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Facilitating the Implementation of new Circular Economy Practices in Higher Education Institutes

Learning through Action Research at the Asian Institute of Technology

Master of Science Thesis
in the Industrial Ecology master's Programme

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Abstract

Higher education institutes (HEIs) play an important role in the transition towards circular economy. Apart from conducting research on circular economy, they can teach the next generations of leaders by integrating the concept of circular economy in the curriculum for every student as well as being a living example.

The motivation behind this research is to facilitate an organisational learning process in an HEI on how to implement new circular economy practices, based on knowledge about the success and failure of previous and current initiatives which could be identified as circular economy practices. Rather than only collecting and analysing data, the main focus is to build circular economy in a campus as well among students who can build circular economy in their career. This is done by uncovering or producing knowledge which can be used by the HEI community for building a circular economy in the HEI.

The case study is based on the Asian Institute of Technology (AIT) in Thailand. AIT aims to promote technological change and sustainable development in the Asian-Pacific region through higher education, research and outreach. The researcher herself was born and raised in a western context, but very interested in sustainable development in Asia. The aim is to learn how to facilitate the transformation of AIT's campus and curriculum from its current state to a circular state, providing a healthy living and working environment as well as relevant education, while also learning more about the intercultural aspect. The four research questions are:
RQ1. What are circular practices in other HEIs?
RQ2. What is the current state of AIT's campus and curriculum from a circular economy perspective?
RQ3. What can be learned from the history behind the current state of AIT to understand what hinders or facilitates the implementation of new circular economy practices in HEIs?
RQ4. How can action research support facilitating the implementation of new circular economy practices in HEIs?

For the first research question, the researcher investigated ten other HEIs through primary and secondary sources. She interviewed key persons in four universities about factors enabling and hindering the transition towards a circular economy. The topics of the interviews were categorised in ten themes and examples of current circular economy initiatives were categorized according the RESOLVE- framework of the Ellen MacArthur Foundation: Regenerate, Sharing, Optimization, keeping in the Loop, Virtualize and Exchange. This research question helped also to get inspiration for a vision for the future state of AIT.

Answering research question two, the current state of AIT from a circular economy perspective was described with an inventory of the stakeholders, a selection of descriptive accounts of issues and needs, brought up bottom-up (mostly by students), and activities which were categorized according to the aforementioned RESOLVE-framework.

The researcher conducted interviews with top managers, faculty and staff, arranged workshops with focus groups of students, used participatory observations and read research done in the past, project proposals and media. An important source of guidance was informal talks with students. When they are off-record, most students open up. This information was not directly used, but brought the researcher new insights, perspectives and tracks to follow up.

To identify the factors enabling or hindering the transition towards a circular economy, the framework of Nadler and Tushman (1997) was a guiding tool. The framework focus is on the move from the current state to a desired future state, but it also highlights different problems that can occur in the transition state. This research also adds the importance of the state before the current state: the past. To be able to

identify the drivers and to address root causes of the current state, the researcher dived into the history of the system of AIT and learned from the successes and failures in the past.

To answer the third research question, two focus areas were selected: waste and energy. The research focuses upon the initiatives in the past. The researcher read about past initiatives and interviewed different stakeholders about the past. The main factors were internal: lack of (mutual) understanding of the principles and importance of circular economy, low degree of internal collaboration, lack of continuous communication, motivation, leadership, lack of long term vision, etc. Also external factors (political, economical, social, technological) play a role especially affecting the speed and momentum of the implementation, but the internal factors determine how the insiders work with these external factors.

As this thesis was designed as action research, the researcher also reflects upon the role that action researchers (from other cultures) can play in facilitation of change, and how the researcher has an impact and also vice versa, how the interactions have an impact on the research(er). The researcher shared her reflections written in the first person in research boxes which are recorded and coupled with observations and results in this thesis report. In the section for the fourth research question, these boxes were categorized according to different learning experiences. An action researcher can learn the most by intervening in the socio-technological system. The insider-outsider balance had many benefits. Being an insider helped to access data and identify the issues and structures easier. Being an outsider means to be able to bring new views and to bypass some cultural norms. An external researcher from another culture, as in this case, can also move across cultural norms as he/she is assumed not to know these cultural norms, but also other factors played a role in why she took this privilege. Intersectionality of social identities matters. The impact of this action research was not only that the action researcher learned more about AIT, circular economy, transition and change management, but that she also made other insiders (e.g. students) co-researchers along the way and after her journey. She created space for others to bring change, which also could happen because others created space for her.

Lastly, this thesis discusses the importance of integrating a social dimension to circular economy, not only in Thailand, but also the host countries of other universities; the selection of other stakeholders as co-researchers in the action research; the creation of spaces (social and physical); and boundary management (after Cash et al, 2013) as part of change management. The mutual understanding of the principles and importance of circular economy is also a working point. Important supporting factors are a strong top down vision to transform the HEI into a circular one; a system that manages the continuous inflow and outflow of people in a HEI; and deep democratic, inclusive design thinking processes which can put the top down vision in alignment with activities from bottom up.

