them into their teaching. This is especially challenging because sustainability is a relatively new subject. Teachers and professors may never have learned about sustainability in a sufficient manner from their own educational background. This means a vast amount of educators are 'first generation' teachers in their field. Thus, it becomes a question of how one effectively teaches sustainability to others when educators most likely had to learn it by themselves.

Furthermore, the evolving nature of sustainability requires educators to stay updated with the latest developments, best practices, and emerging trends. Competence and

knowledge increasingly grows, which means past experiences and knowledge quickly becomes outdated. Collaboration and knowledge sharing among academic institutions, practitioners, and experts in the field can help overcome these difficulties and ensure the delivery of high-quality sustainability education.

To further understand some of the difficulties of turning theory into practice, it needs to be explored how real-world learning opportunities can build key sustainability competencies in students. In the field of sustainability education, it is crucial for higher education institutions to cultivate students' capabilities in addressing sustainability issues. One effective approach is through the integration of real-world learning opportunities into the curriculum, which enables students to gain hands-on experience and develop practical solutions for complex sustainability challenges. Brundiers (2010) defines these opportunities as experiences that enhance students' understanding of sustainability problems and their proficiency in problem-solving approaches.

By incorporating such initiatives, educational institutions can equip students with the necessary skills and mindset to contribute meaningfully to sustainable development efforts (Brundiers, 2010, p. 312). Real-world learning opportunities can better equip students with the skills and mindset required to contribute meaningfully to sustainable development efforts. These initiatives provide students with the chance to apply their knowledge in a practical setting, enabling them to develop creative solutions and make a tangible impact on sustainability challenges. The integration of such opportunities empowers students to actively engage in the process of addressing sustainability problems, bridging the gap between theory and practice (Brundiers, 2010).

Furthermore, these real-world learning experiences broaden students' perspectives and deepen their understanding of the interconnected nature of sustainability issues. By grappling with real-world problems, students gain a holistic view of the complexities involved, including social, economic, and environmental dimensions. This multidimensional understanding is crucial for developing effective and sustainable solutions (Brundiers, 2010).

Section 3 - Problem statement and research questions

Stating and agreeing on the Sustainable Development Goals does not mean we meet them. There is a worldwide progress decline, which might even result in a set back due to the COVID-19 pandemic, war and recession that sets the stage of today. The world seems stuck. The barriers to progress is not a lack of need for change, or incentives, or political will. Rather, the world expresses high ambitions which aim at massive change. It seems to be an inability to translate ambitious goals into practical action. If we want to get unstuck - to move forward - there are different entry points. One way is a bottom-up approach through changes in education. By focusing on education as a catalyst for change, we can unleash the potential to get unstuck and move closer to the SDGs.

Achieving the SDGs largely hinges on transforming our economy, particularly our industrial methods. In essence, it is a question of changes in the economy. Operating within a market economy that relies on demand and supply dynamics, the question arises: To what extent can we manage this transformation? How can we reshape the market economy to align with the SDGs without compromising the efforts to build and remain a market economy?

Education may be a piece of the puzzle. We know that there will be a need for new competencies emerging from the green shift, as societies and industries increasingly prioritize sustainability. However, an important question remains: Do we currently have individuals with the right competencies and skills to fulfill these roles effectively? While the demand for sustainability expertise grows, there is a realization that traditional educational pathways may not fully equip individuals with the specialized knowledge and practical experience necessary for successful implementation. This realization underscores the need for transition managers who can bridge the gap between sustainable aspirations and tangible outcomes at the firm level. Their blend of practical experience, competencies, and skills allows them to effectively navigate, facilitate and implement sustainability at the firm level. However, the field of transition management is still in its early stages of development.

As of yet, there is not enough experience regarding the optimal pedagogical approaches and conveyance of skills and competencies to students. Additionally, the extent of the 'new' competencies and skills are still undetermined. In turn, this poses a challenge in educating 'transition managers' seeing as what sustainability competencies are and how they

should be taught and learned is still under development. This is suited to halt the transition - do we know what we are doing?

Furthermore, the question arises whether the state could work towards achieving sustainability by providing certain competencies that are suited to break with economic patterns (but without the use of more command-and-control measures). Educating future ‘transition managers’ with the practical experience and the competencies and skills to implement sustainability at the firm level may be the solution. A sustainability manager could play a crucial role in driving change, align strategies, and implement sustainable practices. However, this new line of work is still in its infancy and there is little knowledge and experience on what needs to be taught, and how skills and competencies can be conveyed best to students. The role of educational policy in facilitating the sustainability transition needs clarification.

On the policy level, there are documents that highlight several arenas that require advancement in order to succeed in a sustainable transition and strong incentives to strengthen policies exist. While educational policy may be lower ranking in this sense, many authors and practitioners express the need for boosting educational policy in order to meet this demand. In other words, educational policy is often argued to be of fundamental importance, but not what this actually means. The role of education needs to be clarified.

It is becoming increasingly important to produce people who actively create change because all projections say more people with sustainability competencies are needed. To address these issues, this study aims to explore the education of transition managers as a possible solution to bridge the gap between ambition and action. With this as the backdrop, this text puts forward the research objective:

To investigate how transition managers should be educated.

This objective is divided into more concise research questions, which are the following:

RQ1: Are today's educational policies supporting the sustainability transition through the development of competencies and skills?

- Sub question 1: what is needed to create actual change towards sustainability?

- Sub question 2: what competencies can higher education institutions produce to support the sustainability transition?
- Sub question 3: to what extent does educational policy promote competencies to actively create change?

RQ2: *How are competencies and skills developed in today's sustainability education?*

- Sub question 1: do students of sustainability programmes acquire competencies relevant for implementing sustainability?
- Sub question 2: do alumni of these programmes actively use these competencies in their work?

RQ3: *What needs to be improved in order to make higher education a better vehicle for fostering the transition?*

Section 4 - Research approach and methodology

4.1 Rationale and research aim

The aim of this text is to provide an extension of knowledge and insights to literature on sustainable education. The thesis aims to arrive at a statement of generality, so that it can be used for practical application. Through utilizing a qualitative and quantitative lens to study the case study of sustainable education in Norway, it will be possible to say something about how transition managers should be educated at higher education institutions.

The study draws upon various methods. Specifically, a literature review, and a review of theoretical concepts is being carried out. Moreover, a case study on higher education in Norway is being done. The methods used in this study are employed to compliment each other, so that the study will gain insight from several points of view. This can increase the study's validity.

To answer RQ 1, I will (i) review theoretical frameworks on sustainability education, (ii) conduct a literature review on education for sustainable development, as well as (iii) a content analysis of policy documents on the case of Norway. Theoretical frameworks are brought in to understand what the sustainable transition consists of, as well as understand the

logics behind transition theory. The literature review gives insight to what we already know about the topic, here regarding how educational policy is formed, university responsibility and why we need sustainability competencies.

To answer RQ 2, I will conduct a case study on sustainability education in Norway. I will look at the case of the MEES program - master in Energy, Environment and Society at the University of Stavanger, Norway. Both a survey and in-depth interviews were used to arrive at sufficient representativeness. Respondents' replies were analyzed and discussed against theory on competence frameworks as well as theory on incorporation of small-scale actors in the bigger picture of sustainable development.

To answer RQ 3, I will discuss the results of RQ1 and RQ2. By comparing the interventionalist logic existing in government documents to the case of MEES trying to create active change, I will find out whether higher education is given room to be a vehicle for fostering a sustainable transition. To consider integration of higher educational institutions, a content document analysis in addition to a case study was deemed appropriate. Bringing the two research questions together, I will be able to discuss (i) limits on educational policy in Norway, (ii) how HEIs can be better vehicles for sustainable transitions, (iii) how the sustainability competence framework is integrated in practice, (iv) how this has influenced students learning opportunities, and lastly (v) what needs to be improved so that HEIs become better vehicles for change.

4.2 Data gathering methods

4.2.1 Document Content analysis

There are different routes of doing text analyses. This text uses the study of content, in which Prior identifies as one of four distinct approaches (Jacobsson, 2021, p. 169). A content analysis can be used to produce "a systematic and comprehensive overview of the data set as a whole" and may also incorporate a quantitative element (Wilkinson, 2021, p. 88). This is done through an inspection of the data, searching for recurrent instances or themes, regardless of the type (e.g. word/phrase, labels/discourses, and categories) and whether these are counted. Thus, content analysis is a way to examine data for some kind of "recurrent

instances”, and is a way to systematically identify data sets through a coding system (Wilkinson, 2021, p. 89). Next, the data sets are brought together through a coding system.

The unit of analysis is government reports such as parliamentary announcements and governmental roadmaps. These documents were chosen because they could give insight on the current state of affairs. Following Wilkinson’s description of how one goes about analyzing a content analysis, the several documents served as a basis for developing a coding system, which then was systematically applied across the reports (Wilkinson, 2021).

The coding system applied to these documents found inspiration in ethnographic questions put forward by Hammersley and Atkinson (2007, p. 132-33; in Jacobsson, 2021, p. 170), where both the text itself and the context is of concern (e.g. what is taken for granted and/or omitted, what is recorded and how is it written, who reads the text, for what purpose and with what outcome?). This led to a questionnaire being written - a list of questions to “ask” the papers. The list was then mined down to a handful of codes. After coding the data, an issue arises where qualitative and quantitative researchers are divided: should the codes be quantified via counting instances or would this mean we lose important features in generalization? For the purpose of this text, it is appropriate to mix these two. After all, the quantitative argument is strong: counting instances is “effective in providing a summary or overview of the data set as a whole” (Wilkinson, 2021, p. 89). Yet, to get an understanding of the political status quo, it is important that important features of qualitative data do not become lost. Therefore, the analysis started off combining the two sides, as it provided an opportunity to look at the issue from different multiple angles.

The motivation for choosing a document analysis was to investigate what the policy arena actually looks like, and to be able to say something about the current state of affairs. There is a need for documents saying something about political plans or measurements of policies. Thus, the use of secondary data through document analysis of government reports was deemed appropriate because the papers give information about the political situation surrounding the case. With this issue in mind, the unit of analysis consisted of national and supranational political papers, as they would refer to active political plans and goals.

As mentioned, a questionnaire was written to work as a guide for the questions the documents should give information on. The questionnaire was further mined down to where five codes remained. Since both documents in English and Norwegian were of relevance, extra time was spent when first starting to read a new document, in order to get a sense of the

phrasings and language of the writer and whom the writer wrote to. Due to varying tone and language, the codes required minor changes in order to fit the language in each document. This was never a full change of the meaning of the code, but most often the use of a synonym. To illustrate, 'future jobs' and 'future needs of labour force' refers to the same thing, but uses a different phrasing. The use of synonyms is even more prominent in code 4 about competence development, where English documents would often refer to either 'skill(s) development policy/ies' or 'competence building', and Norwegian documents would refer to 'kompetanseheving', '-bygging' or '-utvikling'.

Following a content analysis of documents where the concern is how a document serves as a 'resource' and what is 'in' the document, the five codes (with fitting alterations) were used in searching for fitting documents. This resulted in six documents which were mined for information through searching for the document's answer to the five codes, considering the definition of the code in question, the context in which this was defined or talked about, what made the code important and why, as well as limitations of this use of the code. Documenting the papers' "replies" to the codes is a fast way of going through large amounts of data in a relatively short amount of time, while still making sure one catches the important meanings of the text. The replies to each code were then compared against one another so that generalization could be made.

4.2.2 Survey

When looking to answer RQ2 "*How are competencies and skills developed in today's sustainability education?*" a survey was chosen for several reasons: to be able to (i) gather primary data, (ii) reach a medium-N, as well as present (iii) descriptive statistics that could indicate how students and alumni feel about the study program. The statistics are not meant to provide generalization for the wider population, but to give an indication and overview.

When closing surveys, nettskjema.no automatically provides a report which quantitatively summarizes the variable. Hence, a large set of data is reduced to a smaller amount of numbers that makes sense (McNabb, 2021, p. 145). To do so, there are four categories of descriptive information that is used to summarize data sets for descriptive statistics: measures of central tendency (location), measures of variability, measures of relative position and measures of correlation (McNabb, 2021). It is important to note that this thesis does not aim to compare data sets through percentiles and standard scores (measure

relative position) or numerically identify relationships between variables (measure of correlation), but rather focuses on location and variability. 'Location' is concerned with similarities within the data set, and looks for the "typical" value of the whole set, so that it can be used as a "summary value" (McNabb, 2021, p. 158). Variability on the other hand, tells about varieties within the data set. This says something about deviation between answers: "larger variances indicate the data is more spread out, whereas smaller variances mean the values are more concentrated around the mean" (McNabb, 2021, p.158).

The total population relevant to the study is unknown in exact numbers, but it consists of the total number of students of the MEES program from the first class starting in august 2017 to currently enrolled second year students finalizing their education in june 2023. The population was reduced to the sampling size of the 174 members of the private facebook group "MEES students and alumni". While some enrolled students are in this group, it is made for and consists mainly of alumni. To market the survey specifically for alumni and leave out enrolled students, whom the survey was for was stressed in the post presenting the survey. In addition, one of the first questions in the survey was to check what year the alumni studied MEES. This made it possible to spot if currently enrolled students ruined the statistics. Thankfully, only one currently enrolled student replied to the wrong survey.

The surveys also held open-ended questions requiring qualitative answers. These will be analyzed in the same way as the interviews. This is further described in upcoming sections.

4.2.3 Interviews

The descriptive statistics analysis showed tendencies, but did not explain how or why these came to be. To be able to gain a deeper understanding of the instances pointed to in the survey, in-depth semi-structured interviews were conducted as an addition.

The first strategy for selecting informants was information-oriented selection in which two people were hand picked in order to "maximize the utility of information" (Flyvbjerg, 2006, p. 230). Here, informants are selected on the basis of "expectations about their information content" (Flyvbjerg, 2006, p. 230). These people are sometimes referred to as 'key informants'.

The second strategy for finding informants was used at the end of each of the two initial interviews. Following Brymans' non-probability snowball technique, the key informants were asked whom they would recommend to talk to next for the study. This allows for using the established contacts to further make contact with participants of the same experience or characteristics (Bryman, 2012, p. 201-203).

The third strategy followed, in essence, a random stratified sample where people who voluntarily left their email in the survey, were contacted. However, to avoid systematic biases where the sample size was decisive for generalization within the specially selected sub groups (happy/unhappy alumni), the interviews were divided so that both sub groups were evenly represented. Participants were interviewed consecutively until a clear participant repeated themselves.

Data was collected through semi-structured interviews. A mix of structured and unstructured (hence, semi-structure) allows for the interviewee to add new ideas rather than leaving no room for extra questions to be added or follow-ups (O'Reilly, 2013). O'Reilly stresses that semi-structure gives room for "reflexivity, expressing contradictory opinions, doubts, fears, hopes and so forth" (O'Reilly, 2013, p. 120). It is intentionally done to permit some sense of freedom for the participant. In action, this encourages a range of responses that would otherwise be left out. Considering a deep understanding of specific topics of interest to this study, the open questioning technique was chosen.

A recorder was intentionally left out to create a more calm and relaxed atmosphere during the interviews. Taking notes also allowed for faster transcribing and coding since the material was already in written form.

4.3 Strengths and limitations

Being a single person with a limited time-scale and budget but also in the need for a manageable research opportunity to study one aspect of a problem in some depth, a case study was appropriate.

Critics regard case studies unsatisfactory if they are concerned with theory testing or applicability to the wider population. Blaikie and Priest describe the view that "only numbers

can be used to describe and explain social life validly and reliably” as a prejudiced mistaken belief (Blaikie & Priest, 2019, p. 185).

The ability to generalize is another concern. It is argued one cannot generalize from a single case, and it is too difficult to establish comparability of multiple cases. Yet, the same thing can be said for single experiments or single populations (Blaikie & Priest, 2019). There is, however, a difference in type of generalization that can be made from qualitative and quantitative research. Quantitative research can produce population parameters from statistically generating sample statistics.

Quantitative research identifies systematic patterns through the use of numerical data and statistical measurements (Hammersley, 2013, p. 10-11). However, it is not concerned with the reasons behind the statistical proof. Qualitative research allows generating and developing thick descriptions. What the research problem is seeking to analyze goes beyond stating a fact, and seeks to some extent to understand how and why this came to be. This requires more in-depth research than a pure quantitative method would be able to provide. For this reason, a mix of both is more suited. This way, statistics can indicate descriptions in which interviews can investigate further and provide a coherent study.

4.3.1. Sampling bias and representativeness

It proved challenging to reach the goal of 33% replies on the survey. This was largely due to GDPR and Facebook’s new algorithms and spam filters. Following GDPR, it was necessary to reach out to people through common facebook groups relevant students were already in (where I myself have already been a member for a year prior to this study). New Facebook algorithms make it necessary to “subscribe” to group notifications. Very few would subscribe to a facebook group, especially considering this is a new update from Facebook. Additionally, the spam filter has been updated so that people who message you without being friends on Facebook, will get their message hidden. I solved this by asking everyone to be my friend. This was about 200+ people, so it took some work. Naturally, many did not know me personally, and did not accept the friend request.

Additionally, it is a plausible assumption that people are reluctant to be survey respondents. The picture below visually represents my frustration when I gathered my data.

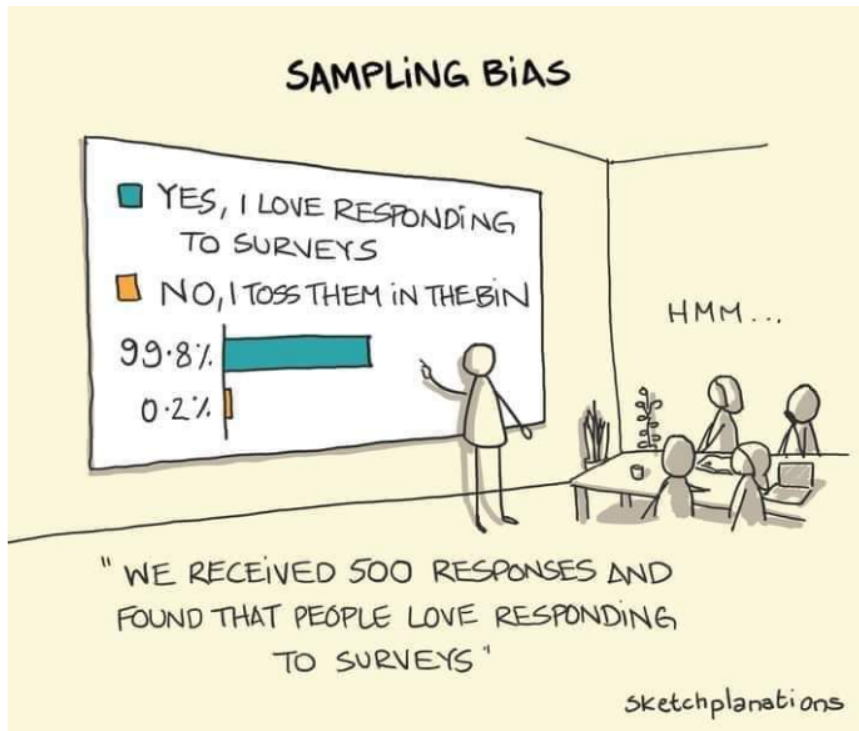


Figure 2. *Sampling bias.* (u/PotentialMillionaire, 2022)

Even with several not responding, many did respond and did so in depth. The survey replies were repetitive, meaning it was possible to identify trends. Even though the study cannot be regarded as fully representative, I believe the trends shown in the study give good insight and can therefore be used.

To compensate for the lack of responses to the survey and my personal desire for greater representativeness, I conducted in-depth interviews in addition to the survey. Most, if not all, of the interviewees referred to their friends and classmates during the interviews to corroborate their stories. This shows that the interviewees were part of a larger trend, and not necessarily just their personal opinions.

Section 5 - Theoretical concepts and frameworks

5.1 The big picture: theories on sustainability transitions

We find ourselves in a position where little progress is being made. If one wants to know how to accelerate this, one needs to know how these transitions move forward. This section looks into what would be needed from a theoretical point of view to speed up the transitions.

There is high diversity in transition theory literature and no commonly accepted definition on the cause or drive of transitions, nor is there consensus on the “best fitted” model. This makes it difficult to choose one theoretical framework to answer the question of how innovation comes about.

What needs to be done in order to achieve growth and the cause and drive of such, may be simplified into two major perspectives: neo-classical and neo- Schumpeterian (Kuzemko, Keating & Goldthau, 2016). The approaches differ in the way they understand the causes and drivers of innovation: as exogenous versus endogenous, as disruptive versus sequential, and as a process versus product (Kuzemko et al., 2016).

The underlying motivation for research on sustainability transitions continues to be the recognition that many environmental problems, such as climate change, loss of biodiversity and resource depletion (e.g. clean water, oil, forests, and fish stocks), comprise grand societal challenges. (...) Therefore, a central aim of transitions research is to conceptualize and explain how fundamental changes can occur in the way societal functions are fulfilled (Kohler et al., 2019).

Socio-technical transitions (to sustainability) are a special research topic, because they are about relatively rare, long-term macro-changes. Since they do not frequently occur, it is difficult to construct large databases that can be analyzed statistically for relationships between variables (Geels, 2011).

'Transition' refers to a discontinuous shift to a *new* trajectory and system. In transition processes, there is a shift to a new socio-technological system and development trajectory. Transitions come about through interactions between all three levels (niche, regime and landscape), and the main drive comes from outside actors that develop radically new innovations. Incumbent regime actors may disappear in transitions, giving way to new social groups and networks (Geels & Kemp, 2007).

Geels' Multi Level Perspective (MLP) stresses transitions as 'long-term macro-changes': as "major technological changes in the way societal functions are fulfilled, such as transportation, housing, communication and feeding". Yet, technological transitions (TT) are understood to "not only involve changes in technology, but also changes in user practices, regulation, industrial networks, infrastructure, and symbolic meaning or culture" (Geels, 2002, p. 1).

As these transitions are considered long-term, it is not a good model for studying smaller cases. However, the latter exist in the way the transition consists of these smaller steps. It is therefore useful to look at other definitions of the term 'transition'.