Keywords: Circular economy, Change management, Transition, Implementation, Action research, Thailand, Industrial Ecology, Education, Boundary Management

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Abbreviations

Abbreviation	Expansion
ADEME	The French Environment and Energy Management Agency
AIT	Asian Institute of Technology
AITCSC	AIT Campus Sustainability Club
CE	Circular Economy
EMF	Ellen MacArthur Foundation
HDI	Human Development Index
HEI	Higher Education Institute
OFAM	Office of the Facilities and Assets Management
SD	Sustainable Development
SDG	Sustainable Development Goal
SERD	School of Environment, Resources and Development
SEATO	Southeast Asia Treaty Organization
SET	School of Engineering and Technology
SOM	School of Management
SU	Student Union
UN	United Nations
YCA	Yunus Center in AIT

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1. Introduction

1.1. Background

As population and natural resource consumption are increasing, many humans in the world are suffering from climate change, environmental pollution and scarcity, which lead to societal problems that affect the whole world. Therefore, one of the global trends is the increased awareness of and actions taken for sustainability. Sustainable development (SD) has many definitions, but the most recognised definition of sustainable development is from the Brundtland report : “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.” (Brundtland, 1987, p41)

Sustainable development is supported by three pillars: social welfare, economic growth and conservation of the environment (UNFSS, 2016 as cited in Anand, 2016). Sustainable development is often considered as a process, not as a goal, calling for re-design and adaption to new challenges locally and globally. The 17 Sustainable Development Goals are a set of 17 goals and 169 targets adopted by members of the UN to end poverty, protect the planet and ensure prosperity for all as part of a new sustainable development goal for 2030. (UN website[1], 2017). The seventeenth goal advocates for partnerships between governments, the private sector and civil society (UN website, 2017). The targets name especially the “North-South, South-South and triangular regional and international cooperation” as key to build capacity, transfer knowledge and technology, for financial stability, trade and to address systematic transboundary issues (UN Website, 2017). This stresses out that we should not focus only at development in our country or region, but also have to work with and in other continents. Climate change, material scarcity, water pollution etc. are transboundary complex issues which require systems thinking and transboundary and interdisciplinary cooperation. “ (...) the systemic features operate not merely within but also between nations. National boundaries have become so porous that traditional distinctions between matters of local, national, and international significance have become blurred. Ecosystems do not respect national boundaries. Water pollution moves through shared rivers, lakes, and seas. The atmosphere carries air pollution over vast distances. Major accidents - particularly those at nuclear reactors or at plants or warehouses containing toxic materials - can have widespread regional effects.” (Brundtland, 1987, p.37)

USA, China and Japan have the biggest economies. In the meantime, also other economies are emerging, especially India and few countries in South-East Asia. Their impact on the environment, and human health, is becoming more visible. According to a report of the Ocean Conservancy in 2015[2], the biggest contributors to plastic waste in the oceans are India, Thailand, the Philippines, Vietnam and

[1] http://www.un.org/sustainabledevelopment/sustainable-development-goals/, last accessed 31st August 2017

[2] https://oceanconservancy.org/wp-content/uploads/2017/04/full-report-stemming-the.pdf, last accessed 20th June 2017

Indonesia. A lot of waste comes also from western tourists and is the result of manufacturing for consumers in developed regions, so not only the "locals should be blamed". The whole world and all economic systems are connected and therefore everyone has to cooperate to design out waste, pollution and other societal problems. "Failures to manage the environment and to sustain development threaten to overwhelm all countries. Environment and development are not separate challenges; they are inexorably linked. Development cannot subsist upon a deteriorating environmental resource base; the environment cannot be protected when growth leaves out of account the costs of environmental destruction. These problems cannot be treated separately by fragmented institutions and policies. They are linked in a complex system of cause and effect." (Brundtland, 1987, p.36) Cooperation requires global citizenship education, which means "nurturing respect for all, building a sense of belonging to a common humanity and helping learners become responsible and active global citizens." (UNESCO[3], 2017). Global citizens have "the knowledge and skills to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development." (Target 4.7 of Sustainable Development Goal 4 on Education, UN website[4], 2017)

In this context Higher Education Institutes (HEIs) could play an important role to raise awareness and contribute to sustainability through education, research and interactions with society. First of all, as HEIs are becoming more and more international spaces of learning, HEIs teach students and employees by letting them understand other cultures through experience.

Secondly, HEIs are considered as hubs of capacity building in sustainable development (by educating the future leaders, carrying out cutting edge research to solve challenges…) and as large organisations with educated staff, students, buildings, networks… they have also the opportunity to orchestrate change within their own practices. According to the UN, HEIs "can become engaged in sustainable development in two ways. First, they can form linkages between knowledge and dissemination in the community. Second, they contribute to societal development through outreach and use of knowledge to serve society" (UN, 2011 as cited in Tangwanichagapong et al, 2017). Research has been playing an important part in sustainable development, on local and global scale. On global scale, for example, thousands of scientists cooperate in the Intergovernmental Panel on Climate Change and contribute on a voluntary basis to the very influential reports on climate change. These reports made clear that human activity has a significant impact on climate change. The IPCC report of 2014 emphasized the importance of local actors, including companies and NGOs. (Alänge, 2016)

Recently, HEIs have been called upon to commit to the development of sustainable practices by the United Nations Conference on Sustainable Development of Rio20. "*HE worldwide is facing substantial*

[3] http://en.unesco.org/gced, last accessed 31st August 2017

[4] http://www.un.org/sustainabledevelopment/sustainable-development-goals/, last accessed 31st August 2017

rethinking about the skills that future graduate cohorts will need to address worldwide recession, ongoing humanitarian concerns, and unexpected ecological crises." (Ryan et al, 2010).

The departure point of this research is that HEIs have two roles:

i. Providing the service of education and research to help the outside world
ii. Providing the service of an healthy environment to all stakeholders who live, study and work there

Sustainable development has many definitions. Therefore it is important to narrow down the research by selecting a path. This research dives into the emerging concept of circular economy, which is "viewed as a condition for sustainability, a beneficial relation, or a trade-off in literature." (Geistdoerfer et al, 2017). The departure point of this research journey is that circular economy is seen as a condition for sustainability. This assumption will be a subject of the Discussion part.

In the last years, governments (like China and EU), civil society organisations in countries like Belgium, the Netherlands, companies (like Google, Danone and Unilever), and higher education institutes (like Technical University of Delft, University of Edinburgh) develop and implement circular economy strategy in their country (macro-level), establish eco-industrial parks based on circular economy principles (meso-level) or transform their linear business model into a circular business model (micro-level). Circular economy is a set of integrated strategies in dematerialization and decarbonization that could be an interesting "business model" for campus management and education in developed *and* developing countries.