Frantzeskaki and colleagues understand transitions as 'societal processes of fundamental change' where the structure, culture and practices of a societal system experiences change (Frantzeskaki et al., 2012, p. 23). Thus, they move on from a technological understanding of the term, to where the societal sphere is recognized as an important contributor. Further, they argue for coordination, commitment, inclusion and active involvement from multiple actors in different levels and different domains in order to achieve sustainability and at the same time, "ensuring "societal cohesion and equity (Frantzeskaki et al., 2012, p. 25). It is thus argued that transition actors cannot be reduced to a technical understanding where smaller actors are without power. Therefore, it is necessary to look into the lower levels where we find businesses and the individuals working there, because when companies decide to move on to sustainable business models, the transition moves as well. To some extent, this depends on the individual working there and their ability to take the right actions.

5.1.1 Market dynamics versus policy driven innovation

The neo-classical approach is rather deterministic, compared to the neo-Schumpeterian view, because it assumes innovation has a given rate. The rate of innovation is caused by the market's ability to create innovation for itself. This process is in turn understood as a function of the historical evolution of markets, thus innovation is understood as a predetermined process that is external to the economic system (Kuzemko et al, 2016). Therefore, for the neo-classical, innovation and technological change is understood as exogenous.

The neo-classic sequential innovation or path-dependent evolutionary change poses a core issue where radical change and faster, accelerating transitions is needed. It is simply

insufficient to rely on market dynamics to bring about sustainable transitions at the fast pace we need (Kuzemko et al., 2016). The Neo-Schumpeterian view presents itself as an alternative, as it understands innovation as a reflection of policy measures, and gives credit to the role of institutions, systems of governance and government policies for the rate of innovation. Increasing levels of innovation through a concentration of economic power at government level, can be done through promoting or discouraging certain processes, and promoting and funding Research and Development (R&D) for sustainable products (Kuzemko et al., 2016). Among other ways of promoting, R&D policy can be one way of ‘injecting’ innovation. Education can be directly linked to this, as a way to ‘promote’ innovation can be through producing people who have the abilities to do the actual changes.

Further, the neo-Schumpeterian understands innovation to happen within a complex system as a result of feedback loops. It argues the role of institutions, systems of governance and government policies plays an important role in setting the rate of innovation. Thus, this view is endogenous, as innovation is viewed as a product produced within the economic system (Kuzemko et al., 2016).

This brings us to what is called “creative destruction”, where the businesses who were in danger of being phased out actually have the ability to generate ‘first move advantage’ for themselves:

Strong environmental regulations might drive heavily polluting businesses and industries out, and create incentives for greener industries and energy producers to emerge. However, heavy polluters can also adapt: through accelerated innovation, they can develop new technologies to meet stricter regulatory requirements. These new technologies then drive economic growth and profit making in the global economy (Kuzemko et al., 2016, p. 195).

To neo-Schumpeterian economics, businesses which are able to do this, have harnessed ‘creative destruction’ and thus “maximize the innovative drive which is at the heart of the economic system” Kuzemko et al., 2016, p. 196). In practice, innovators have gained a ‘first mover advantage’ which means leaping forward in the competition in new technology markets, or even creating new markets (Kuzemko et al., 2016).

‘Creative destruction’ goes against the neo-classical view, who argue innovation happens in a sequential manner because it is path dependent. Again, it is the reflection of existing values, patterns, rules, laws and institutional arrangements that results in innovation

through adaptation of the already existing system. In other words, innovation is seen as a product of existing factors (Kuzemko et al., 2016, p. 197).

However, innovation as a process is not without challenge either. Innovation is extremely high capital intensive. This may limit the industry players' willingness to take risks. In addition, many of the industries in need of a sustainable transition are high-tech industries which feature extensive degrees of automatisisation. This creates a rigidity that makes process innovation problematic (Kuzemko et al., 2016, p. 200).

Kohler and colleagues (2019, p. 2) stress that these problems “cannot be addressed by incremental improvements and technological fixes, but require radical shifts to new kinds of socio-technical systems, shifts which are called 'sustainability transitions’”. The problems we face are grand societal challenges, so there is no either/or between innovation as a product of the past or as a process of more recent intervention (Kuzemko et al., 2016).

Transition frameworks may fall short if they neglect recent debates and further conceptual development. It is therefore necessary to include policy processes in the analysis between policy and socio-technical change. Thus, it can be argued that transition scholars need to pay more attention to the politics of policy processes because of their usefulness in transitions research (Kern & Rogge, 2018). Kern & Rogge (2016, p. 100; 103) argue that there is potential in “cross-fertilisation of ideas across transition and policy studies” and therefore that argue that a “critical stocktaking of policy process theories is a prerequisite for future transition studies that more systematically respond to these challenges”.

Private companies do play an important role in innovation, but state intervention may be required if we are to realize the full potential. This is especially true when it comes to financing the innovation process. Kuzemko and colleagues (2016, p. 201) point to how basic research is typically financed through public support and not private companies due to “the low chances of developing marketable products and recuperating costs”. In addition, lack of financial support or high entry barriers to the market may decrease new technologies' possibility of full commercialization (Kuzemko et al., 2016).

5.1.2 The Multi-Level Perspective (MLP)

The MLP regime level is understood as a rigid structure that is unchangeable by anything other than niche developments, yet still somewhat flexible as policy is being determined by people running core industries (Geels, 2002; 2011; 2014). The flexibility proposes room for

experiments with the rigidity of the regime. This again, poses a challenge: if you believe the MLP to be true in its uttermost sense, it narrows educational policy's ability to create change. On the other hand, if education can challenge the regime, we find ourselves in a paradox, because education is not a niche development.

The Multi Level Perspective (MLP) aims at answering how technological transitions (TT) come about, and addresses patterns and mechanisms in the transition process. While it has been argued that transition frameworks may fall short, it is still necessary to acknowledge their usefulness and bring them into debate. The Multi-Level Perspective is highly relevant to this text because it has been a substantial contribution to understanding societal change processes and is one of the biggest frameworks in transition theory.

Geels raises the question of how inertia can be overcome in TT when radically new technologies have a hard time breaking through to the market. This is challenging because the market is aligned to the existing technology through regulations, user practices, maintenance networks being favored to support the technology already in place (Geels, 2002). Yet, markets are assumed to be 'out there', while radically new technologies have "no established markets and no fixed preferences" (Geels, 2002, p.1259).

The MLP is created to combine two views of evolution (from evolutionary economics): "(i) evolution as a process of variation, selection and retention, (ii) evolution as a process of unfolding, creating 'new combinations', resulting in paths and trajectories" (Geels, 2002, p. 1257). On a less technical note, Geels argues reconfiguration processes occur through a stepwise process of reconfiguration, and not a sudden shift from one regime to another (Geels, 2002).

The MLP identifies the underlying mechanisms of change processes and serves as a way to understand the dynamics of socio-technical transitions. Transitions are understood as a non-linear process created by the interplay of development on three analytical levels: niche, regime and landscape (Geels, 2011).

The micro-level niche innovations act as "incubation rooms" for radical innovation (Geels, 2002; Geels, 2011). Niche actors are typically entrepreneurs, start-ups and the like. They create original technology, and are often protected by external actors through financial support, due to radical innovations usually being expensive and have low technical performance. In addition, they do not (yet) meet the requirement of socio-technical regimes (Geels, 2002).

The meso-level socio-technical regime consists of multiple dimensions like markets, user preferences, industry, science, culture and cultural meaning, policy and technology. The

regime provides rules and stability for "established practices and associated rules that stabilize existing systems" (Geels, 2002; Geels, 2011, p. 26). These are semi-coherent rules both as a medium and outcome action: they can be cognitive routines, shared beliefs, lifestyle, user practices and people's adapted lifestyles, legally binding contracts, favorable institutional arrangements, created regulations and infrastructures and so forth (Geels, 2011; Geels & Kemp, 2007).

The macro-level socio-technical landscape relates to slowly changing external factors. The overarching macroeconomic model of our international society and how that influences niche and regime dynamics is one example of a 'landscape' and its ability to create changes (Geels, 2002; Geels, 2011). The landscape can also be influenced by niches and regimes, but this (most often) happens indirectly by for example economic growth, resource scarcity and broad political coalitions (Geels & Kemp, 2007). Geels highlight three landscape dynamics: (i) fixed or very slow changing factors such as physical climate; (ii) sudden external shocks (i.e. wars or oil price fluctuations); (iii) long term changes (i.e. demographic changes) (Geels, 2011).

'Break-through' from the niche-level to regime-level can come about by landscape development, such as the 1840s oceanic passenger transport that was stimulated by European political revolutions which created emigration patterns, in addition to the Irish potato famine and Californian gold-rush. A second example is how the creation of the Suez Canal opened up for Indian trade (Geels, 2002).

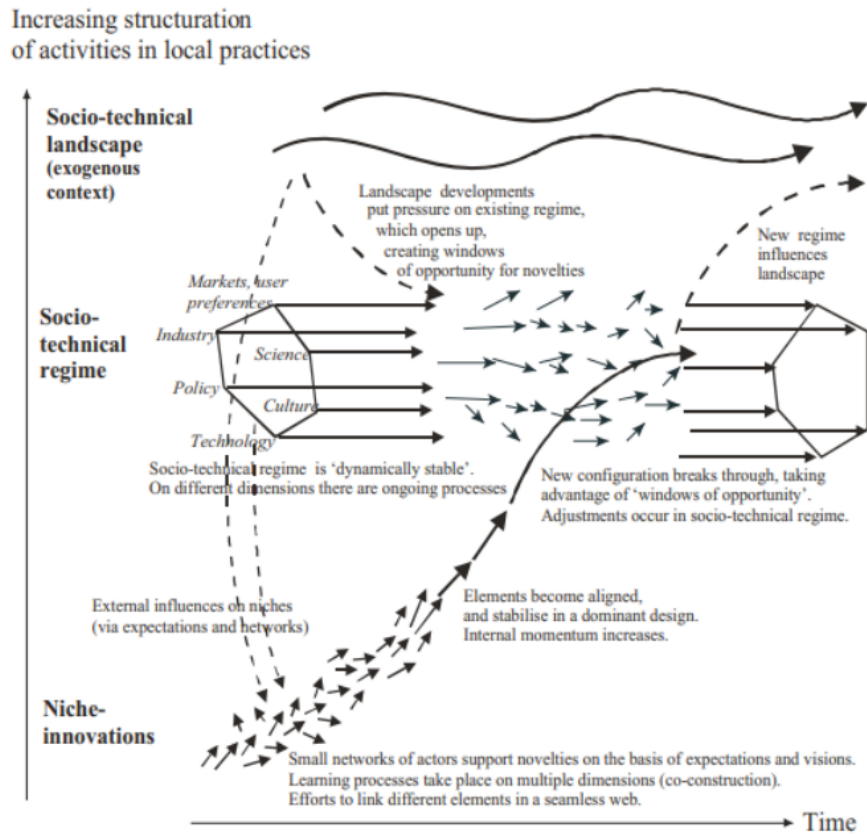


Fig. 2. Multi-level perspective on transitions.

Adapted from Geels (2002:1263).

Figure 3. Multi-Level Perspective on transitions. (Geels, 2011, p. 28).

While the regime is largely understood as a rigid structure, it is still possible for niche innovations, along with changes at the landscape level, to collectively create pressure on the regime. Pressure can cause destabilization in the regime, which can act as a ‘window of opportunity’ for break-throughs and/or diffusion of niche innovations. If niche innovations take advantage of this, they may break-through the ‘glass ceiling’ and become a part of the existing regime (Geels, 2014).

5.1.3 Transition management

Meadowcroft criticizes innovation-oriented scholars for not paying enough attention to the political dimensions of sustainability transitions. Politics is everywhere: as "context, arena, obstacle, enabler, arbiter, and manager of repercussions" (Meadowcroft, 2011, p. 71). There is no way of escaping politics because it serves as an integral part in the complex interplay among economic, technological, social and political factors of sustainability transitions. State

intervention and governance reform are essential, as sustainable development first and foremost is a political project (Meadowcroft, 2011).

Politics can play a powerful role in engineering our development trajectories through political processes. Through lawmaking, the state may favor one or the other niches through modifying frameworks to conduct economic actors affairs (by for example "introducing a carbon tax or a GHG emissions cap and trade system"), as well as "accelerate development and deployment of new technologies and to ease societal adjustment to new patterns of production and consumption through significant expenditure of social revenue" (Meadowcroft, 2011, p. 71). Through government means, the state legitimizes, enforces and encourages sustainability transitions. With this as its background, Meadowcroft argues that sustainability transitions are "inherently political" (Meadowcroft, 2011, p. 71).

In many cases it is necessary for the public to intervene until the product develops a niche market, in order to foster innovation. This is further exemplified in what is referred to as the 'Valley of Death', which takes place between the pre-commercial stage of a product and full commercialisation (Kuzemko et al., 2016, p.201-203). The state is able to 'push' products to develop a niche market through public funding and support. Private investors and market forces are considered the 'pull' factors, but these may not be ready to risk full commercialization. Therefore, the state can also promote increased risk taking across the innovation process and share some of these risks with the private sector (Kuzemko et al., 2019). This indicated that the government already has a role of developing niches, coordinating research and development investment before the MLP even starts (the MLP starts with niche developments that already has moved past the 'Valley of Death' phase). The state means, it becomes a provider of 'catalysts' for innovation (Kuzemko et al., 2019, p. 202). In this way, politics is evident in each of the three levels of the MLP:

1. The landscape level consists of slowly changing external factors, like our overarching economic model (Geels, 2002; Geels, 2011). Politics influences the general economic climate through i.e. "growth or stagnation, free trade or protection" (Meadowcroft 2011, p. 71) . National unification, such as the United Nations, will also influence how technologies are deployed. The orientation of innovation will also be a result of chosen and agreed upon politics (Meadowcroft, 2011).
2. At the regime level, political and economic actors meet and become entangled. Meadowcroft stresses that while states are "dependent on revenues drawn from prevailing economic practices", the dominant regimes are influenced by "legal

structures and regulatory initiative support” placed by the state (Meadowcroft, 2011, p. 71).

3. At the niche level, government programs can discourage or encourage innovation. This can be done through ‘push’ factors like R&D and financial funding as demonstrated in the above section, but also through encouraging certain technological paths like “railroad construction, nuclear weapons/energy, the space race, the telecommunications revolution, and so on”) (Meadowcroft, 2011, p. 71). In addition, politics and governments manage the distributional fallout - “the consequences of rising or declining industries, impacts on regions, workers and owners, and so on” (Meadowcroft, 2011, p. 71).

The concept of transition management seems to be very close to the idea of education ‘transition managers’. However, Meadowcroft largely argues on the level of policy, while ‘transition managers’ operate on a very different level. Even though it is very close to the topic, theoretical literature seems to largely ignore educational matters, or at least not make much reference to it. The idea of ‘transition managers’ is very close to the idea of ‘transition management’, because it is concerned with producing people who are capable of actively creating change. It therefore needs to be evaluated what the overlap between the sustainable literature and education is, particularly with regard to issues related to the ‘sustainable transition’.

5.2 Sustainability on the micro-level

To investigate how education can create sustainability managers is to look at the micro-level of things. The micro-level is important because it holds great potential. By addressing why businesses struggle with balancing success and sustainable development, this exploration emphasizes the importance of integrating individual actors and small-scale initiatives. Empowering employees to act as catalysts for change and fostering motivation to drive sustainability emerges as a critical strategy. Hence, the micro-level focus unlocks a gateway where corporations can achieve economic accomplishments at the same time as lasting environmental and social progress. In the following sections we will therefore dive into how sustainability can be implemented on a corporate level, by looking at the microlevel

(individual people in workplaces). Then we will go into what competencies are needed in order to implement sustainability at the micro level.

5.2.1 Implementation of sustainability on corporate level

To understand what is going on at the micro-level, Corporate Sustainability (CS) is brought forward as a metaphor for the significance of a bottom-up approach. The essence is to understand the reason behind why many companies struggle to combine business success and the advancement of sustainable development. The aim is to explain why it is important to discuss integration of small-scale and individual actors.

CS is a way of taking responsibility for sustainability challenges and contributing to sustainable development through the business model. Aligning the core business with sustainability principles can be done through "incorporating environmental and social concerns into the company's strategy, business model, and eventually, business practices (Manninen & Huiskonen, 2022, p. 2). Corporate Sustainability (CS) is therefore a fruitful example of how small-scale focus can advance sustainable development (Manninen & Huiskonen, 2022). What poses a challenge, is that a lack of strategic perspective on CS management "has been one of the major reasons for the lack of progress in activities contributing to sustainable development" (Manninen & Huiskonen, 2022, p. 2).

What is noteworthy in this context, is that companies hinder reaching their full potential, because they neglect the need to sufficiently bring sustainability into the business model. Instead they are rather concerned with "internal and incremental improvements that mainly benefit the company itself and neglect the macro-level requirements of sustainable development" (Manninen & Huiskonen, 2022, p. 1).

To integrate sustainability into the business model, Manninen and Huiskonen present the integrated strategy process framework as a comprehensive guideline on how CS can be formed and translated into action. It stresses different factors influencing the implementation process on three levels: organization level, employee level and market level:

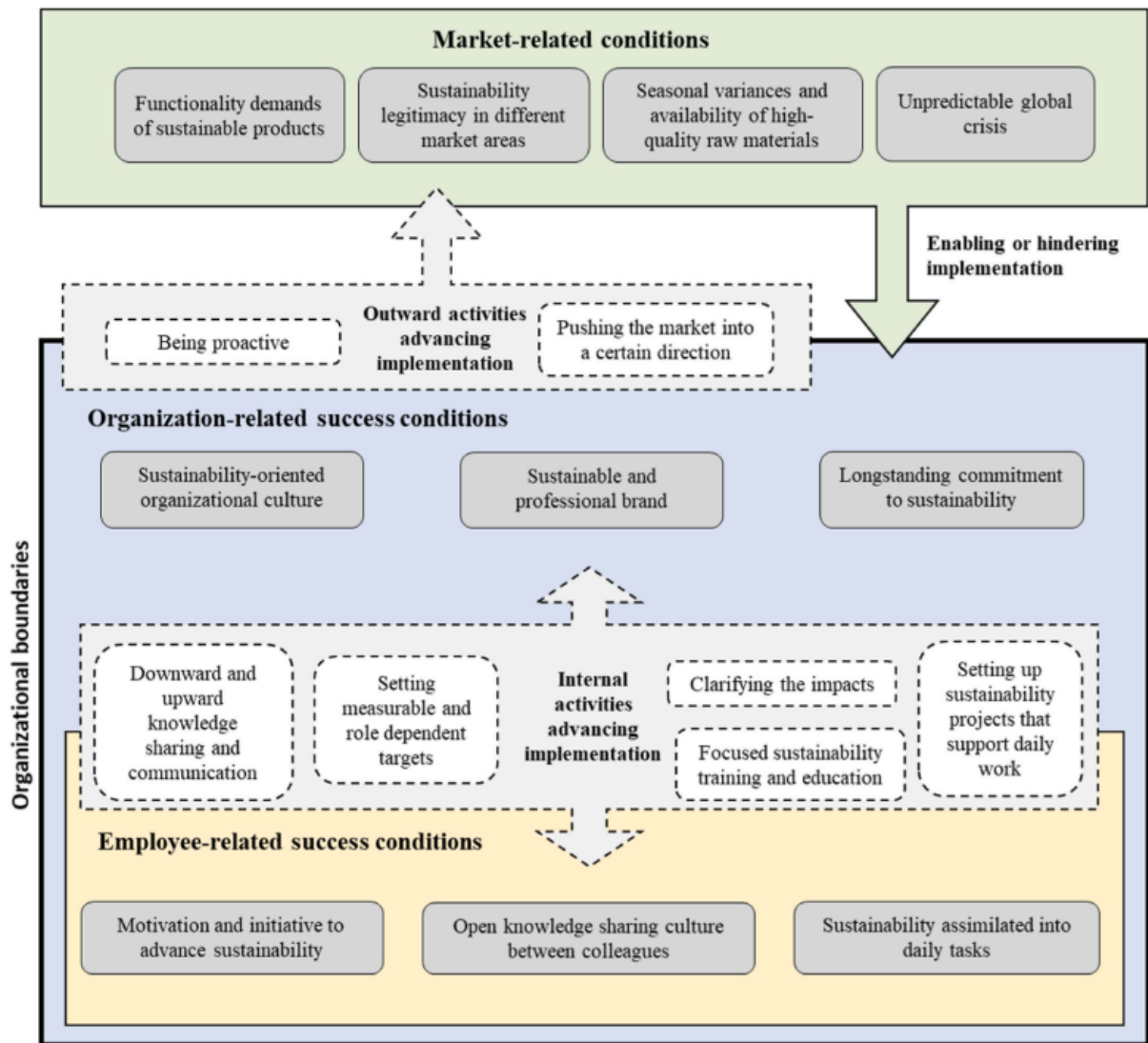


Figure 4. Framework conditions and activities influencing the implementation of integrated strategy. (Manninen & Huiskonen, 2022, p. 5).

Market related success conditions refers to how the market where the company operates, influences the CS strategy implementation either as an enabler or hinder. However, the company may take use of "outward activities" to affect the market and its actors to be more favorable toward sustainability. Internal activities are considered active factors that "creates and maintains conditions, but also pushes the integrated strategy implementation forward" (Manninen & Huiskonen, 2022, p. 5).

Both organization and employee related success conditions are described as "more stable conditions in the company which form the basis for successfully implementing an integrated strategy throughout the company" (Manninen & Huiskonen, 2022, p. 5).

Even though organization related success conditions are understood as stable, organization-wide conditions formed gradually through both employees and manager's decisions and actions, the authors stress the significance of the employee level. Employee related success conditions are said to "enable integrated strategy implementation throughout the company" (Manninen & Huiskonen, 2022, p. 6). Naturally, this is partly dependent on managers' decisions and actions, but still described as "more dependent on employee's behavior" (Manninen & Huiskonen, 2022, p. 6).

This underlines the significance of paying attention to the individual level of working people. For example, one employee-related success condition is 'motivation' and 'initiative to advance sustainability'. This is further described as "employees are motivated and personally interested in sustainability issues and *take initiatives to advance work-related sustainability topics*" (Manninen & Huiskonen, 2022, p. 6). In addition, the authors found that "employees consider working in a sustainable company meaningful and rewarding psychologically, as they can be part of, for example, developing sustainable products that increase their well-being" (Manninen & Huiskonen, 2022, p. 6).

5.3 Competence framework for teaching sustainability

Implementation of sustainability at the micro level demands certain skills and competencies. Acquiring these to some extent is important for putting things into action. While we lack a consensus, there are some theoretical insights about what these skills and competencies are.

Wiek and colleagues stress the inevitable importance of having a reference point for when developing ambitious skills and knowledge students will need to meet the future as "problem solvers", "change agents" and "transition managers" (Wiek et al., 2011, p. 204). Thus, the authors present five key competencies: systems-thinking competence, anticipatory competence, normative competence, strategic competence and interpersonal competence (Wiek et al., 2011). The way they complement each other are visualized in an "integrated research and problem-solving framework":

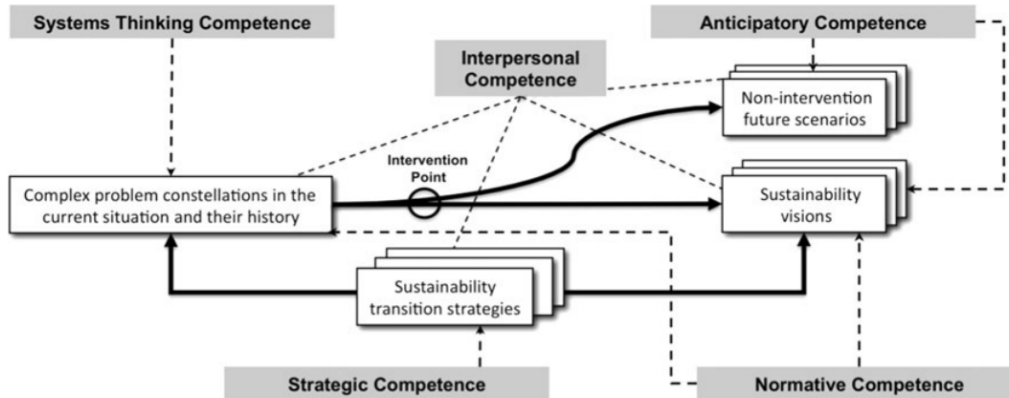


Fig. 2 The five key competencies in sustainability (shaded in grey) as they are linked to a sustainability research and problem-solving framework (see Fig. 1). The dashed arrows indicate the relevance of individual competencies for one or more components of the research

and problem-solving framework (e.g., normative competence is relevant for the sustainability assessment of the current situation as well as for the crafting of sustainability visions)

Figure 5. Key competencies in a problem-solving framework. (Wiek et al., 2011, p. 206)

While Brundiers and colleagues generally agree with this, they refine and evaluate the framework, and add two additional competencies (basic academic competency and values-thinking competency). This is done to create detailed descriptions that can be broadly accepted, and thus can serve as information used in “program development, implementation, and evaluation to enhance employability of graduates and facilitate comparison of sustainability programs worldwide” (Brundiers et al., 2021, p. 13). The following adapted and revised framework - the *integrated problem solving competency framework* - will be the theoretical framework of this thesis.

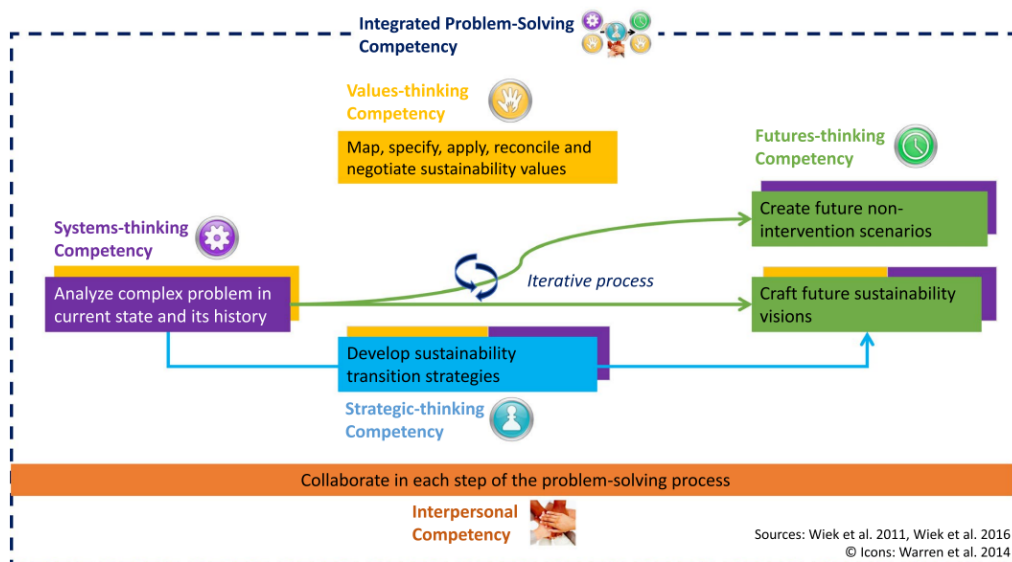


Fig. 1 Overview of the framework of key competencies in sustainability adapted from Wiek et al. (2011); icons credit: Warren et al. (2014)

Figure 6. The Integrated Problem Solving Competency Framework. (Brundiers et al., 2020, p. 15).

In the following sections I will explain the different key competencies as defined by Wiek et al. (2011) and further elaborated by Brundiers et al. (2020).

System thinking competence.

To build transition strategies towards sustainability, system thinking competence is considered critically important. It relates to the ability to “ability to collectively analyze complex systems across different domains (society, environment, economy, etc.) and across different scales (local to global), thereby considering cascading effects, inertia, feedback loops and other systemic features related to sustainability issues and sustainability problem-solving frameworks” (Wiek et al., 2011, p, 207). Here, a “complex system” is understood as an “open notion to include qualitative data, quantitative data, narratives, “thick descriptions,” etc.” (Wiek et al., 2011). Wiek et al. further differentiated between the *ability* and the *capacity* to analyze complex systems. While ability relates to “comprehension, empirically verifying, and articulating their structure, key components, and dynamics”, capacity is based on acquired systemic knowledge which includes concepts such as “structure, function, cause-effect relations, but also perceptions, motives, decisions, and regulations” (Wiek et al., 2011, p. 207).

Anticipatory competence.

These skills are defined to address “key issues of sustainability, including unintended harmful consequences and intergenerational equity (Wiek et al., 2011, p. 209). It relates to the ability to collectively analyze, evaluate, and craft rich “pictures” of the future related to sustainability issues and sustainability problem-solving frameworks. In this context, ‘pictures’ is used as an open notion to include “qualitative information, quantitative information, narratives, imagery, etc. (similar to “stories” or “images”)” (Wiek et al., 2011).

To be able to analyze “pictures of the future” one must be able to comprehend and articulate their “structure, key components and dynamics” (Wiek et al., 2011, p, 209). Then, one must be able to “evaluate” these findings, which refers to “comparative skills that relate to the “state of the art”. Finally, one must be able to craft solutions through “creative and constructive skills” (Wiek et al., 2011). Thus, this competence is based on the ability and capacity to acquire future-oriented knowledge and concepts such as “time and uncertainty, peer-reviewed “classics” such as the IPCC’s emission scenarios, as well as methods and methodologies such as simulation and scenario analysis” (Wiek et al., 2011, p. 208-209).

Normative competence.

Wiek et al. stress that addressing sustainability problems and opportunities requires “going beyond descriptive questions of how complex social-ecological systems have evolved, are currently functioning, and might further develop” (Wiek et al., 2011, p. 209). Normative competence thus collects the ability to “collectively map, specify, apply, reconcile, and negotiate sustainability values, principles, goals, and targets” (Wiek et al., 2011, p. 209). This includes to first “collectively assess the (un-)sustainability of current and/or future states of social-ecological systems and, second, to collectively create and craft sustainability visions for these systems” (Wiek et al., 2011, p. 209).

Strategic competence.

Strategic competence is related to co-constructing knowledge and practical solutions and thus enabling transitions toward a sustainable future. It links knowledge to action through collective design and implementation of interventions, transitions and transformative governance strategies toward sustainability (Wiek et al., 2011, p. 210). This requires “an intimate understanding of strategic concepts such as intentionality, systemic inertia, path dependencies, barriers, carriers, alliances etc.; knowledge about viability, feasibility, effectiveness, efficiency of systemic interventions as well as potential of unintended consequences” (Wiek et al., 2011, p. 210).

Brundiens et al. add leadership in radical change as well as using concepts of transgression and disruption; learning how to ‘unlock’ path-dependencies and the oppressive power structures that they form (Brundiens et al., 2021, p. 18). With strategic competence, one should be able to engage in action that overcomes “inertia and ingrained structures of oppression, privilege, and exploitation” (Brundiens et al., 2021, p. 18).

Interpersonal competence.

Interpersonal competence is considered a ‘key’ competence as the definition goes beyond ‘basic’ communication skills. The capacity of advanced communication skills include to “understand, compare, and critically evaluate different positions, perspectives and preferences (epistemological pluralism)” (Wiek et al., 2011, p. 211). This again includes the capacity to recognize, understand, embrace and facilitate “diversity across cultures, social groups, communities, and individuals” (Wiek et al., 2011, p. 211).

Brundiers et al. broadens this definition to also include “different types of collaboration from small to large interdisciplinary teams and stakeholder engagements, as well as transdisciplinary and action research methods” (Brundiers et al., 2021, p. 18).

Value-thinking competency.

To the existing framework presented by Wiek et al. (2011), Brundiers et al. (2021) add ‘value-thinking’ as a new competency. This extra competency is added to put more emphasis on radical justice. This goes beyond listing concepts of sustainability values, and refine those through more specific values. It is added to highlight the importance of not just *thinking* of sustainability values (such as inter- or intra-generational equity), but also to *display* these values through actions (Brundiers et al., 2021).

Section 6 - Literature review: education for sustainable development

As educational policy aims to shape the future workforce, the mutually influential connection between educational systems and the job market becomes central. This literature review examines whether education shapes the job market or vice versa. To demonstrate this intricate relationship, the Norwegian Green Industrial Initiative serves as a representative example of policy guiding labor development towards sustainability. Digging deeper, this literature review also investigates how educational policy aligns with broader societal goals, emphasizing the transformative function of universities and the necessity of sustainable competencies to navigate a developing world.

6.1 Educational policy: who creates who?

The job market continuously stimulates change in the world we live in, while educational policy has an end goal: students are supposed to achieve something - to actively create change. Is this actually working? Does the job market influence how we educate people and what we educate them on, or is it the other way around? Who creates who?

The national roadmap towards sustainability - the Norwegian Green Industrial Initiative - is an example of how policy can be used as a means to create high-ambition

action-oriented policies. The roadmap explicitly states that in order to succeed with the green shift, access to sufficient labor with the right skills is critical. Norway must actively prioritize educational development of the next generation professionals in order to provide the competence and skills needed to meet the future. It further states that “this competence must be continuously maintained and developed. The opportunity for education and competence development is also important for the individual and is key to a fair and just transition to a greener economy” (MTIF, 2022, p. 52).

It has been made clear by several scholars that policy is an important means of driving change. Sovacool (2016) still argues transitions are caused by market innovation, but agree that it can happen quicker if they are managed or incentivized. The question thus becomes how policies are being put to use, if at all.

Kern & Rogge (2016) stress the question is not 'how long does it take', but rather 'what' it takes. Today, we have a wide variety of actors who actively engage and attempt to govern transitions. It is therefore insufficient to purely look at the pace of historical innovations and expect today's transitions to happen in a similar way, which is the basis of Sovacool's (2016) argument. Historic energy transitions "have not been consciously governed" (Kern & Rogge, 2016, p.1). We have to take into consideration the agency, international dynamics and political will. Together, these create the means to deal with the pace of transitions (Kern & Rogge, 2016). The pace of transitions becomes a question of taking action. Bromley (2016) stress focus and speed can be created through four key dynamics in energy transitions: (i) phasing out and phasing in over time, (ii) the availability of capital, (iii) an engaging and action-oriented policy environment, (iv) and strong ambition and capacity.

Educational policy can thus be considered a part of the third and/or fourth key dynamic. This actively illustrates how educational policy has the ability to take part in forming the future job market. Whether this is the case will remain on the level of ambition, engagement and action created in and by policies.

As the MTIF states in the Green Industrial Initiative, there is a need for expertise, and because of this, Norway must influence educational development. This shows how the dominant regimes are influenced by “legal structures and regulatory initiative support” placed by the state (Meadowcroft, 2011, p. 71). Still, it is important to acknowledge that climate change issues are both political and practical, “embedded seeing climate change as only an academic problem deeply in our civilisation and our industrial way of life” (Geschwind et al., 2019, p. 13). Seeing climate change only as an academic problem will therefore be

insufficient. It requires scientific solutions which provide “the basis for wider social, political and cultural changes that are required to address such complex problems” (Geschwind, 2019, p. 13).

Geschwind and colleagues (2019) highlights that the role of universities has been discussed “since the medieval times” but that today, there is an overall external pressure for increasing accountability in universities (Geschwind et al., 2019, p. 9;15). Further, higher education (HE) has been recognised as an important sector for addressing global issues such as sustainable development (Gough and Scott 2008; in Geschwind et al., 2019, p. 11) as universities provide new knowledge: “hence, it is easy to conclude that they can play a role in overcoming such challenges” (Greu et al., 2017; in Geschwind et al., 2019, p.5).

The basis of change requires making use of the emerging concept of ‘knowledge co-creation’: “action, coordination and collaboration across knowledge domains, sectors and types of organizations,” (Trencher et al. 2013; in Geschwind et al., 2019, p. 13). Universities can link responsibility to the sustainability goals of the United Nations (UN) and use the 17 goals as a framework to work issues of responsibility (Geschwind et al., 2019, p. 12).

Some tension remains. Universities may be well positioned to answer “issues in need of systematic and long-term thinking and inquiry on any matter” (Geschwind et al., 2019, p.5). Critiques point at the strong social embeddedness of universities and how universities “tend to take over responsibilities for various kinds of social problems, perhaps even when they lack the means and measures for promoting such goals” (Geschwind et al., 2019, p.5). Still, it is argued that universities need to become “champions of sustainable development and play a leading role in the implementation of the SDGs for the SDGs to be truly successful at a global scale (SDSN Australia/Pacific 2017; in Geschwind et al., 2019, p. 12).

6.2 The responsible university

Geschwind and colleagues stress how responsibility has become a 'catchword' for organizations, and a means to emphasize their responsible position and behavior (Geschwind et al., 2019, p. 3). It's important to take note of the different meanings put on the term 'responsible'. This varies across individuals or organizations involved, as well as their geographical, cultural and political context, as well as historical periods. The key arenas for business organizations' attention include responsibility for the environment, social

responsibility, financial responsibility, as well as quality and sustainability issues" (Geschwind et al., 2019, p. 3-4).

Geschwind and colleagues uses the Webster's (1994) dictionary definition, where the term includes "connotations of both (a) being accountable for external powers or stakeholders for one's decision and actions and (b) containing the capacity for one's own (moral) decisions, rational thought and action" (Geschwind et al., 2019, p. 4).

Due to the broad use of the term 'responsibility', it's not hard to understand why higher education institutions feel the need to take responsibility in their operations:

"Higher education institutions (HEIs) presently make up a large proportion of national gross domestic products (GDPs) and their activities affect many people, including staff, students (and parents), employers and other stakeholders. This impact is particularly so in systems like those in the Nordic countries with high participation rates and significant investments in research. These investments come with expectations. HEIs are expected to contribute to the development and resilience of societies" (Geschwind et al., 2019, p. 4).

There are multiple reasons for the desire to portray their responsibility. First, the broad awakening to environmental issues and the desire to overcome global challenges. Universities have a play in creating knowledge and thus play a role in creating change and overcoming these challenges. It is even argued that "universities are perhaps the organization best positioned to answer issues in need of systematic and long-term thinking and enquiry on any matter" (Kaldeway, 2018; in Geschwind et al., 2019, p. 5). On the other hand, Ramirez (2009) argues universities tend to "take over responsibilities for various kinds of social problems, perhaps even when they lack the means and measures for promoting such goals" due to their strong social embeddedness (Geschwind et al., 2019, p. 5).

It has yet to be clearly defined what the role of universities are and should be, but scholars point to the evolution of universities' responsibility following this ongoing discussion:

“In different eras, there have been different assumptions as regards how higher education provides society with public goods (Kekäle et al. 2017); with more recent developments (from Europe) emphasizing the instrumental role of universities in directly tackling social issues such as economic development and climate change (Maassen and Olsen 2007). The ongoing discussion on university responsibility, amongst policy and academic circles alike, goes well along with these external pressures” (Geschwind et al., 2019, p. 5).

Gough and Scott (2008) recognize HE as an "important sector for addressing global issues such as sustainable development" (in Geschwind et al., 2019, p. 11). Universities' responsibility can also be directly linked to the UN Sustainable Development Goals as these 17 goals can serve as a framework for working with issues of responsibility. An example universities' key role in fulfillment of these goals, are in the SDG implementation guide published by The Sustainable Development Solutions Network (SDSN)—Australia/Pacific: "for the SDGs to be truly successful at a global scale, universities need to become champions of sustainable development and play a leading role in the implementation of the SDGs" (SDSN Australia/Pacific, 2017; in Geschwind et al., 2019, p. 12).

On the other hand, Trencher and colleagues (2013) stress that "seeing climate change as only as an academic problem is insufficient; such problems are also political and practical, embedded deeply in our civilisation and our industrial way of life. In this respect, scientific solutions provide the basis for wider social, political and cultural changes that are required to address such complex problems. This basis for change, in turn, requires action, coordination and collaboration across knowledge domains, sectors and types of organizations, making the emerging concept of ‘knowledge co-creation’ a rather appealing one amongst policy and managerial circles" (Trencher et al., 2013; in Geschwind et al., 2019, p. 13).

6.3 “GreenComp” - why we need sustainability competencies

There have been many attempts trying to define the necessary competencies to develop a sustainability framework. To a large extent, this has resulted in a sea of labels. Therefore, it is necessary to look into some different approaches found in literature and practice so far (Bianchi, 2020). Despite their different origin, the terms 'competence', 'competency', 'skills',

'abilities', 'capabilities' and similar concepts are often used interchangeably (Bianchi, 2020, p. 8; see also Lester, 2014; Mitchelmore & Rowley, 2010; Winterton, 2002, Baartman et al., 2007; Baethge et al., 2006; Cebrian & Junyent, 2015). Bianchi (2020, p. 8) notes the different connotations between the American and English terms:

“The term ‘competency’, originated in the USA, focuses on behavior, motivations and other personal traits and it is used in reference to superior performance and high motivation (see also Gagliardi & Komarkova, 2015)”;

“The term competence, of British origin, refers to practical skills, knowledge and understanding of the work environment and is tied to job performance (see also Winterton, 2002)”

Taking part in the debate on competence-based education, the European Commission has defined a set of knowledge skills and attitudes that has been widely adopted in the European policy debate (Bianchi, 2020). Here, competence-based education is defined as "outcome-focused, as it is centered on enabling individuals to engage effectively in different situations and contexts to contribute to transform their structures" (Bianchi, 2020, p. 8; see also Rieckmann, 2012).

There is a growing common understanding between scholars and policy-makers that sustainability concepts and competencies need to be instilled. Yet, there is a lack of agreed upon direction and thus it fails to provide guidance. The several terms used in literature hint to this: *“environmental education* (see also Correia et al., 2010; Dewhurst & Pendergast, 2011; Iyengar & Bajaj, 2011; Michalos et al., 2011;), *education for sustainable development* (see also Cebrian & Junyent, 2015; Glasson et al., 2010; Murray et al., 2014; Naeem & Peach, 2011; Rieckmann, 2012, 2018; UNESCO, 2017; Trad, 2019; Yoon et al., 2013), *education for sustainability* (see also Garcia et al., 2017; Hegarty et al., 2011; Iyengar & Bajaj, 2011), *sustainability education* (see also Armstrong et al., 2016; Brundiens et al., 2020; Croft, 2017; Eagle et al., 2016; Holdsworth & Thomas, 2016; Tarrant & Thiele, 2016; Wiek et al., 2011, 2016;), *ecological education* (see also Drissner et al., 2010; Pehoiu, 2013), *education for planetary citizenship* (see also Haigh, 2008), and so forth” (Bianchi, 2020, p. 10).

As the term 'sustainability' is being used differently by different groups of people, this term has also become ambiguous (Bianchi, 2020, see also Croft, 2017). Despite its

conceptual difference, it is often used interchangeably with 'sustainable development'. UNESCO defines sustainability as a "long-term goal, such as attaining a more sustainable world", while 'sustainable development' refers to "the many processes and pathways to achieve development, or progress, in sustainable ways, for example through sustainable agriculture and forestry, sustainable production and consumption, appropriate government measures, research and technology transfer, education and training, etc" (Bianchi, 2020, p. 10). Thus, Bianchi stress education for sustainable development (ESD) equips students with the knowledge, skills, attitudes and values needed to enact sustainable development, progress or growth. It can be argued this underlines the necessary part taking of education in sustainable development (Bianchi, 2020).

With this as its background, one policy action in the European Green Deal is to develop a European sustainability competence framework in order to promote learning on environmental sustainability. The European sustainability competence framework 'GreenComp' aims to help learners develop knowledge, skills and attitudes that "promote ways to think, plan and act with empathy, responsibility, and care for our planet and for public health" (Bianchi et al., 2022, p. 1). Although there is broad consensus for the need of embedding sustainability themes in learning, this framework is designed to be a reference for learning schemes, and not to be prescriptive.