A second departure point of this research is that implementing (new) circular economy practices (thinking and action) can generate many benefits for Higher Education Institute (HEI), as an organisation and for the organisational insiders (staff, student, faculty and the associated communities), on condition that the organisation and its members understand what could hinder and facilitate the transformation, and therefore it is imperative to assess the current state of a HEI.

1.2. Motivation

As the researcher believes that the future of sustainable development is (in) Asia, she decided to conduct action research at the Asian Institute of Technology (AIT) in Thailand, one of the partner universities of the Erasmus Mundus consortium where she did an exchange in the semester before her thesis research. Students, faculty and staff represent most Asian countries in this Institute, so by staying in this system (longer) she would not only learn more about the dynamics in the host country, but also in other Asian cultures, and how people from different Asian nationalities and cultures interact with each other. She wants to work in Asia, and even if she would return to Europe, she believe that experience with people with an Asian background and that the insights of this action research can benefit her and her future colleagues.

The motivation behind this research is to facilitate an organisational learning process in a higher education institute on how to implement new circular economy practices, based on knowledge about the success and failure of previous and current initiatives which could be identified as circular economy practices. Rather than collecting and analysing data, the main focus is to build circular economy in a campus as well as among students who can build circular economy in their career,

- by uncovering or producing knowledge that can be used by the HEI community
- by building necessary capacity for building circular economy in a HEI

1.3. Purpose

The aim is to learn how to facilitate the transformation of AIT's campus and curriculum from its current state to a circular state, providing a healthy living and working environment as well as relevant education, in an intercultural setting .

1.4. Research Questions

The research questions contribute to the bigger aim of this study and are not only a guidance tool in the writing and during the research. In social research, questions can be re-designed during the research process, because the design allows to change from direction, if the main goal (learning how to facilitate the new practices) stays the same. (Berg et al, 2004)

Instead of designing a future state for AIT, based on another HEI, or a combination of practices of different HEIs, a collection and analysis of circular economy practices is made as inspiration for decision makers in AIT and other HEIs to design a vision for a future state.

RQ1: What are circular practices in other Higher Education Institutes?

After understanding what circular economy activities could be in HEIs, the current state of AIT's campus and curriculum will be described from a circular economy perspective.

RQ2: What is the current state of AIT's campus and curriculum from a circular economy perspective?

Throughout this research journey, the intention was to learn from earlier initiatives, from project successes and failures, and use this knowledge as a foundation to build further a circular economy in AIT. Theories in change management and organisational learning will be connected with these empirical findings.

RQ3: What can be learned from the history behind the current state of AIT to understand what hinders or facilitates the implementation of new circular economy practices in HEIs?

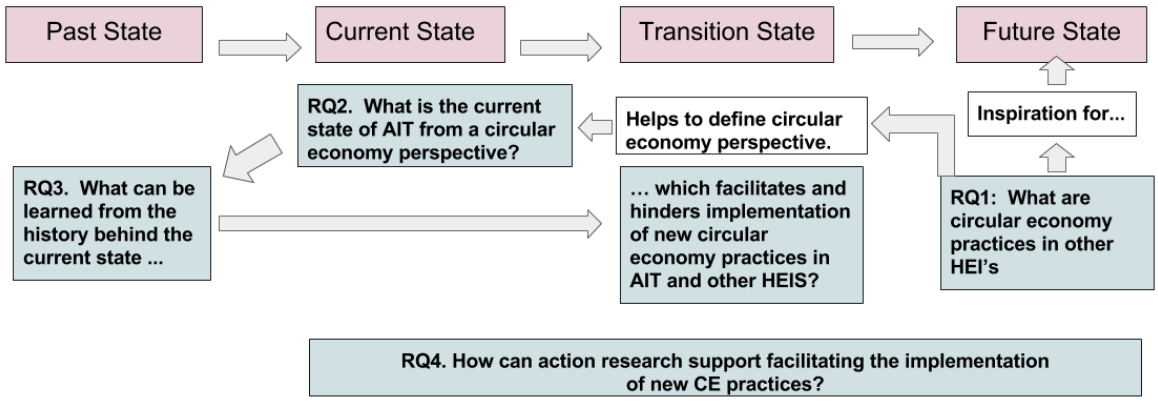
One important part of this journey is the role of the action researcher as an (informal) change maker in any organisations. This leads to the last research question:

RQ4: How can action research support facilitating the implementation of new circular economy practices in HEIs?

Figure 1 gives a graphical representation of the research questions and transition management theory by Beckhard and Harris, described by Nadler and Tushman (1997). “They saw the implementation of a change, such as a new organization design, as the moving of an organization toward a desired future state. They saw changes in terms of transitions. (...)” (Nadler and Tushman, 1997). An organization is at a certain time in a current state, and moves towards a desired state, which could be called the future state, which describes how the organization should function after the change. They call for an understanding of the current state and the developing of an image of the desired future state. (Nadler and Tushman, 1997). The current state itself is also a result of certain decisions taken in the past state, which can be defined as the time before the current state.

The first research question is to learn first from other Higher Education Institutes (HEIs), to get inspiration for the future state. This thesis does not aim to design a future state for AIT, because the departure point of this thesis is that the whole organisation should learn. To balance the role of outsider and insider, it was decided to only collect ideas for a future state and also to describe the current state of AIT from a circular economy perspective, which is done in the second research question. Synchronously with the description of the current state, the causes after the current state will be researched as part of research question 3, which will helps to formulate what facilitates and hinders (barriers and enablers) implementation of new circular economy practices in AIT and other HEIs.