The GreenComp framework consists of four areas: 'embodying sustainability values', 'embracing complexity in sustainability', 'envisioning sustainable futures' and 'acting for sustainability' (Bianchi et al., 2022, p. 1). These are then divided into 12 competencies within the four organized areas:

AREA	COMPETENCE	DESCRIPTOR
1. <i>Embodying sustainability values</i>	1.1 Valuing sustainability	To reflect on personal values; identify and explain how values vary among people and over time, while critically evaluating how they align with sustainability values.
	1.2 Supporting fairness	To support equity and justice for current and future generations and learn from previous generations for sustainability.
	1.3 Promoting nature	To acknowledge that humans are part of nature; and to respect the needs and rights of other species and of nature itself in order to restore and regenerate healthy and resilient ecosystems.
2. <i>Embracing complexity in sustainability</i>	2.1 Systems thinking	To approach a sustainability problem from all sides; to consider time, space and context in order to understand how elements interact within and between systems.
	2.2 Critical thinking	To assess information and arguments, identify assumptions, challenge the status quo, and reflect on how personal, social and cultural backgrounds influence thinking and conclusions.
	2.3 Problem framing	To formulate current or potential challenges as a sustainability problem in terms of difficulty, people involved, time and geographical scope, in order to identify suitable approaches to anticipating and preventing problems, and to mitigating and adapting to already existing problems.

AREA	COMPETENCE	DESCRIPTOR
3. <i>Envisioning sustainable futures</i>	3.1 Futures literacy	To envision alternative sustainable futures by imagining and developing alternative scenarios and identifying the steps needed to achieve a preferred sustainable future.
	3.2 Adaptability	To manage transitions and challenges in complex sustainability situations and make decisions related to the future in the face of uncertainty, ambiguity and risk.
	3.3 Exploratory thinking	To adopt a relational way of thinking by exploring and linking different disciplines, using creativity and experimentation with novel ideas or methods.
4. <i>Acting for sustainability</i>	4.1 Political agency	To navigate the political system, identify political responsibility and accountability for unsustainable behaviour, and demand effective policies for sustainability.
	4.2 Collective action	To act for change in collaboration with others.
	4.3 Individual initiative	To identify own potential for sustainability and to actively contribute to improving prospects for the community and the planet.

Figure 7: *GreenComp areas, competencies and descriptions* (Bianchi et al., 2022, p. 14-15).

With the competence areas and competencies set, the EU Commission continues by stressing a key question: which pedagogies should be used, and how does one incorporate the learning outcomes in them? GreenComp includes the following activities: active learning; student-centered, design-based, project-based, transformative (situated) learning contexts; gamification; role plays, experimental games and simulations; analysis of real-world case studies taken from the local context; blended and online learning; project-based learning; outdoor approaches; and collaborative approaches (cooperation with external partners) (Bianchi et al., 2022, p. 31).

Even with this contribution, there is no explicit agreement on what competencies for sustainability specifically is or should be. The GreenComp does however fall under the developing consensus that sustainability education should include a "variety of capacity-building pathways that engage head, hands and heart" (Brundiers, 2010, p. 310). The issue remains: how should scholars and practitioners learn to be capable of developing practical solutions for the complex challenges of sustainability? There is a need for problem driven and solution oriented research and teaching approaches (Wiek, Withycombe & Readman, 2011). To elaborate on these issues, I will pull on the framework presented by Wiek et al. (2011) and the refined definitions by Brundiers et al. (2021), as these are the most referenced frameworks to date on google scholar.

Wiek (et al., 2011) and Brundiers (et al., 2020) point out specific competencies students should know to be able to manage sustainability. This concept goes well together with transition theory, at least those who follow an interventionist logic. In this literature review, we have seen the development of sustainability competencies, represented by the 'GreenComp' framework, which highlights the need to equip students with the necessary knowledge, skills, and attitudes for a future that prioritizes the planet. As we adapt to the ever-changing environment, the arising issue lies in how education can facilitate the creation of pioneering solutions to the complexity of sustainability. This hints at a possible gap in the literature. We need to develop educational models that prepare students to address complex sustainability challenges while embodying values of empathy and responsibility. How should HEIs go about to move society ahead? What are the obstacles to do so?

Section 7 - Case study on sustainability education in Norway

In exploring sustainability education in the Norwegian context, this thesis explores the nuances of the issue using a case study approach. This will be a comprehensive case study

that uses a combination of descriptive statistical surveys and in-depth semi-structured interviews to shed light on the field of sustainability education in Norway.

This thesis looks to explore whether the efforts of higher education institutions to promote competencies aligned with sustainability goals are producing tangible results. Therefore, a case study is used to examine whether students actually gain the intended competencies, whether these competencies are effectively applied in real-world scenarios, and whether they contribute to broader sustainability goals.

7.1 Case study approach

Case studies have various definitions, such as a type of research design, as involving particular kinds of research methods or being a method of data selection (Blaikie & Priest, 2019). While the latter is not so common, the authors emphasize its usefulness: “case study is not a methodological choice, but a choice of what is to be studied (Stake, 2005, p. 443; in Blaikie & Priest, 2019, p. 181). While literature does not agree on how one should regard case studies, it is commonly referred to as an umbrella term for a “family of research methods having in common the decision to focus on inquiry around an instance” (Adelman et al., 1977; in Blaikie & Priest, 2019, p. 183).

Following Hammersley’s view of a case study as a “*method of selection* [that is] not associated with certain kinds of methods of data collection, or a particular logic of inquiry”, this text uses a case study as a method of selection, rather than a research design (Hammersley, 1992; in Blaikie & Priest, 2019, p. 184). Here, any method can be regarded as legitimate, even surveys (Blaikie & Priest, 2019). The authors highlight that whether it is possible to generalize from such studies depends on the intended generalization. A limitation of this type of case study is that one cannot develop statistical generalization applicable to wider populations (Blaikie & Priest, 2019). However, this text does not intend to provide statistical generalization, but rather to compare characteristics of the case with the ability to actively create change through the lens of educational policy in Norway. Still, it would prove beneficial to the justification of the study to provide some sort of summarizing of the data sets. For this reason, a survey in which descriptive statistics could be produced, was picked as a way to summarize data and describe the samples in concern.

Following the definition of a case study as a method of selecting data to be studied, the approach combined two descriptive statistics surveys and eight in-depth semi-structured interviews.

For the survey, two groups were of concern: (i) enrolled second-year students of MEES, as well as (ii) alumni of the same program. The two groups received surveys with the same type of questions, but some minor alterations to some of the questions was needed. Therefore, two very similar but slightly different surveys were produced and sent out. The surveys were developed using nettskjema.no, as this is developed by the University of Oslo and can ensure sufficient handling of GDPR. People were contacted through the use of school and program related facebook groups. Both posts in the group and private messaging of people found in the same group were taken advantage of.

To receive sufficient information, the survey questions were concerned with questions that made measuring possible, as well as open-answer questions requiring qualitative replies. At only 19 replies, clear tendencies started to form both from the ‘happy’ and ‘unhappy’ sides. Yet, the study could benefit from even more in-depth information from both sides. This is also pointed out by Blaikie and Priest (2019) who stress how structured open-ended questions remain in the language of the researcher, and thus some of the participant’s meanings will be lost in translation through the method of coding which is also a product of the researchers’ language. To bring back a more traditional use of qualitative methods, and thus build on the foundation laid by the surveys, eight interviews were conducted to gain knowledge on the tendencies that were still unclear. In order to catch the essence and thick descriptions on the matters, a semi-structured in-depth interview approach was chosen. While the questions in need of answers were quite specific in nature, seeing as the interviews tried to gain deeper understanding of what the surveys could not, a semi-structured approach could give room to nuances the survey could not. In addition, it proved useful to make room for interviewees to “go off” on a topic close to their heart. That way, there would be further depth in the analysis.

7.1.1 The case of Norway - the Government’s Green Industrial Initiative

The Norwegian Prime Minister Jonas Gahr Støre and Minister of Trade and Industry Jan Christian Vestre launched a national road map to a green industrial transition in June 2022,

with the overarching goal of building Norway on green industry. While Norway has major challenges in store as an economy and society facing a global climate and nature crisis, the Norwegian industry may still have great conditions for success in the green transition - maybe even "the world's best conditions"? (Ministry of Trade, Industry and Fisheries, 2022, p. 7). Still, it requires a radical restructuring of Norwegian business and industry, which calls for higher ambitions, a faster pace, better ability to follow through and a more systematic cooperation than today, all while urgent action is decisive for success (Ministry of Trade, Industry and Fisheries, 2022, p. 7-8).

The Government's approach and vision for the Green Industrial Initiative is that it is primarily the industry itself that must seize the market opportunities, create value and solve challenges of the transition. The Government will place its stance rather as a powerful toolbox using state instruments to facilitate cost-effective emission reduction, profitable green industrial investments and sustainable use of resources through "actively facilitating the private initiatives and investments through adequate framework conditions and an active industrial policy where the state and the business community collaborate to realize the market opportunities in the green transition" (Ministry of Trade, Industry and Fisheries, 2022, p. 22). In turn, this will facilitate the implementation of the UN's Sustainability Goals by the Norwegian industrial sector (Ministry of Trade, Industry and Fisheries, 2022, p. 22).

The industry is considered to be the key driving force to Norway's low-carbon transition, through taking advantage of the market opportunities and creating value in an increasingly climate oriented world (Ministry of Trade, Industry and Fisheries, 2022). Here, the Government considers Norway's most important resource to be competent labor: sufficient labor with the right skills, the opportunity for education and competence development is key to a fair and just transition to a greener economy (Ministry of Trade, Industry and Fisheries, 2022, p. 52).

With this as its background, the roadmap then goes on to state that Norwegian businesses "shall have access to a competent workforce" (Ministry of Trade, Industry and Fisheries, 2022, p. 52). What does "competent" mean in this context, and who or what embodies sufficient competence? The roadmap argues the Green Industrial Initiative will be based on the competence developed in areas such as oil and gas, renewable energy, metallurgy, and the maritime and marine sectors. These industrial environments have developed cutting-edge expertise in strong industrial communities "through employees who

are able to develop and implement new solutions” (Ministry of Trade, Industry and Fisheries, 2022, p. 52-53). The key is listed as employees with insight into entrepreneurship, innovation, sustainability, collaboration and change competence (Ministry of Trade, Industry and Fisheries, 2022).

Lack of relevant skills and competent labor can be an important bottleneck for increased action and value creation in a sustainable green transition. In Norway, the business community is already reporting a shortage of competencies, and have a hard time meeting their needs for manpower. An important political initiative to combat this shortage is to equip the sector “to meet the competence needs of society in the future” through prioritizing the funding committee’s recommendations for how universities and university colleges shall be followed up (Ministry of Trade, Industry and Fisheries, 2022, p. 53-55).

How efficiently Norway’s industrial sector can adapt to a low-carbon future depends largely on having access to sufficient labor with the right skills. While basic input factors - like renewable energy, raw materials, capital - and other factors - like suitable sites, infrastructure, technology and markets - create our foundation for our opportunities, we additionally need a competent work-force with the knowledge of how to make use of the pieces. Sufficient labor with the right skills plays an important role in Norway’s success with the green industrial shift (Ministry of Trade, Industry and Fisheries, 2022, p. 25).

7.1.2 The case of MEES - Master program in Energy, Environment & Society, University of Stavanger (UiS), Norway

'Energy, Environment and Society' is a two year, 120 ECTS credit, master program provided by the University of Stavanger at the department of Media and Social Sciences. With the Paris Agreement and the UN Sustainable Development Goals as its point of departure, the master program focuses on "the challenges associated with the realization of these goals, with a special emphasis on energy" (UiS, 2023). The master program is quite new, as it welcomed its first class in 2017.

The top-of-the-page 'sales pitch' made to stress the significance of the study program and the question it raises says the following: "Climate change, loss of biodiversity, and the possible transition towards a low carbon society trigger political conflicts within the nations

and across the globe. What does the concept of sustainable energy really include? How do the challenges regarding new energy systems affect a society?" (UiS, 2023).

Globally, energy systems are transitioning, or are about to transition, towards lower carbon and more sustainable energy. While this is happening, there is a growing debate on what constitutes sustainable energy policy. This poses "political conflicts over the true meaning of concepts such as sustainable energy, low carbon transition, and with different and competing visions about the future energy mix and future energy system" (UiS, 2023). Thus, the study program aims at answering the environmental challenges associated with climate change, and the challenges for both nations and the international community associated with the realization of the goals stated in the Paris Agreement and the SDGs.

Section 8 - Results and findings

The following section presents the empirical findings from the document analysis, survey descriptive statistics and qualitative interviews. The section is divided into three main parts. It opens with Norway's sustainable politics to introduce the topic of educational policies and future job needs, and explain how competencies and responsibility is described in Norwegian politics. Here, we will look into what literature regards as the future needs for competencies and skills, and how various authors expect people to gain these competencies. The second part presents an overview of students and alumni perception of the MEES program through descriptive statistics. Here, summary value and variances are of most interest. Finally, the qualitative replies from the survey will be presented together with the interviews, to provide further insight and deeper understanding of the reason behind respondents' replies. This is divided into two sub-categories: 'unhappy' and 'happy' students.

8.1 Political logic of Norway

8.1.1 Competencies

The OECD does not define what competencies are or what they should be, but stresses we, as an international society, need to better anticipate future skills needed to help the industrial transition move forward. Although vague, the OECD argues this can be done through i.e.

industry and skills mapping and regional skills foresight exercises. This understanding is generally concerned with entrepreneurship as a key to business innovation and business growth and thus regional innovation. However, the OECD goes on to state “a successful industrial transition depends on “system innovations”, i.e. a need for simultaneous changes in technology, business models, competency bases, resource use and supporting infrastructure” (OECD, 2019, p. 22-23). This points to a broader understanding of what is needed to move the transition, and can explain why policy is given responsibility:

“The big challenge for policymakers in regions in industrial transition lies in strengthening appropriate competencies and resources for innovation at the firm level, to encourage local actors to engage with innovation processes and to ensure broad networks, strong interaction and knowledge exchange between actors across different policy domains” (OECD, 2019, p. 22-23).

The Norwegian Ministry of Trade, Industry and Fisheries (MTIF) also expresses the need for further research on needs in the green transition. They do, however, stress that the industry “needs employees with insight into innovation, entrepreneurship, sustainability and with collaboration and change competence” (MTIF, 2022, p. 53). This calls for “adequate access to the right competence, [which will be] crucial for companies' ability to operate efficiently and create value” (MTIF, 2022, p. 8).

The Norwegian Directorate for Higher Education and Competence (HKDIR) does not define competencies, but stresses the need for further developing educational programs. Developing quality education through a cooperation between education and industry so that industry needs are better incorporated in education, is seen as the best way to be able to map industry needs and form students who are better equipped to meet the challenges of tomorrow (HKDIR, 2022).

Kompetansebehovsutvalget (KBU)¹ (Eng: Committee of competence needs) appointed by the government in June 2021 highlights there is little empirical research on what a transition to a low-emission society will mean for the industry’s needs for competencies. We need more knowledge and statistical evidence to conclude what future higher education looks like (KBU, 2022). Yet, the Norwegian model presupposes investment in competence,

¹ The proper citation for this report is Skule et al., but the abbreviation of 'KBU' will be used for these reasons: 1. It is easier for the reader to keep the papers mentioned in the thesis apart; 2. Seeing as the thesis discusses several government papers it is necessary to keep the papers apart. Thus, this was done to make the text more readable. The full and proper citation is of course added in the bibliography.

and competence politics is high on the Norwegian political agenda. This is important to be able to meet the changing competence needs that are driven by long term trends such as technological advancement and digitalization, demographic development, green transitions and shocks in the labor market and overall society i.e. the COVID-19 pandemic and Russia's war in Ukraine (KBU, 2022).

The government's Competence Reform states there is a gap that needs to be filled between the industry's competence needs and the competencies workers actually have: "the green shift, where oil and gas becomes less dominant in the economy, will demand new competence" (Meld. St. 14, 2019-2020, p. 20). It is not defined what this competence should be, but we know which sectors that lack manpower (health sector, construction, ICT) (Meld. St. 14, 2019-2020).

The only paper coming close to defining sustainability competencies is the 2020 NOU on future competence needs. The UN environmental program UNEP, the international labor organization ILO and EUs statistical office Eurostat all define competencies differently (NOU 2020:2, p. 83). This makes it difficult to conclude on a set of competencies. Still, there is a need for both general competence and 'specialist competence' on sustainability.

'Generic skills' are defined as self-reflection, critical thinking and social awareness, (...) risk evaluation, collaboration skills, adaptability and environmental awareness (NOU 2020:2, p. 82). Then follows more specific competence needs related to more specific industry areas. Apprentice-, technology- and science 'competence' require competence on all levels. Management and climate risk competence is important as "more environmentally friendly routines and practices in businesses require a solid anchoring in the entire organization, especially in management" (NOU 2020:2, p. 82-83).

8.1.2 Future skills needs

The OECD defines future skills needs as future-oriented and digital occupations (OECD, 2019, p. 9). To meet the coming demand, it is critical that the labor force upgrade their skills. This calls for a 'skills dialogue' where "policymakers must be able to convince local employers of the need for change, to be prepared for differences in opinion, and to allocate sufficient time, human and financial resources to build up contacts and generate trust among all parties involved" (OECD, 2019, p. 55-56). While policymakers should encourage change, it is undefined who is responsible to bring about change.

For the MTIF, sustainability is listed as an important skill for the future, but what this entails has yet to be defined. This document is more a statement that Norwegian businesses “shall have access to a competent workforce” and a statement that the government will pursue this in active policy, than an explanation on how (MTIF, 2022, p. 52).

HKDIR highlight that we do not yet know what needs the future require, and for that reason it is important to ‘learn as long as we live’ so that knowledge and competence does not get stuck (HKDIR, 2022). We must continuously update our knowledge in the future, because tomorrow's challenges will be the biggest challenge of our time (climate) and we don't yet know how it will affect us or what kind of expertise will be required to overcome the challenges it will impose (HKDIR, 2022).

The green transition will change the need for retraining and upskilling. For example, updated expertise from the petroleum industries can be of great use in greener and other industries. The green transition will also affect industries differently and may change the industrial structure both within and between regions. This could lead to varying changes in skills needs across regions. This raises the question of the role that vocational education and training, with its close link to the labor market and a dimensioning mechanism linked to the needs of the labor market, can play in meeting the changing needs associated with the green transition (KBU, 2022; see also Meld. St. 14, 2019-2020, p. 8).

The NOU 2020:2 understands relevance to working life as a complex term with various actors stressing different definitions. Future skills needs are continuously developing, and some sectors will experience rapid changes (NOU 2022:2, p. 98). In this paper, it is described as important that higher education institutions are able to meet future changes in the industrial structure, technological development and societal challenges in single industries and sectors (NOU 2022:2, p. 98).

8.1.3 Training and continuing education

The OECD views continuing education as a meaningful way to deal with the lack of skilled labor, but limits skills and competence development to something gained through the means of scaling up innovative entrepreneurship (OECD, 2019). They do, however, broaden the understanding of future needs inexplicitly when describing how “jobs of the future will use different skills and may have higher educational requirements” (OECD, 2019, p. 38).

Therefore, “workers may need to switch occupations and acquire new skills. Upskilling and

retraining the existing workforce should be high on the agendas of policymakers in these regions in order to prepare workers for the future of work” (OECD, 2019, p. 38).

The MTIF stress that the “opportunity for education and competence development is also important for the individual and is key to a fair and just transition to a greener economy” (MTIF, 2022, p. 52). ‘Education’ is still quite broad in this text, but focuses on building new competencies in vocational education and does not specify tomorrow's needs. However, a white paper on competence needs will come (MTIF, 2022).

HKDIR generally agrees with the previous views, and expresses a need to promote quality measures in education in general. This should be funded through government subsidies (HKDIR, 2022).

While KBU is still somewhat vague, they describe the situation as a big picture with multiple needs and not ‘one way’ to solve:

“Technological and demographic changes, globalization and climate change are driving new ways of working, living and understanding the world. Strategies to accommodate these development trends will entail changed competence needs and demand for different forms of competence. The overall picture is that businesses are struggling to recruit people with the right skills.” (KBU, 2022, p. 21)

Again, this is very similar to Meld. St. 14 (2019-2020). Nor does NOU 2020:2 offer a descriptive understanding of what continuing education is or should be. The obvious is pointed to here: that education is important and there must be a better match between what is taught in education and what the industry needs, without specifying any further what this is or should be, or who should research this. The description is thus limited, seeing as there is no explicit description on training or continuing education, other than what better fits into the other categories.

8.1.4 Competence development and future competence needs

The OECD highlights digital competencies and skills specifically, due to the ‘Fourth Revolution’ as the digital age. Still, a changing demand for particular skills is expected at various wage levels which will cause “permanent gains or losses for certain groups of workers” (OECD, 2019, p. 9).

Competence development is expected in these jobs: digital skills (job profiles related to future technologies, such as professions in web-and app-enabled markets, machine learning skills and software developers,), entrepreneurship; transforming old jobs into new jobs (these new being both digital and entrepreneurship, but not stating what these entrepreneurs need to make, just that they need something new) (OECD, 2019, p. 24).

The MTIF gives a vague definition on what competencies need development, but expresses the vast importance is a more general matter: “Norwegian businesses shall have access to a competent workforce. Through tripartite cooperation, continuous competence development will be facilitated, and the Government will pursue an active policy to include more people in working life” (MTIF, 2022, p. 52). Here, individual people are also perceived to be a part of the bigger puzzle: “the opportunity for education and competence development is also important for the individual and is key to a fair and just transition to a greener economy” (MTIF, 2022, p. 52). This is similar to HKDIR’s understanding as well, where they describe that people must continuously learn and develop their competencies, because businesses and industries are dependent on high and updated competencies and skills (HKDIR, 2022).

While all sectors will to some degree be affected by the green transition, there will be a growing new industry that may experience shortage of skilled workers and thus hinder growth and development in Norway. KBU points to circular and bioeconomy, hydrogen, solar energy and carbon capture and storage in particular (KBU, 2022, p. 27). In addition, it is deemed important to develop these skills and competencies in close cooperation with practical working life and not rely solely on academics (KBU, 2022).

Mld. St. 14 points to the same. The needs for new and other types of competence and skills is rapidly developing and changing, which may increase the gap between supply and demand of workers with specific skills (Meld. St. 14, 2019-2020). What we do know is that changes in technology, climate and demography will result in an altered skill demand due to new ways of working and new tasks (Meld. St. 14, 2019-2020).

Building on this, NOU 2020:2 explains that “employers are demanding candidates with discipline-specific skills as well as generic skills such as collaboration and communication skills. Previous research has also shown that students in higher education demand better communication skills and the development of collaboration skills” (NOU 2020:2, p. 98).

8.1.5 Responsibility

Seeking an understanding of who should be responsible for providing supply of competence development, the OECD emphasizes that political cooperation and commitment are crucial: “it starts with policy because it is a policy issue” (OECD, 2019, p. 96); “. However, regions can be a “support function” and universities can be a “linkage function” (OECD, 2019, p. 96). conclude by emphasizing that responsibility for "redesigning education and skills systems to fit the new world of work is a complex task that requires policy" and that this, in turn, "lies with regional policymakers, but also with national ministries and employment agencies, and is often split across stakeholders (OECD, 2019, p. 54).

The MTIF call attention to Norway’s responsibility as a country, to deal with climate change: “the state must become a powerful toolbox and facilitate opportunities so that the companies later can make use of these” (MTIF, 2022, p. 8). However, even with a strong expression for state intervention, it is still:

“primarily the companies' own responsibility to take advantage of the market opportunities and deal with the challenges that arise from the transition to a low-carbon society” (MTIF, 2022 p. 7)

The KBU also considers this to be the overall responsibility of the state administration, while the counties have a special responsibility to ensure that regional competence requirements are met (KBU, 2022). This is important because Norway is obliged through an international educational development in the OECD where the overarching goal is to “promote and design policies that have a positive impact on economic growth and social development in member states” (KBU, 2022, p. 47).

Although government intervention is high on the political agenda, and is described as having the overall responsibility, businesses and industry are considered to have the “main responsibility” of competence development seeing as “it is not possible to achieve the goal of lifelong learning for all, without a working life that invests more in the skills of its workforce, provides good learning opportunities for individuals, and facilitates learning at work” (Meld. St. 14, 2019-2020, p. 9). The government emphasizes the need for more proactive competence policies in which companies, industries, and workers must actively participate. Therefore, the state "should not and will not take over the responsibility that workers and public and private companies have to invest in the skills that are necessary for the company" (Meld. St. 14, 2019-2020, p. 11).

While previous papers have also mentioned responsibility at the level of higher educational institutions, the NOU 2020:2 explain how and why by referring to the “broad societal mandate that includes research, education, and conveying” (NOU 2020:2, p. 115) held by universities and colleges:

The sector must be responsive to society's need for competencies and ensure a supply of qualified manpower for both the private and public sectors. But the uniqueness of the higher education sector is also to be a corrective to society by producing new ideas, new knowledge, new skills, and new ways of doing things, and by transferring new knowledge and skills to students. (NOU 2020:2, p. 115).

With this as the background, higher education institutions are said to be able to “solve the labor market's most challenging tasks [by] meeting the immediate competence needs of the labor market” (NOU 2020:2, p. 97-98).

8.2 Creating an overview: summary value and variances of MEES students and alumni

Before reading the statistics, do note that at the top of every page in the survey, an overview of the competency framework as well as a summary of definition were presented. This is the same as was presented in the theory chapter of this text. This was done to remind students and alumni who took the survey, what the definition of each competency were.

8.2.1 Alumni

Of the alumni participants, 46.7% were students of 2020-2022. This is noteworthy for three reasons. Firstly, they are newly graduated and started three years after the first class. Secondly, this group was hit the hardest by COVID-19 restrictions, which means most, if not all, of their classes were online. Thirdly, this is the biggest group of alumni who replied, which may affect the statistics. The second largest group of participants was the 40% who studied 2018-2020. This group was also affected by COVID-19 restrictions, but considering lockdown happened while they wrote their theses, it is likely they were not as affected seeing

as one tends to lock oneself in voluntarily when writing such big projects. The two smallest groups were both 6.7%, and were enrolled in 2017-2019 and 2019-2021.

Out of all the participants, only one came from outside social science (like occupational therapists (nor: vernepleie), a medical bachelor). The remaining participants were 40% from political science, 26.7% from sociology, and 33.3% “other” social science bachelor’s.

When asked to what degree alumni feel the MEES program taught them sustainability competencies from a scale of ‘1’ = not learned’ to ‘5’ = very well’ (see table 1), all replies hold to the middle ‘3’ = ‘medium well’. There are no strong deviations, and vary from 1-3 votes which determined the outcome.

To what degree do you feel like the MEES program taught you the competencies described above?

Svar	Not learned	Low	Medium well	Well enough/sufficient	Very well	Diagram
System thinking competence	0	1	8	6	2	
Anticipatory competence	0	8	5	3	1	
Normative competence	0	3	7	6	1	
Strategic competence	1	5	6	5	0	
Interpersonal competence	0	4	5	7	1	
Value-thinking competence	0	2	8	6	1	


 ■ Not learned ■ Low ■ Medium well
 ■ Well enough/sufficient ■ Very well

Table 1: “To what degree do you feel like the MEES program taught you the competencies described above”

When asked how they learned the competencies (see table 2), only 17.6% of alumni voted internship (in addition to other choices) increased their learning, while 11.8% said the competencies were not learned through the program. Those who did ‘not learn this through MEES’ all explain this was learned by reading literature relevant to the work placement, working with projects external to the university, and through a job either during their study or after graduation.

How did you learn this?

Antall svar: 17






Svar	Antall	% av svar	
not relevant because I did not learn this through MEES	2	11.8%	 11.8%
internship	3	17.6%	 17.6%
reading the curriculum	14	82.4%	 82.4%
group assignment (s)	13	76.5%	 76.5%
lecture/in class	13	76.5%	 76.5%

Table 2: “How did you learn this?”

Alumni express a strong wish for more focus on ‘strategic competence’, followed by ‘anticipatory competence’ and ‘interpersonal competence’ (see table 3).

Which of these competencies do you wish were more focused on in the program?

Antall svar: 17







Svar	Antall	% av svar	
Value-thinking competence	5	29.4%	 29.4%
Interpersonal competence	8	47.1%	 47.1%
Strategic competence	12	70.6%	 70.6%
Normative competence	6	35.3%	 35.3%
Anticipatory competence	9	52.9%	 52.9%
System thinking	4	23.5%	 23.5%

Table 3: “Which of these competencies do you wish were more focused on in the program?”

The graph with highest variety was related to competencies learned outside of MEES. The variety makes a summary value difficult, as participants tend to report either that they did not learn this outside of MEES, or that they did on a ‘sufficient/well enough’ level.

Which of the competencies did you learn outside of MEES and to what extent?

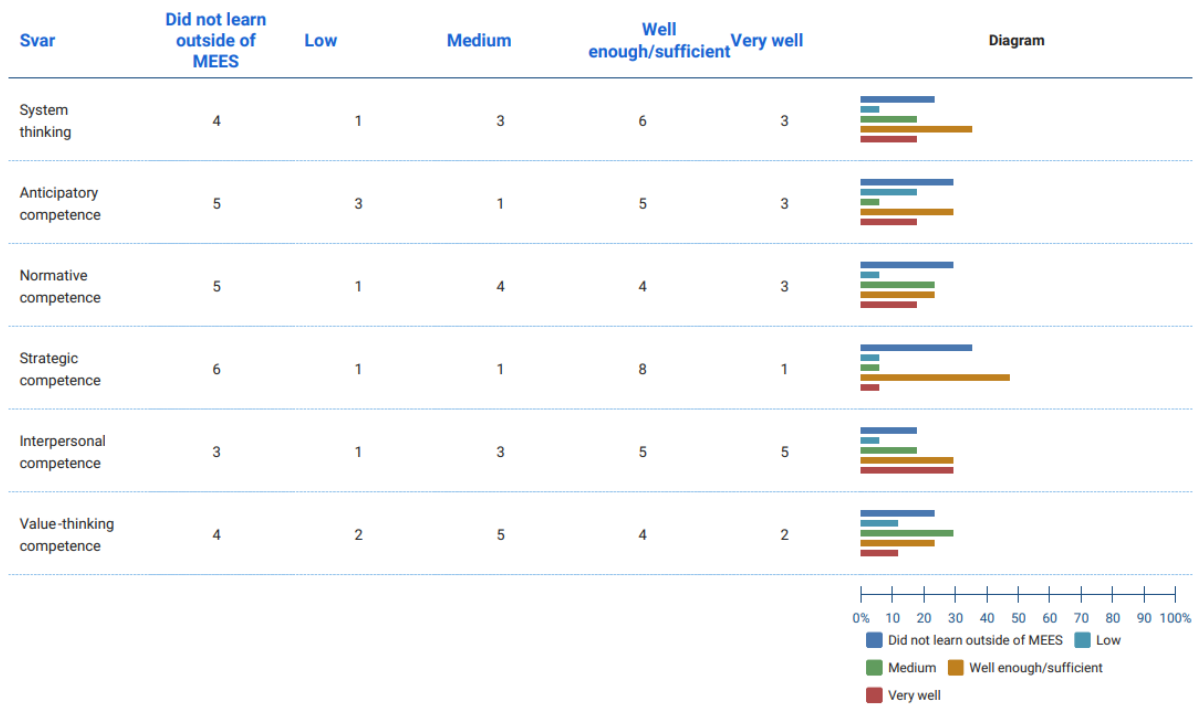


Table 4: “Which of these competencies did you learn outside of MEES and to what extent?”

When asked to define ‘outside’, participants report part-time jobs during studies, previous studies like bachelor or extra/other classes, as well as reading outside of the curricula.

While many reported they could not find a MEES related job at the time where it was relevant for them to apply, 29.4% describe they work with MEES related tasks quite a bit. 17.6% replied (close to) all they do is MEES related. On the other side of the graph, “somewhat/a little” received 11.8% votes, ‘barely’ received 17.6% and ‘not at all’. To clarify this better, they were then asked which competencies they used in their (daily) work. The variation is so strong it is difficult to prove a summary value representative.

Do you actively use the competencies you learned in MEES, in your (daily) work?

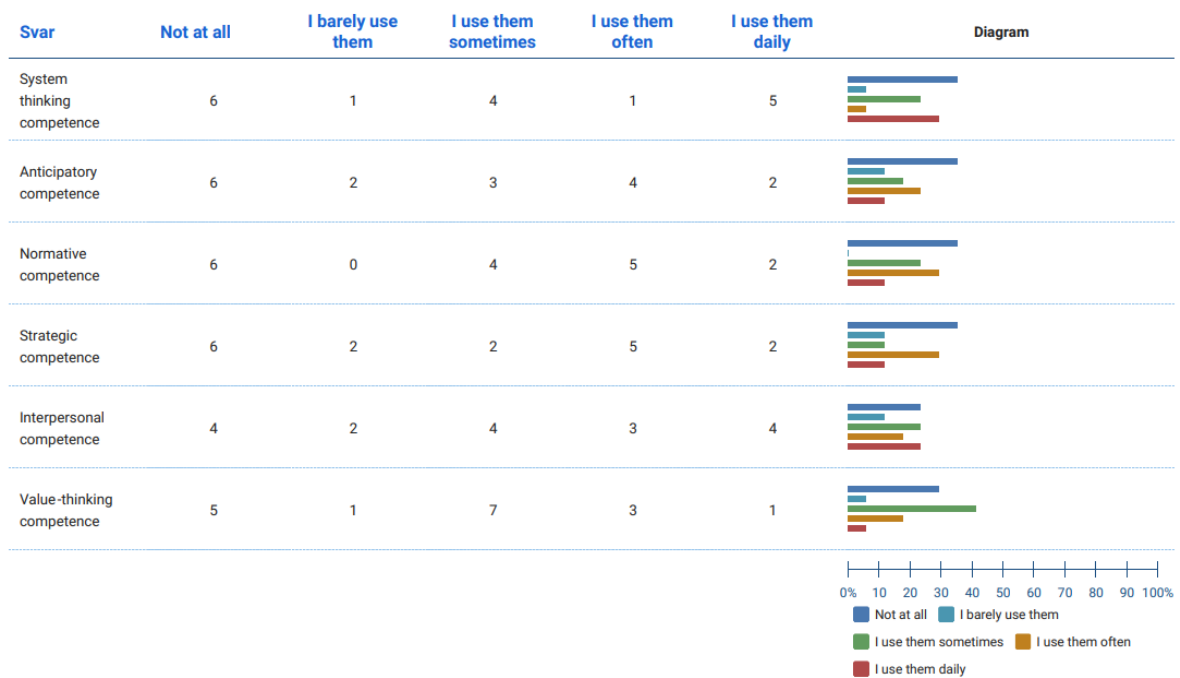


Table 5: “Do you actively use the competencies you learned in MEES in your (daily) work?”

8.2.2 Enrolled students

The survey for class 2021-2023 was concerned with currently enrolled students. One person who replied to the survey was enrolled in 2019-2021, which leaves a small inaccuracy of the results.

This group of students hold a more varying background than those who participated in the survey for alumni. In addition to the majority holding a social science background (history, environmental studies and social anthropology), 16% had a background in economy and business, 21.2% had a background in marketing and leadership.

When asked to what degree enrolled students feel the MEES program taught them sustainability competencies from a scale of ‘1’ = not learned’ to ‘5’ = very well’ (see table 6), all replies pull towards low and medium well. Yet, a summary value will not tell us all we wish to know from this table. The variance is high, which means people do not agree with each other. While only 0-2 votes determined the highest ‘score’, people disagree with each other to a great extent, especially looking at ‘interpersonal competence’.

To what degree do you feel like the MEES program taught you the competencies described above?



Table 6: “To what degree do you feel like the MEES program taught you the competencies described above?”

When asked how they learned these competencies, most of the replies match alumni. However, ‘internship’ was deemed more important here, as it received 42.1% votes. ‘Not relevant because not learned in MEES’ received the raging number of 31.6% votes, however, this is only six people.

Students are generally in agreement when it comes to what competencies they wish were more focused on in the program. While all competencies received at least 26.3% votes, strategic competence and anticipatory competence were the ones students more often referred to. Strategic competence received 68.4% votes, and anticipatory competence received 52.6%.

Which of these competencies do you wish were more focused on in the program?

Antall svar: 19







Svar	Antall	% av svar	
Value-thinking competence	9	47.4%	 47.4%
Interpersonal competence	5	26.3%	 26.3%
Strategic competence	13	68.4%	 68.4%
Normative competence	5	26.3%	 26.3%
Anticipatory competence	10	52.6%	 52.6%
System thinking	8	42.1%	 42.1%

Table 7: “Which of these competencies do you wish were more focused on in the program?”

Taking the world outside of academia into consideration in Table 8, the summary value is 3.2 - medium well. There are no strong deviations, resulting in low variance. In the follow-up question, participants were asked *where* this was learned. This strongly corresponded with what alumni reported: ‘bachelor’s degree’ received 56.3% votes and part-time job during studies received 62.5%. Participants also mentioned taking extra classes, joining research projects, online researching and reading forums, as well as political debates and activism.

Have you learned any of the competencies outside of MEES and to what extent?

Svar	Did not learn outside of MEES	Low	Medium	Well enough/sufficient	Very well	Diagram
System thinking	1	2	6	8	2	
Anticipatory competence	2	1	7	7	2	
Normative competence	2	2	8	7	0	
Strategic competence	1	4	5	7	2	
Interpersonal competence	1	1	7	7	3	
Value-thinking competence	2	2	5	9	1	



Table 8: “Have you learned any of the competencies outside of MEES and to what extent?”

If not learned, participants still felt the key competencies would be valuable for their future jobs. Here, the variance is so minimal the summary value seems largely agreed upon: 4,1 - relevant.

If not learned*, do you feel like the key competencies would be relevant for your work in the future?

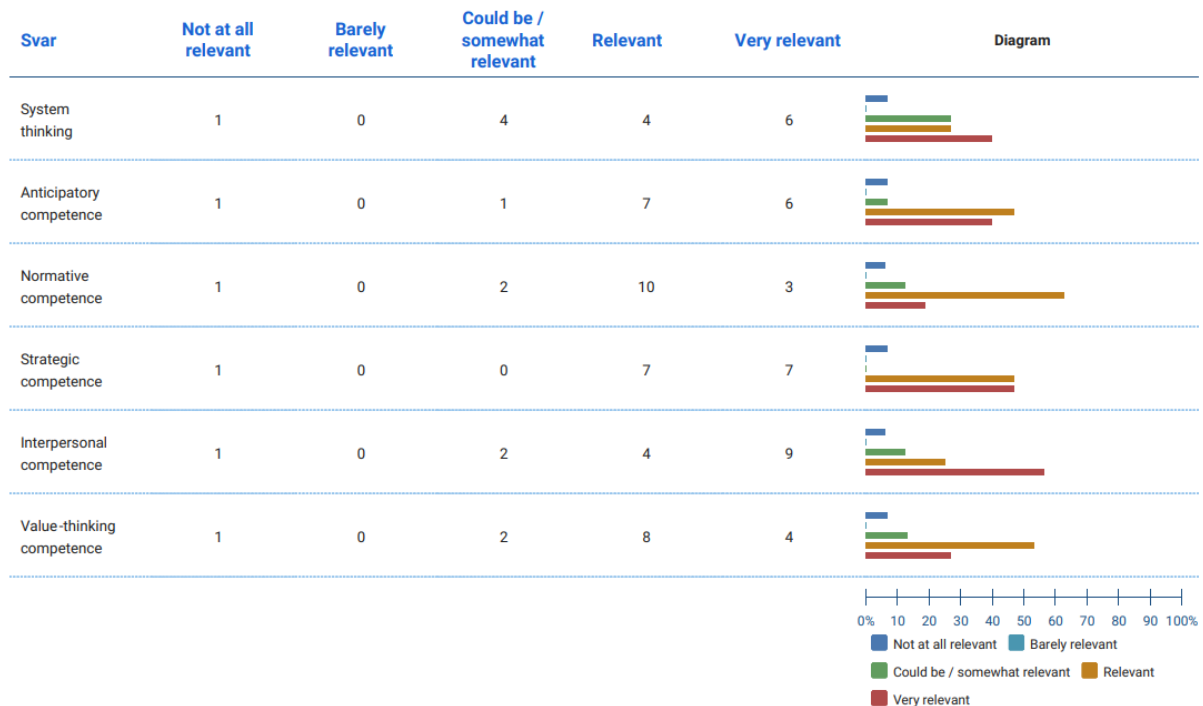


Table 9: “If not learned, do you feel like the key competencies would be relevant for your work in the future?”

8.3 Going deeper: in-depth interviews and open-ended survey questions

8.3.1 How 'unhappy' students and alumni relate to MEES

From the interviews with ‘unhappy’ students as well as qualitative questions in the survey, three themes were identified: (i) lack of coherence and structure, (ii) lack of sufficient or in-depth education, and (iii) understanding ‘why’.

The majority of the ‘unhappy’ students report a lack of coherence and structure in the study program, but vary in their explanation why. One alumni stated:

"Subjects are not really linked to each other (with maybe a couple of exceptions on methodological subjects) and therefore you never get the feeling of having the "full picture" on these matters. I get that [MEES] is a really complex subject, but after two years investing my life on this, I don't feel like I've mastered any of [the competencies mentioned]" (survey)

Some say that this might have been caused by the restrictions laid by COVID-19, while another large group of people agree that the program was sufficient in its interdisciplinary approach. For the same reasons, however, others argue some classes are lack depth:

"I feel that more in-depth teaching in these topics might have helped to further strengthen students' strategic, normative and value-thinking competences." (survey)

The lack of depth is by some, described as due to a lack of practical application:

"I feel like while the MEES programme gave me a great amount of knowledge about energy transitions, I didn't get anything related to practical applications of that knowledge. I didn't learn how to actually create different scenarios of the future on a scientific basis or build concrete strategies. In short, it feels like I know many smart words, but have no idea how to use them" (survey).

The currently enrolled students mention the same categories, but take it one step further by explaining why they feel like this and suggest a solution: they need a better explanation of ‘why’ these competencies are taught. As one student explained how the same concepts were taught ‘sufficiently’ in her undergrad:

"Every class was formulated to be relevant to the field of environmental science and the purpose and application of such knowledge was always very clear from the beginning."

One student summed up the issue this way:

“I have probably learned more than I realize at this point because competences become visible in practice. But I guess the programme lacks in connecting with practice/business. We are not aware of what we are able to do with the knowledge we obtain in the programme. The learning outcomes in and throughout the courses are perhaps not clear enough, and how they relate to different competences or skill sets. The vision and goal of MEES should be clearer which will help students better understand what we are able to do. I think a more clear structure and explicit aims of each steps/semesters would help.”

8.3.2 How 'happy' students and alumni relate to MEES

Although ‘happy’ students agree that the lack of practical use of theories lead to a lack of regional relevance of their education, they point to two key factors in why they are "happy": (i) ‘expectations’ and (ii) 'personal skills'.

“I think all of [the sustainability competencies] belongs to a continuous process of learning in which the master could only give a fundament to build on” (survey)

“The courses were a foundation for many of these competencies and made us question assumptions” (survey)

Happy students view their education as “an entry ticket to the job market, and not the “solution” in itself” (interview 8). They have a different perspective on what a master program should provide and thus different views on the purpose of the program. One interviewee summed it up this way:

“It comes down to what you expect to learn and what you want out of your studies. I started MEES expecting to learn more things that I could actively use, and I have. It's difficult to learn something concrete in the social sciences, but this program is moving towards the environmental-technical field. I was missing something more concrete from that field - something that I could put to [active] use” (Interview 2)

Another participant summed it up by highlighting the importance of volume training:

“I feel [classes were] 50-50 sufficient because you have the historical perspective, system thinking and anticipatory thinking, but the remaining 50%, you kind of have to get on your

own” (Interview 1)

Section 9 - Discussion and analysis

In this section, I will discuss the empirical findings in combination with theoretical insights presented above and analyze in the following order: first, whether higher education is given political room to be a vehicle for fostering a sustainable transition, second, if the MEES program is successful in producing transition managers, and third, what of this needs to be improved in order to make higher education a better vehicle for fostering the transition.