Figure 1. The research questions and transition management
Inspired by Nadler and Tushman (1997)



1.5. Delimitations

This study will look only at the case of the Asian Institute of Technology, Thailand (base subject).

This research started in January and was concluded in June 2017. The duration of stay in AIT was from July 2016 until May 2017. Due to the time availability of stakeholders and the research, not all

stakeholders were involved. The focus was mostly on students, and to a more limited extent on top management and faculty.

While being aware that any circular economy practices and aspects are dependent on the system in which the HEI is located, the study is delimited to only research AIT itself. The researcher did not include the Board of Trustees, because this thesis was mostly done from a student's perspective and she perceived their world to be far from the student's world. She did not also include key persons in the Religious Associations located at AIT, because religion is a sensitive and complex topic. She realized only in the final stage also their influence in campus life, because she is not a religious practitioner herself. She decided to focus on what was already done in the past, because in the initial phase of her research she discovered that much research had been conducted and projects happened. She wanted to learn from the past. She decided to not use large scale surveys to collect statistics about f.e. readiness for circular economy in education and internal environment, because that would require time and/or money. As she decided to learn by doing, and her study is about a specific organisation, she decided to learn by doing and delimit her literature review to the necessary.

2. Theories and Concepts in use

This chapter will discuss first some views on circular economy, especially in the organizational context. Second, the key references for the learning organisation and transition will be elaborated upon.

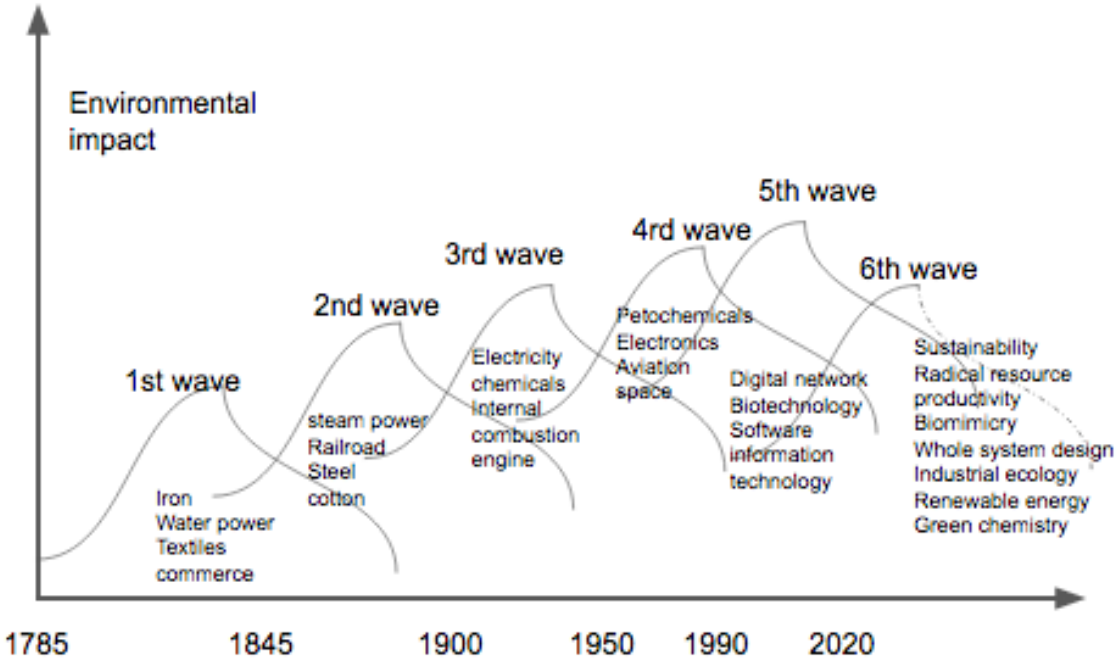
2.1. Circular Economy theory and definitions

2.1.1. The origins of Circular Economy Thinking

The circular economy concept has deep rooted origins. The origins cannot be traced back to a single source, but different schools of thought: cradle-to-cradle, performance economy, biomimicry, natural capitalism, blue economy, regenerative design and Industrial Ecology (EMF 2017, Ghisellini et al, 2015). According to the Ellen MacArthur Foundation (EMF), the practical application has gained momentum since the late 1970s.

To understand why these schools of thoughts -and later on- the circular economy concept emerged, it is imperative to understand what happened before. The Industrial Revolution changed the socio-technological systems in a way that it is threatening economical, environmental and social factors. Since the beginning of the Industrial Revolution, economic development knows different waves of innovation, which can be visualised as the Kondratieff waves, which changed the world and were answers to the current challenges of that time. Figure 2 visualises the evolution and how each wave has a bigger environmental impact.

Figure 2. Waves of innovation
Based on Hargroves et al (2005)



The first wave was characterised by iron, water power, the innovations in textile industry, mechanisation and was the beginning of the Industrial Revolution. The second wave is all about steam power, railroad,

steel and cotton. Prior and following World War I novel products and services such as the telephone, cars, electric lighting, domestic appliances (third and fourth wave) changed the life of many people in especially "developing" countries. According to Andrews (2015) and Rau et al (2016), especially the concept of Planned Obsolescence changed the society. Planned obsolescence in industrial design and economics is a policy of planning or designing a product with an artificially limited useful life, so it will become obsolete (that is, unfashionable or no longer functional) after a certain period of time (Andrews, 2015, Rau et al, 2016). During periods of perceived affluence and abundance (especially in the fifties), Planned Obsolescence encourages and enhances the Linear Economy, a take-make-use-dispose model in which products become waste at end of life (Andrews, 2015, Rau et al, 2016). Planned Obsolescence is still present today in many designs. Rau et al points out that *new* today means "just not out of fashion", "just not broke", "just not outdated" and gives -as an example- counting chips in washing machines which makes the appliance broke after a certain number of washings. (Rau et al, 2016)

Rachel Carson's Silent Spring (1962) and disasters like Bhopal, oil leakages and nuclear disasters, triggered awareness about threats to the health of environment, and also from humans in the sixties and seventies (Winans et al, 2017, University of Edinburgh, 2015, Alänge 2016). There was a shift from abundance thinking to the recognition that resources for industrial and agricultural use are finite, partly due to some events like the oil crisis and research on planetary boundaries and limits (like the "Limits to growth" thesis of the Club of Rome). A lecture of Dr Mohanty in AIT pointed out that the oil crisis in the seventies motivated also countries like France to invest in for example alternative resources, to reduce their independency from energy from other countries.