9.1 Are today's educational policies supporting the sustainability transition through the development of competencies and skills?

9.1.1 Does interventionist logic exist?

To discuss whether the idea of producing people who are able to actively create change exists, we must take a step back and start by exploring how the Norwegian Government places political intervention on the agenda. What is of interest here, is to take note of the ‘responsibility’ related to the cooperation in the tripartite program. The Government states it will “pursue an active policy to include more people in the working life”. This does not mean the government aims to be the only or main actor, but rather to provide solutions for businesses to take use of. The argument for state intervention is that “the transition that is needed is nevertheless of such a scope that the state must become more involved through an active and ambitious industrial policy, which works in concert with the companies” (MTIF, 2022 p. 7). Therefore, the state takes on the role of a diplomat and tries to be an active driver of change through incorporating other actors and finding meaningful pathways together; by “placing great emphasis on cooperation with all relevant parties” (MTIF, 2022, p. 7).

The understanding of the state as an important contributor is aligned with the arguments put forward by Meadowcroft, stating that sustainable development is first and foremost a political project (Meadowcroft, 2011). The Norwegian government argues for the coordination and inclusion of multiple actors in order to create a way forward together. This shows how politics play an engineering role in creating a development trajectory in Norway.

This also follows Frantzeskaki's understanding of transitions as something that requires political integration to ensure social cohesion and equity, where multiple actors from different levels and domains need to be involved to achieve the overarching goal of sustainability (Frantzeskaki et al., 2012).

The political engagement put forward by the Norwegian government describes a state which argues for being an active party in driving changes and providing sustainable solutions. Private companies still play an important role, and are included because of that. However, the Norwegian government argues for state intervention due to the scope of the required transition. This directly corresponds with Meadowcroft's argument that state intervention is required to realize the full potential because sustainability transitions are inherently political (Meadowcroft, 2011). This demonstrates how political dimensions of sustainability transitions are being pulled in and actively being used. Consequently, it can be argued that interventionist logic does exist in Norwegian educational policy.

The interventionist logic can also be seen at the supranational level, through the OECD. The OECD points to two incremental factors of regions in industrial transitions: (i) to broaden and diffuse innovation (OECD, 2019, p. 10), and (ii) to supply the right skills for emerging activities (OECD, 2019, p. 45). The goal and aim is specified, but we circle back to 'responsibility' when searching for an extent of interventionist logic. One key finding that will be discussed further here is the understanding of higher educational institutes' responsibility in achieving these goals. But first, we go through the overall extent of interventionist logic.

The OECD states that "enhanced knowledge sharing is fundamental to economic development and industrial modernisation" (OECD, 2019, p. 53). Therefore, "more actively engaging firms in training and education can help boost productivity and ultimately enhance the contribution of local firms to industrial modernisation (OECD, 2019, p.49). The OECD is also concerned with integration of 'anchor institutions', such as universities, vocational education and training institutions, as they can "reach out to employers to support changes in the workplace" (OECD, 2019, p. 53). While the exact approach will vary in each region depending on the local labor market, including a variety of actors is important to encourage cooperation and knowledge exchange (OECD, 2019).

The OECD argues that lack of coordination and financing mechanisms is a policy issue in need of a policy response. This includes "effective multi-level partnerships" and "ensure sufficient and well-targeted financing and investment", and mention this can be achieved through the use of tax incentives as subsidies, paid training leave, loans, personal

training accounts, increasing stakeholder participation in local skills ecosystems, better coordination arrangements and capacity building initiatives (OECD, 2019, p. 54). The rationale for this focus is to (i) "[create a] coherent development of transition policies across levels of government", (ii) "improve policy effectiveness and efficiency" and (iii) "stimulate private sector engagement in the provision of training" (OECD, 2019, p. 54). To do this, we must "clarify responsibilities across and within different levels of government and different groups of stakeholders" (OECD, 2019, p. 142). An explicit answer to this is not presented, and thus comes across as vague. It is difficult to pinpoint the state's responsibility in this sense because there is nothing to compare it to. However, what is stated is that the main responsibility of the state is to provide sufficient infrastructure, and finance and support businesses so that the tools laid out by the government can be practiced.

The MTIF follows the same logic in Norway's Roadmap for the Green Industrial Initiative. Here, it is stated the overall goal will be to "accelerate the green transition in the business sector" (MTIF, 2022, p. 64). This forms the basis for why national, regional and international cooperation across sectors is required (MTIF, 2022). For this reason, the triparty industry program for competence development was put forward. The cost-sharing is divided so that "state pays for education and training programmes at all levels of education, while the companies and the individual employee invest their time" (MTIF, 2022, p. 54). However, it is the industry itself that must define their needs so that relevant programs can be created.

It is the government's task to "ensure that various initiatives for the green shift are well connected and that the responsibility for the various initiatives is clearly positioned between ministers and ministries, agencies and public enterprises (MTIF, 2022, p. 60) and will therefore "place great emphasis on cooperation with all relevant parties (MTIF, 2022, p. 7). What this means, is that the state aims to be more involved through the role of a powerful toolbox. The Government does not seek to 'intervene' to the point where companies are forced, but rather lay out market opportunities for companies to grab: "the Government can facilitate private initiatives and investments through sound framework conditions and an active industrial policy, [but] it is primarily the responsibility of the companies to utilize the market opportunities triggered by the green transition (MTIF, 2022, p. 8).

This puts a cap on the interventionist logic to some extent. There is broad consensus for more research on competence needs and to acquire these competencies, but there is no set plan on how to achieve this. To be able to create a better functioning system, the Competence Reform requires the work sector to reach out and express their needs. While this is done to make sure the necessary and required competencies are taught, it poses a challenge for the

pace in which this can be achieved. It is clear that there is an idea to produce people who can actively create change, but does it move beyond a mere idea?

To what extent the state should intervene is a question as old as time, and this text will not go further into that discussion. However, considering the upcoming challenges of time management, it may be time to put forward the question of whether it would be beneficial to also include the state as a more powerful actor if our overarching goal is to reach sustainability before the climate crisis reaches new heights.

9.1.2 Is the idea to produce people who actively create change?

The MLP mentions three 'neighbors' of education: Policy, Science and Culture. These are part of the regime. Educational policy is thus part of the regime. With this as the background, it can be assumed that there is a level of stability (as 'established practices' in the MLP refers to). If this is true, can 'disruptive' or 'interventionist' policies be expected? If this is not (so much) the case, then it could be expected that educational policy - just like R&D - would rather be focused on repeating the same 'locked-in' approach. In other words, not so much of an 'interventionist' logic. This is, however, not the case.

In all of the documents analyzed, there is a consensus that there is a need for more research on what kind of competencies will be in demand in the future. With this as the backdrop, the Norwegian government puts forward a 'competence reform' with two goals: (i) that no one should be left unemployed because their competence 'expires', and (ii) to close the competence gap between the skills needed in the workplace and the skills people actually have. To reach these goals, the "educational system must open to life long learning and gain a better connection between supply and demand for competence development" (Meld, St 14, 2019-2020, p. 7).

"Norway and Norwegian industry may have the world's best conditions for success in the green transition, but it will require higher ambitions, a faster pace, better ability to follow through and more systematic cooperation than today" (MTIF, 2022, p. 7). As a result of this declaration, the Norwegian Ministry of Trade, Industry and Finance (MTIF) presented a roadmap for the "Green Industrial Initiative". To realize this initiative, "[Norway] needs competent employees at all levels of education, from skilled workers to technologists" (MTIF, 2022, p. 53). To achieve this, the Norwegian government will submit a white paper to the Storting that will "highlight the skills needed in working life in the short and long term"

(MTIF, 2022, p. 55). The aim of this report is to be able to "meet society's skill needs in the future and to ensure that citizens throughout the country have access to education" (MTIF, 2022, p. 55).

Taking part in helping the industrial sector's future challenges, the Government will implement a 'broad competence reform' for working life based on a tripartite cooperation (MTIF, 2022). Hence, the 'triparty industry program for competence development' was put forward as a way for the government and work sectors to cooperate and increase participation in competence development (HKDIR, 2022, p. 27). The goal of the multiple-sector program is to assure that competence development is aligned with short- and long-term sector needs through an "effective and strengthened dialogue between the business community, educational institutions and the educational authorities at both national and regional level" (MTIF, 2022, p. 53).

Not only does this underline that there are interventionist policies on several levels of government, but also that there are incentives to make education a vehicle for fostering the transition through creating people who can intervene. This shows that educational policies are being developed in order to support the sustainability transition. To better comprehend the capacity of these policies to support the transition to sustainability through the development of competencies and skills, we need to take a closer look at how higher education institutions are integrated as a piece of this puzzle.

9.1.3 Integration of Higher Education Institutions

What is known is that Norway experiences a lack of competent manpower and the tripartite program is concerned with tackling this challenge. We do not know what challenges tomorrow will bring. Here, the state argues they can only facilitate. In the end, it is the companies that must adopt what the state facilitates (MTIF, 2022). However, the Meld. St highlight that despite businesses' responsibility to take advantage of what the state brings forward:

we cannot rely on companies to take full responsibility for meeting the skills development needs of working life. Many small and medium-sized enterprises do not have the capacity to work systematically on skills development for their employees. Companies are primarily interested in meeting specific skills needs within a relatively short time horizon (Meld. St. 2019-2020, p. 23).

For this reason, higher educational institutions are brought into the debate. The Government takes part of the cost-sharing by engaging the triparty industry programmes for competence development, where "the state pays for education and training programmes at all levels of education, while the companies and the individual employee invest their time" (MTIF, 2022, p. 53)

While politics is expressed to have the vital role, universities can be 'major drivers of industrial change' if their potential is fully exploited: "universities are important knowledge generators that can contribute to innovation and actively support the transition from old to new industries by bringing new knowledge and networks into the region" (OECD, 2019, p. 68).

This does not change the fact that lack of skilled workers is a policy issue, but that policies must "pursue a variety of objectives and reach across different target groups" so that the complex task of redesigning education and skills systems will fit the new world (OECD, 2019, p. 54).

The MTIF emphasizes that we do not yet know what tomorrow's requirements will be, but we do know that they will be based on completely new knowledge. Universities and university colleges are important actors in knowledge development as they contribute to knowledge sharing and distribution between stakeholders, which in turn diffuses technology and competence nationally and across borders (MTIF, 2022, p. 48).

Consequently, the Government will "give tertiary vocational education a major role in the competence reform, place a greater role in teaching technical expertise, and in furthering education and development of the workforce throughout the country" (MTIF, 2022, p.55).

The Government's plans for academic higher education is not as defined as for vocational education, but it is stated the Government will "consider how the recommendations from the funding committee for universities and university colleges should be followed up" (MTIF, 2022, p. 55). The priority of these fundings is still concerned with the same goal: "to equip the sector to meet the competence needs of society in the future" (MTIF, 2022, p. 55). While the specific way of how to achieve this is under development, it is clear there is an idea and a need to create people who have the competencies which the future requires. Overall, specific competencies remain too vague and unclear. Some more specific competencies are mentioned, but it does not go along with the presented competency framework.

9.1.4 What competencies are suggested for higher education?

The Meld. St. 14 committee sums up the majority of the papers when they state we still need to identify tomorrow's required competencies. They propose multiple changes that shall better fit the needs of the work sector. The main proposal is a work sector-driven competence development program which aims at "identifying needs, developing suggestions for change, and finance their implementations, at high school-level, vocational training, higher education, and high quality non-formal training" (Meld. St 2019-2020, p. 39).

HKDIR places a great emphasis on vocational education and how this can be further developed through various training and courses. The reason behind this focus is to make sure as many people as possible will have the actual possibility to further develop their competencies throughout their whole lives, so that they are always ready to meet tomorrow's challenges (HKDIR, 2022).

While highlighting we do not yet know what competencies are 'missing', attention is given to assure high quality cooperation between education and different sectors where the expressed needs from the work sector is a priority (HKDIR, 2022).

Bringing in the prominence of HEIs, KBU refers to the Vocational School Act §4 and explain how higher education differs from higher vocational training seeing as HEIs are to offer higher education based on "leading research, academic and artistic development, and experiential knowledge" as opposed to building on knowledge and experience from occupational fields (KBU, 2022, p. 72). Still, the NOU 2020:2 is the only paper that explicitly refers to green competence to such a degree where it is tangible. They do, however, point to what may be the cause of vagueness in the other papers. What is considered 'relevant' competencies is understood differently by various businesses:

Some businesses highlight that higher educational institutions must create people to solve specific tasks and problems in the individual company. From the companies' perspective, the extent to which candidates are able to do this after completing their education, is what the company will define as relevant to the work sector (Meld. St. 2019-2020, p. 97).

To universities and colleges on the other hand, 'relevance' can imply to educate people with great basic skills, who transition from schooling to work with ease, and who quickly acquire

more specific competence that is required to solve the concrete problems they are served when working (Meld. St. 2019-2020).

It is not one specific type of competence that a sustainable transition demands. Both general and specialist environment related competencies are needed (NOU 2020:2). While 'green competencies' do not have a clear definition, the committee indicates four skill sets:

1. 'Generic skills' - self-reflection, critical thinking and social awareness, risk evaluation, collaboration skills, adaptability and environmental awareness;
2. 'Vocational-, technical- and science skills' - demand for competence and science at all levels. Need for skilled vocational workers, technologists, natural scientists and researchers;
3. 'Administration management and climate risk' competence: transversal and sector-wide competence, climate risk competence and ethical assessments;
4. 'Leadership skills': A solid anchoring throughout the organization, not least at the top, is required for more environmentally friendly routines and practices in companies (NOU 2020:2, p. 82-83).

Although it could be argued this somewhat adds to the existing 'sea of labels' of sustainability competencies, these definitions revolve around the previously mentioned set of skills. It is clear that there is a need for a better understanding of how we are to deal with climate change. One solution that has been presented is to create people with the capacity to understand what is going on and how to take action. With this in mind, the Norwegian government has proposed multiple cooperative programs in which educational policies are strengthened. The intention of these educational policies is to lay the foundation of competencies and skills needed in the future, and through that, support a sustainable transition. Since higher education institutions are powerful actors in the creation and diffusion of new knowledge, the integration of these institutions can create great momentum.

9.2 How are competencies and skills developed in today's sustainability education?

To explore how students acquire their competencies and skills, we will use the case of MEES - Master in Energy, Environment and Society at the University of Stavanger, Norway. To unravel this, we first go into what sustainability competencies and skills are. Second, we ask what competencies HEIs aim at equipping students with. Third, we ask if students acquired these competencies. Lastly, we look into whether these competencies are actively being used in alumni's work.

9.2.1 What are competencies and skills?

A set of terms needs to be explained, so that we can understand what makes some competencies 'key' as opposed to other competencies that are called 'basic.'

Competence and sustainability competencies.

'Competencies' are fairly abstract and "in need of translation into specific learning outcomes to be operational (e.g., for curriculum development)" (Wiek et al., 2011, p. 204). The term 'competence' is ambiguous, particularly in sustainability education. It is associated with "skills, abilities, capacities, qualifications and other concepts" (Wiek et al., 2011, p. 204). This thesis will use Wiek et al.'s definition of competence as "functionally linked complex of knowledge, skills, and attitudes that enable successful task performance and problem solving with respect to real-world sustainability problems, challenges, and opportunities" (Wiek et al., 2011, p. 204). This definition also aligns with Bianchi's definition of 'sustainability competencies' as "the interlinked set of knowledge, skills, attitudes, and values that enable effective, embodied action in the world with respect to real-world sustainability problems, challenges, and opportunities, according to the context" (Bianchi, 2020, p. 9).

Basic academic competency.

The basic academic competency is defined to be what underpins key competencies in any degree program (Brundiers et al., 2020, p. 19). Brundiers and colleagues expands Wiek and colleagues' definition to also includes "the abilities to recognize different approaches to theory building (e.g., social constructivism, critical theory); to acquire basic research

competencies to enable evidence-based decision making, including conducting an interdisciplinary literature review (Brundiens et al., 2021, p. 19). They stress critical thinking as an important part of basic academic competency, and uses the definition used in UNESCO's (2018) recent publication on Education for Sustainable Development: critical thinking competency as "the ability to question norms, practices and opinions; to reflect on one's own values, perceptions and actions; and to take a position in the sustainability discourse" (UNESCO, 2018, p. 12; in Brundiens et al., 2021, p. 19).

Key competencies.

It is important to note that key competencies does not imply that basic or "regular" competencies and skills are not important. Critical thinking and basic communication skills are considered 'basic' and utterly important at the same time. What makes some competencies 'key' is rather that these are considered essential for the specific study program, as well as competencies requiring "special attention because they have not been the focus of traditional education" (Wiek et al., 2011, p. 204). Complex challenges and opportunities of modern societies make key competencies more and more relevant, especially considering globalization, artificial intelligence and sustainable development (Bianchi, 2020; see also Lambrechts et al., 2013; Mindt & Rieckmann, 2017). Therefore, this text follows the definitions in Brundiens' Integrated Problem Solving Competency-framework as the baseline for understanding and discussing sustainability competencies.

9.2.2 What are students supposed to develop?

In the case of MEES as one HEI, the aim is to equip students with knowledge to answer environmental challenges associated with climate change. This is done following a multidisciplinary approach:

"The program gives students an overview into energy specific challenges, environmental challenges associated with energy (e.g. climate change, water resources deterioration, competition for land, etc.), and explores the different actors, interests, perceptions and drivers of a possible transition towards a low carbon society in diverse contexts. It encompasses the environmental, social and economic dimensions of sustainable development." (UiS, 2023).

To answer this, the program explores transition theories through two general questions: (1) "How can societal changes be managed and directed towards specific goals such as sustainable development and a low carbon society?" and (2) "What are the specific configurations of politics and policy that will enable a transition to a sustainable society in different contexts?" (UiS, 2023).

Career wise, the study program highlights the demand for knowledge that is expected to increase in the future. There is a need for new ways of thinking and new ways to govern in the nexus between energy, environment and sustainability. There is a need for new ways to "enable social change together with low-carbon energy transitions" (UiS, 2023). Head of Department of Media and Social Science Oluf Langhelle argues in the program's promotion video that:

"[Our society] needs people who are able to recognise the environmental challenges we are facing and who are experts on possible solutions that are available. The demand for such people will increase. People who can help businesses develop strategies that account for the changing climate will be vital for maintaining current and developing future goals" (UiS, 2023).

With this as its backdrop, the master program puts forward the 'Sustainability Manager' as a career pathway for the future, as the role "will be vital for maintaining current and developing future goals" (UiS, 2023). While the learning outcomes stated on the website refer to both basic and key competencies and skills needed to become a Sustainability Manager, there is only an implicit and somewhat vague overlap to the competence framework. Two points do, however, overlap more explicitly with the competence framework: students should be able to (i) "critically assess different sources of information and to use them to structure and develop a scientific argument" and (ii) "apply theoretical approaches, formulate proposals, and recommendations" (UiS, 2023). The first point coincides with systems-thinking, values-thinking and future-thinking as it refers to being able to analyze complex information, map this out and create and negotiate a future plan. The second point coincides with futures-thinking and strategic thinking, as it refers to crafting future sustainability visions and developing transition strategies. We can therefore conclude that, in theory, all five key competencies are a part of the study program (the fifth of interpersonal competence is considered a part of each step in the problem-solving process). In the next section, we will

discuss some issues that are raised when students look to learn the competencies for active use.

9.2.3 Did students of the MEES program acquire competencies relevant for implementing sustainability?

As presented in the findings (section 8), the survey and interviews show two main categories of students and alumni: ‘happy’ and ‘unhappy’. In spite of this vast variance in perception of the study program, the survey showed no strong deviations when alumni and students were asked to what degree they felt the MEES program had taught them sustainability competencies. It was only 0-3 votes that determined the outcome. All replies pulled towards the middle ‘3’ = medium well for alumni, and ‘2’ to ‘3’ low to medium well for enrolled students.

To what degree do you feel like the MEES program taught you the competencies described above?

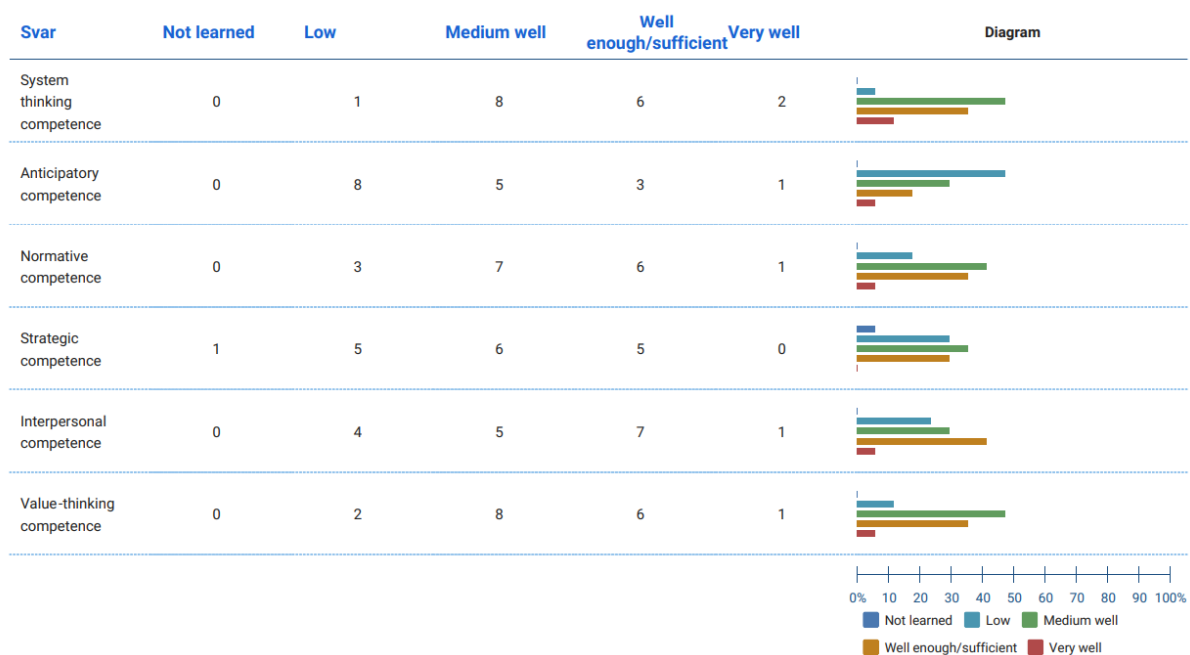


Table 1: “To what degree do you feel like the MEES program taught you the competencies described above” (ALUMNI)

To what degree do you feel like the MEES program taught you the competencies described above?



Table 6 : “To what degree do you feel like the MEES program taught you the competencies described above?” (ENROLLED STUDENTS)

This tells us that students and alumni are familiar with the sustainability competencies, and did learn them, however to various extent.

How can there be a strong variation in perception of the study program when students and alumni seem to somewhat agree with each other that they were taught sustainability competencies low to medium well? Why is there variance and what makes up the two groups?

The two categories are differentiated by their perception of the study program as a whole. At first glance, “perception of the study program” can be understood as whether people feel like they were taught sustainability competencies sufficiently or not. Through in-depth interviews, this understanding proved insufficient. It is not so much to what degree the institution was able to teach sustainability competencies, but rather to which degree students and alumni know how to act in alignment with these competencies after they have been introduced and taught. It is not so much a question of *if* they have sufficient knowledge of the sustainability competencies, but rather knowledge of *how* to put them into action. In simpler terms, the happy students are those who know how to use the competencies - they know what to do.

This is a significant finding because it is the people who know how to take theory into practice who make up the idea of a Sustainability Manager. If we want a Sustainability Manager to be able to, i.e. align core business with sustainability principles, it is insufficient to merely have knowledge about sustainability competencies. It is of utter essence to know how to put the knowledge to use. Exploring this small-scale focus is imperative if we are to advance sustainable development, because it is individuals who make up the group we expect to take sustainability to the next level.

The value of focusing on small-scale actors like individual employees is further explained through the theory of Corporate Sustainability. Following this theory, businesses who struggle to reach their full potential are those who struggle to, or even neglect the need for, bringing sustainability to the core of the business. How, then, can sustainability be brought into the core business? To reach full potential of sustainability, it is insufficient to look at only market-related conditions, organization-related conditions and the activities in between each layer. The bottom layer - the people on the floor - is still left out. It is important to consider employee-related conditions like people's motivation, their ability to bring up sustainable initiatives, having open knowledge sharing and ensuring their daily tasks are assimilated with sustainability. This small-scale focus is often overlooked in favor of company benefits.

To recognize and harness the potential of working individuals is crucial to drive transformative change in their workplaces. By recognizing the value of smaller-scale actors, such as employees, in the broader context of sustainability, we can understand their powerful role in shaping the trajectory and goals of sustainability initiatives within their respective work environments. This inclusive approach empowers individuals to actively participate in and contribute to the sustainability agenda at the micro level, ultimately influencing the overall pace and direction of sustainability within their workplace.

If we want people to be able to actively participate and contribute to sustainability, those people need to know how to act out sustainable principles. Higher educational institutions have great power in forming such students, but the case study in this paper identifies a challenge: many find their education insufficient because they don't know how to put it to use. When the two categories of "happy" and "unhappy" students are analyzed, several subcategories emerge. These subcategories are 'expectations' and 'personal skills' which make up the 'happy' students and alumni, and 'lack of coherence and structure', 'lack of sufficient or in-depth education', and 'understanding 'why' for the 'unhappy' students.

Expectations of happy students and alumni.

As stated, all students generally agree with each other when it comes to the degree in which they were taught different competencies sufficiently. A factor that differentiates 'happy' from 'unhappy' is their expectation of the study program.

The 'unhappy' students expect the link between theory and business to be an initiative to come from the faculty. Since the students do not feel like they experience this initiative, their education feel insufficient in connecting academia to the "real life out there".

The alumni who report a greater deal of 'happiness' or 'success' are generally those who expected "less" from the MEES program, and more from themselves. Several 'happy' students and alumni describe themselves as a potato. In Norwegian (the language of many of the interviewees) a potato has positive anecdotes and refers to someone who can be used for anything. It must not be mixed with the English understanding of 'potato' as someone dull, uninteresting, etc. (with negative anecdotes). While even the happy alumni wished for more concrete skills such as learning how to calculate LCA, LCE and ESG, the overall understanding of the study program was that it acted as a foundation:

"I think all of the [sustainability competencies] belongs to a continuous process of learning in which the master could only give a fundament to build on." (survey reply)

Personal skills of happy students and alumni.

To deeper understand the variations between happy and unhappy students, we need to take the topic of personal skills into consideration. Personal skills are closely related to expectations. The understanding of personal skills here goes beyond the idea of it being merely personality based. It is rather an understanding of skills gained through work, rather than a birth-given personality type.

The way personal skills are described by happy students, refers to volume training and actively using what they have learned. What makes students 'happy' is their ability to take what they learned and put it into practice themselves. One alumni believed this is what caused the gap between students:

"For a master program, it will be beneficial to have worked before you start studying - you need some extra curricular activities. Many people have only studied their books and never had a voluntary position. Those who quickly got a job after their studies, had either taken a gap year and worked, done internships or held voluntary positions. This work experience

builds the 50% of knowledge you have outside of academia, because you are able to apply your competencies and skills.”

It appears the happy students have what we can call an ‘action competency’. Happier students expect the study program to only lay a foundation for them to actively use outside of classes and books. They do not expect the program to actually provide sufficient knowledge and skills, and therefore do not rely on the program. Instead, they seek these competencies outside of the program through work experience in various forms. Thus we can conclude that the happy alumni and students have understood ‘how’ sustainable competencies can be put to use as they create their own ‘action competency’.

It is important to understand that this does not mean the ‘unhappy’ students are to blame for any “missed opportunities” or the like, but rather that the lack of an action competency is a challenge for HEIs who aim to produce people who know how to act. The problem goes full-circle. Consequently, we can conclude that the significance of ‘action’ competencies must be better incorporated in the study program. Deep-diving into how the ‘unhappy’ students describe their relation to the MEES program, it becomes clear that an ‘action competency’ is the bread crumb trail which is the foundation of the issue they point to.

Lack of coherence and structure.

The ‘unhappy’ category of students and alumni have pointed to a lack of coherence and structure as the cause of their ‘unhappiness’. While all recognize the Sustainable Competence framework and report they have been taught this to some extent, they lack a holistic understanding of the framework as a whole. Competencies are learned somewhat individually and not in sufficient connection with another. Therefore, students lack the overarching competency of the framework as an Integrated Problem Solving Competency in which the other competencies are a part. In other words, the sustainable competencies form subcategories that, when sufficiently learned and brought together, create the overarching competency of Integrated Problem Solving. Consequently, enrolled students and alumni report they miss the ‘full picture’. They experience the MEES program as unstructured because it seems vague. They understand the subject as complex, but still miss some coherent mastering of the sustainable competencies.

These aspects are symptoms of a bigger problem. The ‘unhappiness’ stems from a lack of understanding in how to bring theory into practice. Respondents experience that actual use of theories and skills are not sufficiently focused on, and thus the competencies

that are actually taught, are difficult to hold on to. The sustainable competencies are pieces of a puzzle, but the respondents don't know how to put the pieces down in order to form a picture that makes sense.

'Happy' and 'unhappy' groups do not have a vastly different understanding of how the program was taught, but rather differ in the way they apply this in practice. Whereas 'happy' students find a way to put theory into practice themselves, the 'unhappy' respondents are made up of those who don't find these ways. Thus, the MEES program is insufficient in teaching the whole student group how to actually use the theories in practice. Again, this could be solved by giving more focus to an 'active use' competency. Giving more practice on turning theory into action, the 'unhappy' respondent groups would experience a better coherence of the sustainable competencies and consequently create better solutions because they would know how to act - what to do.

Lack of sufficient or in-depth education.

How can an increased integration of practice help if respondents still experience their education as insufficient and in lack of in-depth knowledge? Like the last section, respondents' understanding of insufficient education can also be seen as a symptom of not knowing how to bring theory into practice.

This category made respondents point to more existential issues, like "what am I?" and "what do I put on my resume?". Respondents explained these concerns stemming from a lack of connection between courses. Many wished for more in-depth knowledge in various themes, but experienced topics were only looked into lightly. Of course, this would be somewhat understood and expected seeing as the MEES program covers a vast and complex issue. However, this broad aim caused respondents to struggle to grasp the true meaning. This is also closely connected to why many respondents experienced the program as unstructured. Learning "a little bit of everything" as one respondent put it, is insufficient when you want to create active change. Relying on theory is insufficient when you want to do something in practice. Therefore, more in-depth classes so that students could deep-dive into their point of interest, and where these competencies were also taught in active use, would be highly beneficial. Thus, the competency of active integration of theory would once again prove beneficial to the overall understanding of the competence framework as a whole.

Understanding why.

In addition to the previously mentioned categories which define ‘unhappy’ respondents, the currently enrolled students add the question of ‘why’. This is closely related to the other categories, but is more explicit in its focus on existential issues. The discussion is moved from "what am I?" as a more personal question where the self is expected to be the respondent, and towards ‘why am I learning this’ as a question the respondents expect the HEI and program to give an answer to. Here, respondents are questioning the reason behind individual courses and their connection. They also express a desire for a deeper understanding of a ‘web of knowledge’ that seems to be produced but is not adequately taught. Thus, respondents gain knowledge they don’t know how to use in a way that feels satisfactory.

As respondents have pointed to, sustainable competencies are taught, although not to a satisfactory extent. What remains is why these are taught. What is their true value? This is yet an example of how the MEES program lacks connecting the dots of theory and action.

Metaphorically, we can say that people experience the competencies as dots. Unhappy respondents understand these dots to some extent, but don’t know how to connect the dots in a meaningful way. Others know how to connect them, but don’t know what to do with the now connected dots. It is still dots on a paper and lacks a deeper meaning. What makes the happy students different is that they know how to connect the dots so that they can make meaningful action.

Understanding how.

The breadcrumb trail through respondents' answers suggests a yearning to understand ‘how’: how to connect sustainable competencies in a way that can be actively used and thus be used as a tool for actively creating change.

Does that mean active use of the competencies is not included in the Integrated Problem Solving Framework? No, it is. In fact, active use of the competencies is a major part of the framework. The values-thinking competency calls for *applying, reconciling* and *negotiating* sustainability values. The strategic-thinking competency calls for *developing* sustainability transition strategies. The futures-thinking competency calls for *creating* and *crafting* future non-intervention scenarios and visions. Additionally, interpersonal competence is explained to be integrated into each step of the process, which specifically calls for *collaboration*. It can therefore be argued that the key sustainable competencies goes beyond mere theory, as active use is an integral part of learning the competency. Despite the

clear integration of action in the theoretical competencies, students and alumni report a lack of active use in their education. This can be the reason for why they feel they lack a coherent understanding of the courses. They report they lack an understanding of why and how - what is the purpose of these competencies and how should they be put together? How can HEIs expect sustainable competencies to be actively used in alumni's work if alumni do not know how to use them?

9.2.3 Are the competencies actively being used in alumni's work?

The way, and if at all, sustainable competencies are being used in alumni's work says something about the significance of the MEES program. Has the HEI successfully done what they intended? How can this be measured? First, we look into what alumni say themselves and bring back table 5 from the findings.

Do you actively use the competencies you learned in MEES, in your (daily) work?

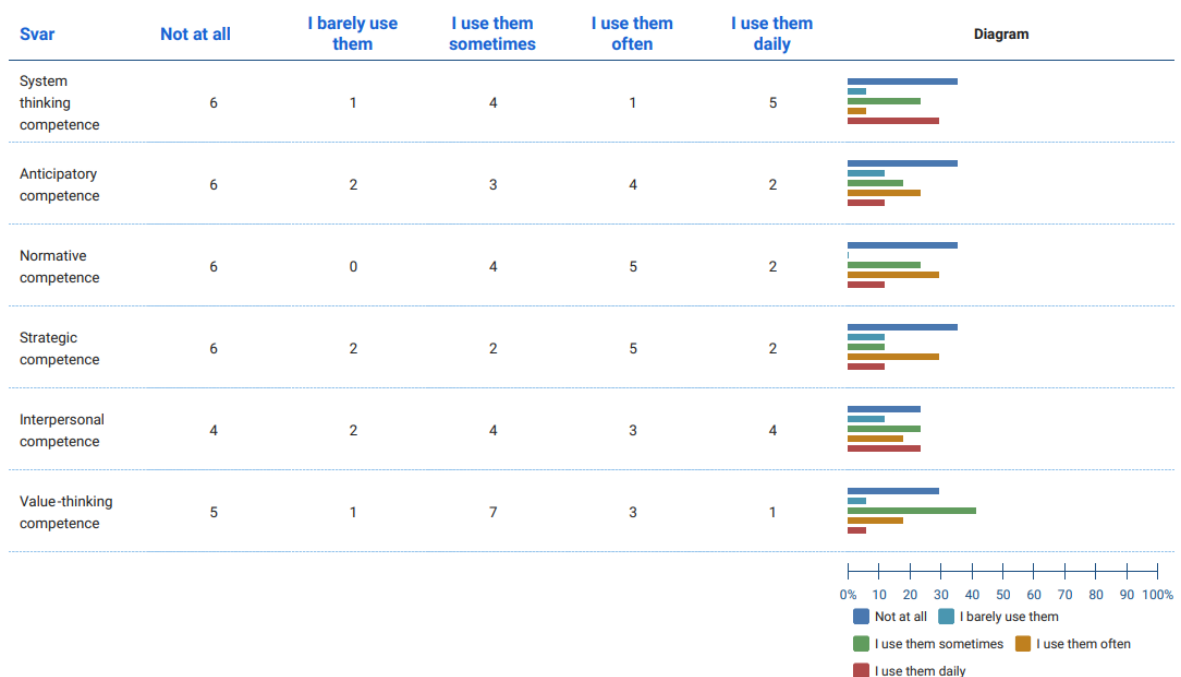


Table 5: “Do you actively use the competencies you learned in MEES in your (daily) work?”

Here, variation is so strong it is difficult to prove a summary value representative. Logically, the variation followed the ‘happy’ versus ‘unhappy’ categories. Those who reported they did not use the competencies were in the category of ‘unhappy’ alumni, whereas the ‘happy’ alumni generally reported they used the competencies often and daily. But what does this

really tell us about the success of MEES' HEI in teaching students about sustainability? What is the reason behind these numbers?

Ostensibly, HEIs would succeed in teaching sustainable competencies if alumni consider themselves sustainability managers. However, for alumni to 'be' a sustainability manager, they must be able to use sustainability competencies. Thus, the question becomes if alumni actually *do* know how to put them to use. Is the sustainable competencies given to the students from the HEI?

First, we have to take a step back and assess whether the competencies are actually taught sufficiently. The survey and interviews in the case study of MEES points to the education being insufficient on this matter. Sustainable competencies are taught, but to various extent. As a consequence two camps of students have emerged: one feeling more fulfilled by the study program than the other. Now that we know sustainable competencies are taught to some extent, we need to assess whether it is used.

This is a key point because, as the case study shows, happy students are characterized by knowing how to put theory into action. They know how to use theoretical competencies to actively create change. Happy students differ from unhappy students in that they also inhabit an 'action competence'. As the unhappy students have pointed out, the lack of 'action competence' is made up of many smaller symptoms. It is caused by a lack of structure and coherence, a lack of sufficient and in-depth education, and an understanding of "why" the sustainable competencies are being taught. Knowing this, we can conclude that the "unhappy" students need better training in the active use of the competencies they have been taught, in order to be able to actively use them in their future work.

9.3 What needs to be improved in order to make higher education a better vehicle for fostering the transition?

In the previous sections, we have discussed how transition managers should be educated from a policy perspective and in practice. In this section, we will elaborate on some of the issues that have arised related to educational policy and competence development in today's sustainability education.

As we have seen, there is a broad consensus for more research on skills needs and skills acquisition, but no established plan on how to achieve this. We know we need a competence reform in order to create a better functioning system. While there exists state

interventionist logic, the competence reform requires the work sector to reach out and express its needs. Outsourcing some of this responsibility ensures that it is the competencies necessary and required by the workforce that are actually taught. However, bringing multiple actors into the equation poses a challenge for the pace at which this can be achieved. In section 9.1 this question was raised: It is clear that there is an idea to produce people who can actively create change, but does it go beyond a mere idea? In this section we raise a follow-up question: what needs to be improved so that HEIs can produce people who can actively create change?

9.3.1 The cap on interventionist logic

Where does the interventionist logic stop? Theoretically, it does not actually stop, but we still experience an issue in practice.

To progress on our sustainability path, we need to form focus and speed (Bromley, 2016). This can be achieved in multiple ways, but calls specifically for some type of change actor, in which literature often gives the state this responsibility (see also Meadowcroft, 2011; Mintrom & Rogers, 2022; Kern & Rogge, 2016). As we have seen in this text, what causes and drives transitions is a big debate in transition theory (see also Smil, 2016; Sovacool & Geels, 2016; Sovacool 2016). It is strongly argued that driving a sustainable transition cannot solely be the market's burden to bear. Meadowcroft argues that sustainable development is fundamentally political, requiring state intervention and governance reform. The state shapes development trajectories through laws, frameworks and financing, legitimizing and accelerating sustainability transitions (Meadowcroft, 2011). Meadowcroft contends that politics permeates each level of the Multi-Level Perspective (MLP): landscape (economic climate, international bodies), regime (state influence on dominant practices), and niche (state promotion of innovation pathways) (Meadowcroft, 2011, p. 71). Therefore, to view the MLP as a mere innovation-based framework only holds half the truth as politics is an ingrained part. This top-down approach is challenging because today, the state does not hold the focus and speed we need to accelerate sustainable development.

Kern and Rogge (2016) critique the top-down approach. They move on from the question of 'what does it take' to drive transitions, towards '*what*' does it take. They argue that strong political will is needed, but also that agency and a variety of actors are equally important. A transition needs agency and engagement from multiple actors first and foremost, and then it can be topped off with political will. Following this view, the state acts as a

project manager in our transition team. Small-scale actors will thus be a part of the larger team.

As we have seen, small-scale actors, like HEIs and individual people with a sustainability mindset, hold great potential in bringing about change. By bringing HEIs closer to competence development and overall sustainable development, we will gain the advantages of a bottom-up approach. This is a fruitful proposal because we still lack a confined competence framework that all parts agree on, and we need this to guide future development in the right direction.

To increase HEIs engagement follows Meadowcroft's notion of transition management, because transitions are political. This way, the public can intervene, to some extent. Increasing HEI engagement also follows the MLP because educational policy is part of the regime. Thus, we can argue that educational policy is given a place in the MLP framework. To conclude, both theories allow HEIs to be a part, but it should be increasingly incorporated in order to capture the potential HEIs hold. In the following section, we will go into why this is needed.

9.3.2 Better incorporation of educational policy

The responsibility for creating a framework upon which future educational policy development will be based, is distributed among multiple actors. Among these participants, we find the Norwegian state itself, encompassing initiatives like the 'Roadmap - The Green Industrial Initiative,' the Directorate for Higher Education and Competence, and the Committee of Competence Needs. Moreover, businesses are encouraged to articulate their requirements, while higher education institutions (HEIs) are tasked with implementing developing frameworks and contributing to research and development aligned with these goals. However, the involvement of these diverse players, crucial to both democratic practices and addressing competency demands, does slow down the process of creating a unified and cohesive competence framework. Urgency exists due to time constraints to address climate restoration. As the goal is to produce change agents, a clear framework is necessary. The current development of this framework is progressing slowly, yet it is vital to determine the necessary competencies and skills needed for the future.

Educational policies outlined by the government emphasize the role of educational institutions, including vocational and higher education, in achieving these goals. Nevertheless, the lack of clarity regarding the distinct qualities and abilities that characterize

sustainable competencies poses a challenge for higher education institutions (HEIs) and other actors in their efforts to effectively promote these competencies. Therefore, it is crucial to utilize the capabilities of small-scale actors in order to accomplish the ultimate objective of creating a unified vision concerning future competency requirements. As a key participant in this transformation, the education system is emphasized in Meld. St 14, asserting that "the education system must open up to lifelong learning and achieve a better link between supply and demand for competence development" (Meld, St 14, 2019-2020, p. 7). This emphasizes the need to align education with developing competencies, effectively bridging the gap between educational supply and societal demand.

Apart from the aforementioned government document where the educational system is clearly linked to competence development, HEIs are not explicitly mentioned. It is clear there is will to act, but how to act is vague. That may be why HEIs are not specifically mentioned, seeing as the path to success is still underdeveloped. This text has clearly pointed to why small-scale actors like HEIs should be considered an active entity, seeing as they hold great potential in creating the change actors we need. HEIs should be increasingly engaged though placing a bigger emphasis on educational policy and education's contributions to society. HEIs are not taken for granted in the analyzed documents, but perhaps not fully understood in the way that they can contribute to our overarching goals. Seeing as Norwegian universities are under national government responsibility, it is in national government documents it should be discussed how HEIs can be incorporated in a more helpful way. How HEIs should be included specifically, goes beyond the scope of this text. Arguably, future research is needed to have proper insight before such policies can be put in action. In this text, we will now move on to discussing what needs to be improved regarding competencies and skills development in today's education.

9.3.3 Do we have a competence framework?

We have several competence frameworks, but we still lack consensus on which one to use (see UNECE, 2011; Bianchi et al., 2022). This thesis bases its theoretical foundation on the Integrated Problem Solving Competency Framework by Brundiers et al. (2020) because it is the most cited competence framework to date on google scholar. In the context of Norway, the Government has taken initiative to examine future competence needs and create an

agreed-upon framework (see section 9.1 in this text). This is still under development, which means we do not yet have a clear framework to guide us.