All these aforementioned challenges lead to a need to search for, identify and implement various transformations aligned with the requirements of a more environmentally sustainable development (Mirata, 2005). "Important vehicles for this transformation are frameworks fostering innovation processes for changes that enable alternative means for providing goods and services, the prevention of pollution, the decreased use of energy and material resources and the development of original socio-technical systems[5] involving both technological and organisational elements" (Ashford, 2000). Innovation activities become more and more characterised by sustainability and environmental awareness.

It also inspired different academic thinkers. Pearce and Turner (1989) based their ideas on the studies of environmental economist Boulding (1966), famous for the spaceship metaphor. "Boulding's idea of economy as a circular system is seen as a prerequisite for the maintenance of the sustainability of human life on Earth (a closed system with practically no ex- changes of matter with the outside environment)." (Ghisellini 2015). The law of thermodynamics of entropy is often mentioned by especially environmental economists such as Boulding, Pearce and Turner to point out the matter and energy degradation, to stress out the need to conserve energy and material as much as possible, and they therefore "should have a price" (Ghisellini 2015, Su 2013, Winans et al, 2017). During the 1970s, the Swiss architect Walter

[5] A socio-technical system means the interactions between people and technology in workplaces, and can also refer to the interaction between society's complex infrastructures and human behaviour.

Stahel proposed that materials should be processed in a closed loop and waste can become (again) a resource. He coined the concept of “Cradle-to-Cradle”. He advocated also for the importance of repair, remanufacture… to extend the product life (Andrews, 2015, Ghisellini et al, 2016). William McDonough and Braungart made a C2C benchmark “to endorse and promote products that meet this standards” (Andrews, 2015, Ghisellini et al, 2016, Winans, 2015).

This change in policy and academic thinking is now also present in the next Kondratieff wave (figure 2). Currently, economies are going from the fifth wave, the wave of digital networks (the invention of “internet), biotechnology, software information technology, to the sixth wave of “sustainability”. System design thinking, biomimicry, green chemistry and green nanotechnology are shaping more and more economies around the world and the call for sustainable development is becoming more present (Hargroves et al, 2005). This leads us back to Industrial Ecology. This term was coined in 1989 by Frosch and colleagues: “*Why would not our industrial system behave like an ecosystem, where the wastes of a species may be resource to another species? Why would not the outputs of an industry be the inputs of another, thus reducing use of raw materials, pollution, and saving on waste treatment?*” (Frosh and Gallopoulos, 1989).

Industrial ecologists look especially for solutions for industrial systems to make them more as ecosystems: resource-efficient, no waste, in harmony with other systems… and use tools that acknowledge the complexity of problems. In ecosystems, humans and other animals eat animals, some animals eat plants, plants take nutrients from the soil, and the soil exists partly of degraded materials of humans. Industrial ecology acknowledges that the waste of one industrial process or industry can be the “food”, the resource, for another industrial process or industry. (Frosh and Gallopoulos, 1989). The two main directions, since the beginning, of industrial ecology are industrial symbiosis and dematerialization and decarbonization. (Erkman, 1997).

Dematerialization is reducing material input while maintaining performance (Andrews, 2015). Decarbonization is reducing carbon emissions while maintaining performance.
Industrial Symbiosis is a collaboration between two or more industrial facilities or other organisations (even households) in which the byproducts or waste become the resource for another. According to Mirata (2005), the aim is “to make use of the spatial proximity of industrial activities to respond to environmental concerns”. Therefore they “work by catalysing inter-organisational collaboration among local economic actors to harvest environmental improvement potentials present at the inter-organisational interfaces”. Mirata (2005) defined Industrial Symbiosis networks as “a collection of long-term, symbiotic relationships between and among regional activities involving physical exchanges or materials and energy carriers as well as the exchange of knowledge, human or technical resources, concurrently providing environmental and competitive benefits”. Industrial Symbiosis is more than transforming trash into cash. It is also about sharing logistics, warehousing, sharing knowledge, material cascades, thermal cascades… (Lowe, 2010). In China, the government set up many EIPs and a famous example in Europe is Kalundborg Symbiosis. Also Thailand, the hosting country of this case study, established the Industrial

Estate Authority within the Ministry of Industry, in 1972, and initiated eco-industrial estates. The two objectives were to decentralize industrial development, but also create value through the 3R principles. In 2000, five industrial estates were selected as pilot projects, but failed due to the the lack of dialogue between government and industry and effective economic instruments that support circular economy. In 2006, a separate estate developed, called the Map Ta Phut Industrial Estate, which involved actors from industry and academic world. This was more successful and initiated a second phase. (Winans et al, 2017, Lowe 2001)

Dematerialization, decarbonization and industrial symbiosis are exactly what circular economy is all about, and therefore industrial ecology is often seen as the origins of circular economy.

According to Veselinov (2016), in this era of history, circular economy can be enabled because of certain current megatrends in the world (results of previous waves), that also give insights in the global needs:

Resource scarcity and water insecurity	More and more people are living in water-stressed areas. Also resources such as fossil fuels, minerals, sand… are finite, and accessing virgin resources becomes more expensive in monetary and socio-political terms.
Climate change	Due to the increasing credibility (evidence) given by IPCC, climate change becomes more an agenda point in international and national policies. For example, UN, in collaboration with national governments, invests a lot of money with programs like REDD+ to decarbonize the society.
Air Pollution	Countries, especially in Asia, are feeling the costs in terms of human health because of air pollution. The biggest death causes in cities as Ulaanbaatar and Beijing are air pollution-related.
Urbanization	The growing middle class is moving to the cities, especially in emerging countries (in Asia).
From consumers to co-creators	Consumers become more aware of the externalities of products, and there is a growing niche of people who invest in more eco-friendly fair trade products, which are healthy for humans and the environment.
Rise of a sharing economy	Companies such as Uber, AirBnB are growing and more and more companies are entering the market. This changes the socio-technological systems.

With the current approach to the resources, the population increase, the entrance of billions of people into the middle class etc. it will not be possible to meet the needs of everyone, therefore the socio-technological systems have to change. Circular economy could be a vision where humans can satisfy their needs (human well being), but also integrate the challenges of material scarcity, water insecurity and climate change in the (re)design of products and services (decoupling environmental impact).

Last, but not least, the reason why circular economy attracted the attention of many companies and governments, is the value creation. In June 2017, the World Business Council for Sustainable Development (WBCSD) stated that the circular economy is a 4.5 trillion USD opportunity. (WBSCD, 2017[6]). Saving the environment and earning a lot of money can happen together in a circular economy.

2.1.2. Definitions and Principles in Circular Economy

“Looking beyond the current "take, make and dispose” extractive industrial model, the circular economy is restorative and regenerative by design. Relying on system-wide innovation, it aims to redefine products and services to design waste out, while minimising negative impacts. Underpinned by a transition to renewable energy sources, the circular model builds economic, natural and social capital.” (EMF[7], 2017)

One of the recent global thought leaders in circular economy thinking is the Ellen MacArthur Foundation (EMF), established in 2010 in UK, which aims to accelerate the transition to a circular economy and work together with decision makers across business, governments and academia.

The World Business Council of Sustainable Development calls it a “new way of looking at the relationships between markets, customers and natural resources, leveraging innovative new business models and disruptive technologies to transform the current “take, make, dispose” economic model. Successful circular initiatives will reduce our dependence on natural resources while creating value for companies and their stakeholders. Companies may also discover that the circular economy helps them to drive bottom-line growth, enhance competitiveness and mitigate risk.” (WBCSD[8], 2017)

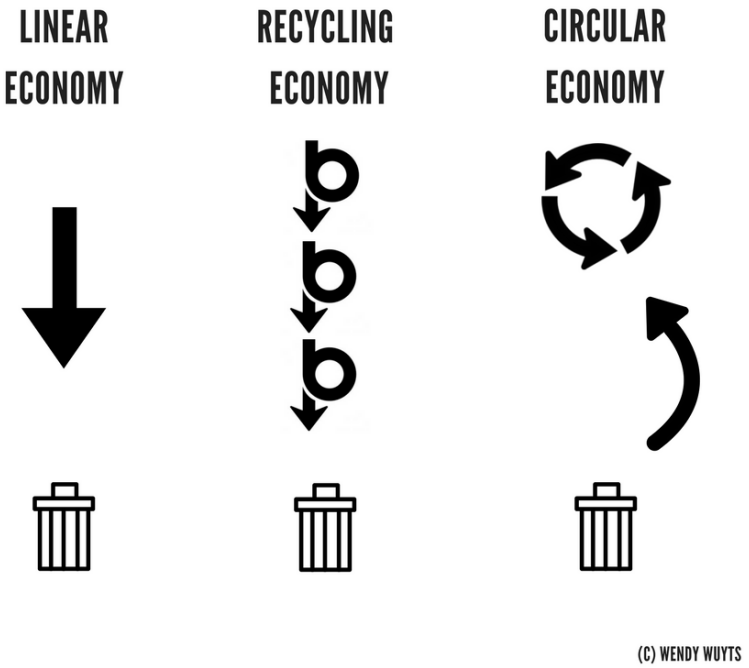
In academic literature, circular economy is mostly associated with waste management (especially referring to 3R principles of Reduce, Reuse and Recycle) and/or renewable energy, but it is more than that. It is a call for a structural change. EMF (2017) introduces three more principles, besides the 3R principles:

- appropriate design
- reclassification (cascading)
- renewability”.

[6] http://www.wbcsd.org/Clusters/Circular-Economy , last accessed 30th June 2017
[7] https://www.ellenmacarthurfoundation.org/circular-economy , last accessed 30th June 2017
[8] http://www.wbcsd.org/Clusters/Circular-Economy, last accessed 30th June 2017

Another important key word is “resource efficiency”, which implies resource reduction and increasing economic and social well-being at the same time (Ness, 2008 in Ghisellini, 2015). Winans et al (2017) mention 6Rs: reuse, recycle, redesign, remanufacture, reduce, recover. One of the problems, as mentioned by Rau et al (2016), is that circular economy is often considered as a synonym for recycling economy. Recycling economy is according to him a linear economy, because recycling businesses need a certain scale of waste for its operations and operates on maximizing profit, not on designing out waste. Also, in the process of recycling, the quality of the material gets lost. Recycling economy could be considered as a grey zone between circular economy and linear economy and recycling could be seen as one of the last favoured circular economy actions.