Is the sustainable competency framework clear cut enough so that it is easy for HEIs to use? First, it is important that we lack a clarification of the problem in the first place. We have not come to agreement about future competence needs, which is the reason we lack a framework. We need a framework to guide us on specific solutions. Mintrom & Rogers (2022) highlight that a clarification of the problem is the first requirement of driving a sustainability transition. We must articulate a shared vision, and this can be done through a framework that all parts can agree on (Mintrom & Rogers, 2022). Having this in place will have ripple effects, like engagement of others and from there be able to identify solutions and pathways forward. Second, the competency framework by Brundiars is extensive, but the evidence provided in this thesis shows HEIs still struggle to sufficiently bring these competencies to the students. In the former sections we have talked about the lack of ‘action competency’ being the divider between happy and unhappy students. This is the case even when ‘action’ is arguably already part of the specific competencies. Indeed, it would probably be easier for students to claim the key sustainable competencies if they had a competence framework to refer to - one that is widely used and agreed by several actors.

How can we expect HEIs to teach sustainable competencies if we have no framework to refer to? How can we expect students to understand the competencies if they are not widely used? We have a vast array of competency frameworks to choose from. Brundiars (et al. 2020) present an in-depth framework that is widely referenced and may be just what we need. What is still missing is a common agreement on how to incorporate it. This must be improved so that students and faculty have a reference point to which classes and courses can stem from.

9.3.4 Teaching key sustainable competencies and skills

In the discussion section addressing RQ2, which explores the development of competencies and skills in contemporary sustainability education, our findings indicate a need for enhanced training. This training should specifically focus on the active application of the acquired competencies to better equip them for future work settings. Wiek and colleagues emphasize the crucial importance of active involvement in sustainability research and problem-solving in academic sustainability programs (Wiek et al., 2011). Excluding the action competency'

leads to an inadequate understanding of pivotal competencies. Therefore, there is a decisive necessity to enhance teaching methods..

How can HEI teaching be improved so that students learn to *use* competencies *in action*? Building competencies does not happen automatically when engaging in learning opportunities (Brundiens et al, 2010). As sustainability programs are generally fairly new, Brundiens argue it's important to exchange experiences, show mutual support between universities, and build progressive models through coordination and collaborative design (Brundiens et al., 2010).

Literature presents a variety of models on how to integrate real-world learning opportunities into sustainability programs. Today, we are missing a standardized approach to integrate competencies into real-world learning opportunities (Brundiens et al., 2010; see also UNECE, 2012; SINTEF, 2023:5). This makes it difficult to effectively teach theory through practice. In addition, students express the need for clear information about what the under-development program contains. For this reason, Brundiens emphasizes the importance of flexibility in universities to accommodate various levels of preparedness among students (Brundiens et al., 2010).

In this thesis, we pull on Brundiens' table I because it shows an overview of "key differences among dominant models of real-world learning formats" and summarizes learning outcomes, types of learning through different activities, types of interaction, degree of linking theory and practice as well impact of the models (Brundiens et al., 2010, p. 311). Additionally, this framework highlights similar points as other literature, but differs because it is put together in a framework that is easy to use

	Project-based learning	Service learning	Internship
Outcomes: what students learn/benefit	Collaborative problem-solving capacity	Education and teaching capacity	Professional working experience; career development
Practices: what students do	Collaborating with partners to develop solution approach	Educating people	Assisting or working on a professional project
Interaction with stakeholder	Two-way knowledge generation (co-production)	One-way knowledge transfer (students to community)	One-way knowledge transfer (employer to student and student to employer)
Integration of theory and practice	Explicit, supervised by faculty and stakeholder	Implicit, not supervised by faculty	Implicit, not supervised by faculty
Impacts on world	Systemic innovation	Support of social innovation and change	Modular innovation

Figure 8. *Real-world learning opportunities.* (Brundiens et al., 2010, p. 311)

Table I points out specific learning formats, explain how they should be used, and what students should gain from it. The breadcrumb trail in all mentioned formats is active use of competencies. Incorporating one or several of these learning formats will thus be a way to solidify student's competencies and skills.

HEIs are not new to these types of learning practices. The MEES program does also include learning opportunities like internship and some project-based learning. If this is included in the program, why do students still report it is challenging to sufficiently master the sustainable competencies? Without doubt, there is room for improvement. To figure out what specific areas are causing these challenges, is ultimately a question for the HEI itself to self evaluate and assess issues that must be overcome. It's still easy to assume that this could be due to the newness of the MEES program itself, having only been launched in 2017. Starting a new program in a country where no other program is alike, will be challenging. Yet, it is clear that somewhere along the way in the study program, there is a lack of learning opportunities for the different students, and this must be improved so that the aim of producing sustainability managers can be met.

Section 10 - Piecing the puzzle

10.1 Educational policies

We do not have a silver bullet for achieving sustainable change. Education alone cannot be viewed as the miracle ingredient that will solve all of our problems. A sustainable future demands the implementation of various components. Given the recent climate reports, we don't have much time to lose. Escalating the engagement of higher educational institutions follows an 'all hands on deck' ethos.

This means we must recognize that coordination among the departments of education, science and technology, and social affairs is essential to achieve deep and lasting change. By establishing collaborative frameworks, educational policies can be designed and implemented in a more comprehensive manner. This coordination will ensure that educational policy developments are aligned with broader sustainable development goals and enable the effective use of resources, infrastructure, and technologies.

In sum, this underscores the critical role of higher education in advancing sustainable development. This demands an emphasis on not only primary and secondary education but also acknowledging the transformative potential of higher education as an essential catalyst for sustainable development towards a more just and prosperous future. By investing in the expansion and transformation of higher education, countries can unleash its potential to promote innovation, propel economic growth, and support the accomplishment of the Sustainable Development Goals.

10.2 Sustainable education in practice

While the idea of cultivating active managers of change exists, it lacks an established framework. Progress toward such a framework has been slow. Yet it's critical to identify the skills and competencies needed to prepare for the future. Ambiguities in terminology and the search for common ground in defining competencies does not only pose a challenge for global development plans, but also affects students' learning opportunities.

This study demonstrates that students and alumni are questioning the competencies gained through their education. Two categories of students have been identified: 'happy' and 'unhappy'. The difference between the two groups is that the 'happy' individuals possess a clearer understanding of how to translate competencies into applicable skills, thereby experiencing a more comprehensive comprehension of key sustainable competencies. The 'unhappy' group of students and alumni express dissatisfaction with their education as they have not fully acquired the competencies required to apply them practically. For HEIs to effectively promote sustainable transition, a concerted effort must be made to bridge the gap between sustainable education theory and practical applications. This approach facilitates a more comprehensive understanding of sustainable competencies, which is imperative for growth and development.

Section 11 - Conclusion

In the pursuit of a deeper understanding of education for transition managers, this study aimed to uncover the subtleties of educational needs through the lenses of policies, theory, and practice. The main objective was to investigate how transition managers should be educated, through assessing the effectiveness of current educational policies in providing transition managers with the necessary competencies and skills to lead sustainability initiatives. This inquiry resulted in the development of three crucial research questions. Each question is intended to illuminate various aspects of the educational environment:

1. RQ1 - Are today's educational policies suited to support the transitions through the development of competencies and skills? We assessed how prevalent educational policies align with the demands of sustainability transitions, in regards to promoting competencies to actively create change, and how HEIs can help in reaching this goal. The findings underscored the need for policy adjustments to more effectively foster the necessary competencies. The proposed policy adjustments are largely concerned with reaching consensus on a competence framework. This is believed to get us 'unstuck' from the vaguely described initiatives we find for future development.
2. RQ2 - How are competencies and skills developed in today's education? This thesis has evaluated the development of competency and skills in today's sustainability education, and assessed the qualifications that need to be in place so that students are able to acquire the necessary competencies for engaging in sustainability practice. The findings stress the significance of the 'action' part in each key sustainable competency, so that all students sufficiently learn the competencies in theory, as well as how they can be put to use in action.
3. RQ3 - What needs to be improved in order to make higher education a better vehicle for fostering the transition? The study compared the former research questions to be able to point to areas of improvement. For HEIs to become better vehicles for fostering the transition, findings point to two main elements: (i) policy: integration of small-scale actors like HEIs hold great potential because education creates sustainability managers on floor-level. Integration of HEIs into the mixture of actors can help drive consensus on a competency framework; (ii) practice: students experience an insufficient integration of sustainability competencies in their education. Not providing enough real-world learning opportunities is largely an institutional issue. Effectively teaching how to put key sustainability competencies

into action must be improved if the aim is to produce people who can actively create change.

The study illuminates the complex relationship between institutional initiatives, curriculum development, and students' actual competency attainment. It examines both accomplishments and obstacles, exploring how effectively higher education institutions promote a sustainable future. Going beyond the constraints of the specific topic, this research makes a substantial contribution to the field of sustainable education through looking from different lenses, combining educational policy and student experiences. It underscores the significance and uniqueness of the discoveries, pinpoints prospects for further investigation, and broadens the comprehension of how sustainable education can enhance its outreach, both through engaging in educational policies to complete a comprehensive framework for future competence needs, and through further engaging students in active use of sustainable competencies and skills.

Pursuing a deeper understanding of sustainable education, the study encountered certain limitations. The limitations met in this study are recurrent in other studies that combine the same methods. Surveys may lead to bias as individuals who hold strong opinions or enjoy taking surveys are more inclined to respond. The omission of people who don't like to take surveys, may result in the exclusion of alternate perspectives from the statistical analysis. To combat this issue, I conducted in-depth interviews; however, these may also exhibit a similar type of bias. These do not diminish the value of the findings, but provide insight to challenges in this type of research. After all, the opinions expressed in this study are the respondent's true and personal opinions, which are worth considering when designing educational policies and competency requirements. Due to possible limitations, this study does not intend to provide statistical generalization, but rather seeks to provide a comprehensive understanding of this case within this context.

The study employed a mixed method approach to comprehensively address how transition managers should be educated within the context of Norway. Through content document analysis, statistical analysis and in-depth interviews, a study was conducted on sustainable education in Norway, focusing on transition managers' education and what needs to be improved so that HEIs can become better vehicles for fostering change. The research methodologies, comprising literature and theoretical reviews, along with a case study of the MEES program, enriched our analysis.

To address Research Question 1, we conducted a literature review, analyzed policy documents, and reviewed theoretical frameworks. Research Question 2 was investigated

through a survey that examined competency development, as well as in-depth interviews that explored participants' viewpoints. For Research Question 3, we have comprehensively analyzed the previous findings to determine the areas that require improvement. In sum, the methodological approach provided a nuanced understanding of how transition managers should be educated, adding to the wider dialogue on sustainable education and transition management.

Bringing together the threads of this thesis, we sum up the main points: in order for HEIs to become better vehicles for fostering the sustainable transition, several areas must be improved:

1. If we want to accelerate the transition, we cannot rely on a top-down approach. To form focus and speed is to include small-scale actors, such as HEIs. Incorporating HEIs raises significant potential, because education creates sustainability managers on floor-level. Thus, empowering HEIs to play a bigger role in educational policy formation is necessary.
2. We must agree on a framework which describes sustainable competencies and skills in detail so that it is easy to use. Today, the lack of an agreed-upon framework hinders effective development.
3. Real-life learning opportunities for students must be sufficiently incorporated in sustainable education so that they can learn to actively use these competencies. Books can only take you so far. Active use makes students fully grasp the potential learning outcomes of sustainable competencies.

This study has identified an objective and comprehensive approach to educating transition managers for sustainable transitions. The research provides valuable insights, highlighting various components of the journey toward a sustainable future. From examining the alignment of education policies with the demands of sustainability transitions, to exploring the complexities of competency development in contemporary education, to highlighting opportunities for higher education institutions (HEIs) to better facilitate the transition, to identifying areas for improvement within the educational landscape - each thread has been a contribution to a deeper understanding beyond the primary scope.

The findings and analysis emphasize the necessity for transformative changes in both policy frameworks and educational practices. It is clear that HEIs are indispensable in this transformation, as they have the potential to produce a generation of sustainability managers with the knowledge, skills and conviction to actively drive change.

As we reach the end of this journey, we find ourselves at the crossroads of theory and practice, words and action, individual growth and global impact. This research provides not only a blueprint for educating transition managers, but also a roadmap for empowering a generation to become catalysts for positive change. With the insights obtained from this research, we can introduce a new era of sustainability education, where theory is put into practice and education becomes an empowering tool for fostering the sustainable transition we so desperately seek.

Literature

Mintrom, M., Rogers, B. C. (2022). How can we drive sustainability transitions? *Policy, Design and Practice*. Vol 5:3, p. 294-306

Bianchi, G. (2020). *Sustainability competences*, EUR 30555 EN, Publications Office of the European Union, Luxembourg, ISBN 978-92-76-28408-6, doi:10.2760/200956, JRC123624

Bromley, P. (2016). Extraordinary interventions: Toward a framework for rapid transition and deep emission reductions in the energy space. *Energy Research & Social Science*, 22, 165-171.

Bianchi, G., Pisiotis, U., Cabrera-Giraldez, M. (2022). *GreenComp – The European sustainability competence framework*. Bacigalupo, M., Punie, Y. (editors), EUR 30955 EN, Publications Office of the European Union, Luxembourg, 2022; ISBN 978-92-76-46485-3, doi:10.2760/13286, JRC128040

Bianchi, G. (2020). *Sustainability Competencies*. Publications Office of the European Union. EUR 30555 EN. ISBN: 978-92-76-28408-6

Blaikie, N., Priest, J. (2019). *Designing Social Research: the logic of anticipation*. (3rd ed.). Polity Press

Bromley, P. (2016). Extraordinary interventions: Toward a framework for rapid transition and deep emission reductions in the energy space. *Energy Research & Social Science*, 22, 165-171.

Brundiers, K., Barth, M., Cebrián, G., Cohen, M., Diaz, L., Doucette-Remington, S., Dripps, W., Habron, G., Harré, N., Jarchow, M., Losch, K., Michel, J., Mouchizuki, Y., Reickmann, M., Parnell, R., Walker, P., Zint, M. (2020). Key Competencies in Sustainability in Higher Education - Toward an Agreed-Upon Reference Framework. *Sustainability Science* vol 16, 2021, 13-29

Brundiers, K., Wiek, A., Redman, C. L. (2010). Real-world learning opportunities in sustainability: from classroom into the real world. *International Journal of Sustainability in Higher Education*. Vol 11, no. 4, pp. 308-324

Bryman, A. (2012) *Social Research Methods* (fourth edition). University Press

Flyvbjerg, B. (2006). Five Misunderstandings About Case-Study Research. *Qualitative Inquiry*, 12(2), 219–245. <https://doi.org/10.1177/1077800405284363>

Filho, W. L., Salvia, A. L., Eustachio, J. H. P. P. (2022) *Journal of Cleaner Production* 386 (2023)

Frantzeskaki, N., Loorbach, D. & Meadowcroft, J. (2012). Governing societal transitions to sustainability, *Int. J. Sustainable Development*, vol. 15, Nos ½, pp. 19-36

Geels, F. & Kemp, R. (2007). Dynamics in socio-technical systems: typology of change processes and contrasting case studies. *Technology in Society*, vol. 29 (2007), p. 441–455. DOI: 10.1016/j.techsoc.2007.08.009

Geels, F. (2002). Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case study. *Research Policy*, vol. 31, p. 1257–1274.

Geels, F. (2014). Regime resistance against low-carbon transitions: introducing politics and power into the multi-level perspective. *Theory, Culture & Society* (2014), vol.31(5), p. 21-40. DOI: 10.1177/0263276414531627

Geels, F. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions*, vol.1(1), p. 24–40. <https://doi.org/10.1016/j.eist.2011.02.002>

Geschwind, L., Kekäle, J., Pinheiro, R., Sørensen, M.P. (2019). Responsible Universities in Context. In: Sørensen, M.P., Geschwind, L., Kekäle, J., Pinheiro, R. (eds) *The Responsible University*. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-030-25646-3_1

Hammersley, M. (2013). *What is Qualitative Research?* (The 'What is?' Research Methods Series). Bloomsbury Academic. DOI: [10.5040/9781849666084](https://doi.org/10.5040/9781849666084)

Direktoratet for høyere utdanning og kompetanse (HKDIR) (2022). Rapport nr. 12/2022. *Tilstandsrapport for høgare yrkesfagleg utdanning 2022*. ISSN 2535-5961

Jacobsson, K. (2021). Chapter 10: Analyzing documents through fieldwork. In Silverman (Editor), *Qualitative Research* (5th edition, p.167-185). SAGE publications

Kern, F. & Rogge, K. (2018). Harnessing theories of the policy process for analysing the politics of sustainability transitions: A critical survey. *Environmental Innovation and Societal Transitions*. Vol. 27 (2018) p. 102-107. DOI: <https://doi.org/10.1016/j.eist.2017.11.001>

Kern, F., & Rogge, K. S. (2016). The pace of governed energy transitions: agency, international dynamics and the global Paris agreement accelerating decarbonisation processes? *Energy Research & Social Science*, 22, 13-17. ISSN 2214-6296

Kohler, J., Geels, F., Kern, F., Markard, J., Onsongo, E., Wiezorek, A., Alkemade, F., Avelino, F., Bergek, A., Boons, F., Fünfschilling, Hess, D., Holtz, G., Hyyasalo, S., Jenkins, K., Kivimaa, P., Martiskainen, M., McMeekin, A., Mühlemeier, M., Nykvist, B., Pel, B., Raven, R., Rochrachter, H., Sandén, B., Schot, J., Sovacool, B., Turnheim, B., Welch., Wells, P. (2019). *Environmental Innovation and Societal Transitions*, vol. 31, p. 1-32.

Kompetansebehovsutvalget (KBU) / Skule, S., Aure, M., Berg, S. L., Bergene, T., Børresen, H., Falch, T., Flagtvedt, E.K., Karlsen, J. T., Knudsen, J. P., Krudtå, B., Løken, K. V., Meling, C., Michelsen, S., Rege, M., Rokne, B., Sannes, L., Søgaaard, B., Torvatn, H., Turmo, A. (05.2022). *Fremtidige Kompetansebehov: Høyere yrkesfaglig utdanning for et arbeidsliv i endring*. Temarapport 1/2022. Kompetansebehovsutvalget. URL: <https://kompetansebehovsutvalget.no/wp-content/uploads/2022/06/KBU-temarapport-2022.pdf>

Kuzemko, C., Keating, M. F., Goldthau, A. (2016). *The Global Energy Challenge: Environment, Development and Security*. Palgrave.

Manninen, K. & Huiskonen, J. (2022). Factors influencing the implementation of an integrated corporate sustainability and business strategy. *Journal of Cleaner Production* 343. DOI: <https://doi.org/10.1016/j.jclepro.2022.131036>

McNabb, D. E. (2021). *Research Methods for Political Science Quantitative, Qualitative and Mixed Methods Approaches* (3rd ed). Routledge

Meadowcroft, J. (2011). Engaging with the politics of sustainability transitions. *Environmental Innovation and Societal Transitions* 1 (2011) 70–75.
doi:10.1016/j.eist.2011.02.003

McNabb, D. E. (2021). *Research methods in public administration and nonprofit management: Quantitative and qualitative approaches*. Routledge.

Meld. St. 14 (2019-2020). *Kompetansereformen - lære hele livet*. White paper on the Norwegian competence reform 2019-2020, Department of Knowledge. Retrieved from: <https://www.regjeringen.no/contentassets/afb66fbbcdfb47749f1b7007b559d145/no/pdfs/stm201920200014000dddpdfs.pdf>

Ministry of Trade, Industry and Fisheries. (07.09.22). *Roadmap - The Green Industrial Initiative*. Publication code: W-0043 E. Ordered and printed by the Norwegian Government Security and Service Organisation 09/22 – print run 20. URL: https://www.regjeringen.no/contentassets/1c3d3319e6a946f2b57633c0c5fcc25b/roadmap_the-green-industrial-initiative_singlepages_web.pdf

Authors' note: This text uses the English version published 07.09.22, but note that the original document in Norwegian was published and launched on 23.06.22 by the Prime Minister and Minister of Trade of Industry.

NOU 2020: 2. (2020). *Fremtidige kompetansebehov III: Læring og kompetanse i alle ledd*. Kunnskapsdepartementet.

<https://www.regjeringen.no/no/dokumenter/nou-2020-2/id2689744/>

Borgonovi, F., Brussino, O., Seitz, H., Bertolotti, A., Biagi, F., Bitat, A., Karpinski, Z., Montanari, M. (2022). OECD Social, Employment and Migration Working Paper no. 275

Organization for Economic Co-operation and Development (OECD). (2019). *Regions in Industrial Transition: Policies for People and Places*. OECD Publishing, Paris, <https://doi.org/10.1787/c76ec2a1-en>

O'Reilly, K. (2012). *Ethnographic Methods* (2nd ed.): Routledge

Sachs, J.D., Schmidt-Traub, G., Mazzucato, M. *et al.* Six Transformations to achieve the Sustainable Development Goals. *Nature Sustainability* 2, 805–814 (2019). <https://doi.org/10.1038/s41893-019-0352-9>

Universitetet i Stavanger (27.03.2023). *Master in Energy, Environment and Society*. Uis.no. Retrieved 16.05.23 from <https://www.uis.no/en/studies/master-in-energy-environment-and-societ>

United Nations. (2015). *Transforming Our World: the 2030 Agenda for Sustainable Development*. Retrieved the 30.01.22 from <https://sdgs.un.org/2030agenda>

United Nations. (2022). *The Sustainable Development Goals Report 2022: Key Messages*. Retrieved from: https://unstats.un.org/sdgs/files/report/2022/SDGs_Report_Key_Messages_2022.pdf

United Nations Economic Commission for Europe (UNECE) (2012). *Learning for the future: Competencies in Education for Sustainable Development*. UNECE

u/PotentialMillionaire. (2022, undated). Interesting survey! Sampling Bias. *r/MathMemes*. URL: https://www.reddit.com/r/mathmemes/comments/uoc3zq/interesting_survey/?onetap_auto=true

Wiek, A., Withycombe, L., Redman, C. L. (2010). Key Competencies in Sustainability: a Reference Framework For Academic Program Development. *Sustain Sci* (2011), vol 6, 203-218.

Wilkinson, S. (2021). Chapter 6: Analyzing focus group data. In Silverman (Editor), *Qualitative Research* (5th edition, p.167-185). SAGE publications