Figure 3. Difference between 100% linear, 100% recycling and 100% circular economy, and the relation to “waste”, design by the author, based on visualisations from different sources[9]



Lewandowski (2016) emphasised the following five principles that occur in literature on circular economy, blue economy, industrial ecology… as the main principles of circular economy:

i. “Design out waste: design for reuse
ii. Build resilience through diversity
iii. Rely on energy from renewable sources
iv. Think in systems
v. Waste is food/Think in cascades/Share values (symbiosis)”

Veselinov (2016) presents four principles which refer to the circular aspect:

[9] These designs were seen at social media, like Pininterest, but could not be tracked back. The new element that the researcher added, is also the arrow from the garbage bin to the circle, because researchers are looking into enhanced landfill mining in a responsible way, not only in developing countries.

The principle of the inner circle	"Where, early in the design process, products are made to focus as closest to the use phase as possible. All products should be created in order to be as long as used as it is possible than repaired, refurbished, remanufactured etc." (Veselinov 2016)
The principle of circling longer	"Refers to the maximization of the number of consecutive cycles (be it reuse, remanufacturing, or recycling) and/or the time being used in each cycle" (EMF, 2013 as cited in Veselinov 2016)
The principle of cascaded use	"Represents the attempt where materials are to be used in multiple applications after their primary life cycle. These later applications suppose degraded value of resources from a previous life cycle." (Veselinov 2016)
The principle of pure circles	"Is to enable toxic-free society, where all building materials will be carefully chosen in order to, when put back in nature; harm neither humans, nor their ecosystem." (Veselinov 2016)

The EllenMacArthur Foundation designed also a framework to describe business actions to implement the principles of the circular economy: the ReSolve Framework. Each letter stands for an action area:

REgenerate	"signifies the shift to **renewable** energy and materials. It is related to returning recovered biological resources to the biosphere. Thus it aims to reclaim, retain, and regenerate the health of ecosystems." (Lewandowski, 2016)
Share	"actions aim at maximizing utilization of products by **sharing them among users**. It may be realized through peer-to-peer sharing of private products or public sharing of a pool of products. Sharing means also reusing products as long as they are technically acceptable to use (e.g., second-hand), and prolonging their life through maintenance, repair, and design-enhancing durability." (Lewandowski, 2016)
Optimise	"actions are focused on **increasing the performance/efficiency** of a product and **removing wast**e in the production process and in the supply chain. They may also be related to leveraging big data, automation, remote sensing, and steering. What is important is that optimization **does not require changing the product or the technology**." (Lewandowski, 2016)
Loop	"Actions aim at **keeping components and materials in closed loops**. The higher priority is given to inner loops." (Lewandowski, 2016)
Virtualize	"actions assume to deliver particular utility **virtually** instead of materially" (Lewandowski, 2016)
Exchange	"actions are focused on replacing old materials with advanced non-renewable materials and/or with applying new technologies (e.g., 3D printing). It may also be related to choosing new products and services." (Lewandowski, 2016)

All these principles are calling for practices that lead to less material extraction (dematerialization), less pollutants in the biosphere (depollution) and less global warming (decarbonisation), more value, which all would result in an optimal equilibrium between humans and the interacting ecosystems. **Circular economy** is defined in this research as a future state where this optimal equilibrium is reached. **Circular economy practices** are the practices that lead to this future state.

2.1.3. The Circular Business model

The aforementioned ReSOLVE framework is a structure or a categorization for circular economy practices, but does not support practitioners in the transition process from linear business to more circular ones. Lewandowski (2016) made a business model[10] which would stimulate and foster implementation of (new) circular economy practices on a micro-level. His research question is "How may the principles of the circular economy be applied to a business model?" He made a literature study of different business models and adapted the model from Osterwalder and Pigneur (2014) into a **circular business model**. Two building blocks were added to the traditional linear business model, namely adoption factors and take-back system. It exists of the following eleven building blocks (Lewandowski, 2016):

1. Value propositions	Value offered by circular products and services enabling product-life extension, virtualized services, and/or collaborative consumption, as well seek to solve the problems and satisfy the needs of customers. This component encompasses the incentives offered to the customers bringing back used products and materials
2. Customer segments	Targeting of the customer is linked with value proposition component
3. Channels	Used to deliver, communicate and sell value In circular economy, this can go through virtualization
4. Customer relationships	Underlying production on order and/or what customers decide and social-marketing strategies and relationships with community partners when recycling is implemented
5. Revenue streams	Relying on the value propositions and comprising payments for a circular product or service, or payments for delivered availability, usage, or performance related to the product-based service offered
6. Key resources	Assets should be better-performing materials. This can lead to choosing other suppliers or exploring virtualization of materials. Looking for resources allowing to regenerate and restore natural capital, and/or the resources obtained from customers or third parties meant to circulate in material loops (preferably closed)

[10] A business model is a … " system of interconnected and interdependent activities that determines the way the company does business with its customers, partners and vendors - a bundle of activities (an activity system), conducted to satisfy the needs of the market along with the specification of which parties conduct which activities and how these are linked to each other." (Amit and Zott, 2012)

7. Key activities	Focused on increasing performance through good housekeeping, better process control, equipment modification and technology changes, sharing and virtualization, and on improving the design of the product, to make it ready for material loops and becoming more eco-friendly. It might also encompass lobbying.
8. Key partnerships	A network of suppliers and partners that support the business by providing some of the resources or performance of some activities.
9. Cost structure	Reflecting financial changes made in other components of CBM, including the value of incentives for customers. Special evaluation criteria and accounting principles (taking into account f.e. externalities) must be applied to this component.

Extra two building blocks (compared with traditional linear models):

10. Take-Back system	The design of the take-back management system includes channels and customers relations related to this system.
11. Adoption factors	Transition towards circular business model must be supported by various organizational capabilities and external factors

(Lewandowski, 2016)

The focus will be upon the two extra building blocks. **Take-Back System**, is about reverse logistics. As material loops are key to circular economy, the departure point is that products, their components and/or materials can be reused, redistributed, remanufactured, down or upcycled (recycled) - in case of technical materials - or can be cascaded - in case of biological nutrients (Lewandowski, 2016). Especially in the case of “technical nutrients”, this requires reverse logistics, where materials or products are collected back from the consumer. Also Planing (2015), who also developed “a new conceptual framework for business model innovation in a circular economy and to explore the reasons for consumer non-adoption of business models in this context.” , called “global reverse logistics” as one of the four keys to circular economy and also Veselinov identified reverse logistics systems and waste management system (and also renewable energy systems) as the three “(...) “hard” technological systems that are recognised as necessities to develop prior to, or parallel with the CE introduction.

2.2. Theories in Transition and Organisational Learning

2.2.1. Transition (Nadler and Tushman)

The framework of Nadler and Tushman (1997) sees change as a transition from a current state A via a transition state to a future state B. During the transition status three types of problems can be encountered:

i. The Problem of Power
ii. The Problem of Anxiety
iii. The Problem of Organizational Control

The next paragraphs will discuss these problems and the implied actions.

2.2.1.1. The Problem of Power

“Power is generally now interpreted as a multifaceted concept that includes a broad range of dimensions, such as domination, manipulation, agenda setting, opinion making, discipline, force and structures.” (Thomsen, 2005 as cited in Hansen et al, 2013). “Any organization is a political system made up of various individuals, groups and coalitions competing for power. Political behaviour is thus a natural and expected feature of organizations.” (Tushman and Nadler, 1997) This behaviour becomes even more intense when change happens, which implies often the dismantlement of political and social structures and changing the power balance. Individuals and groups will take some actions and sometimes even block the change (Tushman and Nadler, 1997). Also Giddens wrote about power dynamics in development processes. His Structuration Theory (ST) “is based on a premise that power dynamics are present in development processes at all times as a result of knowledgeable and capable actors being “able to intervene in the world or to refrain from such intervention, with the effect of influencing a specific process or state of affairs” (Giddens, 1984:14). (...) ST holds that social structures, akin to what are often called institutions, make social action possible, and at the same time that social action creates and/or sustains those very structures. Agency and structure should therefore be understood as a duality rather than two separate phenomenon, where decisions are neither the product of structure or agency alone: they are co-produced.” (Hansen et al, 2013) According to Hansen et al (2013), structuration theory divides structures into rules and resources.

- Rules could be formal (like written policies) or informal (values, status, or norms like “real men eat meat”).
- Resources are defined as “the media through which power is exercised.” (Hansen et al, 2013)

While Nadler and Tushman wrote that the first step is “identifying key players in the organization, or the individual and/or group stakeholders - the individuals who have a positive, negative, or neutral stake”, Giddens would zoom more into the social structures and how certain social structures especially discriminate certain people with a certain social identity (gender, age, income class, caste, nationality…) in decision making, i.e. not individuals, but power structures hinder and enable change.

In feminist theories and methodologies, power is also a recurring topic, especially in how structural power discriminates certain people. The feminist scholar Bowl (2001) studied the barriers for non-traditional students (such as single mums, students who already work, students coming from another cultural background) in developing their educational career and the experience of higher education. The concerns were mostly inadequate funding, lack of childcare, feeling of alienation and sense of isolation. “Feminist methodology recognizes that women have been systematically disadvantaged by educational and occupational structures. They experience barriers which relate to their gender position ± as mothers, frequently as lone carers and as workers directed towards particular occupational roles with poor wage and career structures. There is a danger, in attempting to research working-class, black and women’s experiences that the participant becomes `the problem’ to be researched, rather than the structures within which racism and sexism are perpetuated.” (Bowl, 2001)

An important concept in feminist theories is intersectionality, coined by Crenshaw. She researched discrimination of black women in US Court, and said that they are treated worse than black men or white women, because of their intersecting social identity and the related system of discrimination. She suggested that “this single-axis framework erases Black women in the conceptualization, identification and remediation of race and sex discrimination by limiting inquiry to the experiences of otherwise-privileged members of the group.” (Crenshaw, 1989). Social identities are gender, income class, nationality, religion, age, educational background etc.. Intersectionality is important in not only in understanding structural power and discrimination processes, but also in behaviour itself. White men behave differently than black men in a certain context, because of some structures (norms and expectations), and the identification of this (power) structures can lead to a better understanding of the socio-technological system. Senge also researched why organizations have learning disabilities and points out the significance of power. He advocates that especially managers look into “the underlying structures which shape individual actions and create the conditions where types of events become likely.” Even when a leader of an organization, or another decision maker, wants change, if he or she does not understand the power relations, he will fail. (Senge, 1990)

Nadler and Tushman (1997) do not zoom in on social structures and power structures, but just on mapping the political topography of the change with a stakeholder map, and then to think about approaches for building support. The first approach is participation, because when you involve individuals or groups in a change, they tend to see it as their change, rather than one imposed on them. But it is important to see that the opposing parties cannot use participation to grow their power. Nadler and Tushman also emphasize the importance of the leader, by 1) serving as a model and sending important signals through the informal organization, by 2) serving as important persons in articulating the vision of the future state, by 3) providing support through political influence and needed resource, by 4) removing barriers and maintaining momentum.

The other action areas mentioned by Nadler and Tushman (1997), like the use of symbols and stability, will be discussed in the next “problem”.

2.2.1.2. The Problem of Anxiety

Change means the move from a known current state to the unknown. Individuals will have concerns about the change. As stress and anxiety increase, this can have an impact on their performance or behaviour. (Nadler and Tushman, 1997) This is more a problem for staff, than for customers (students). If staff seems to protect the status quo, it is important to use techniques that disengage them with the current state. It is also beneficial to provide specific information to let them understand the importance of the change. They also pointed out that it is even good to overcommunicate in the transition period, so people may hear and integrate messages effectively.

2.2.1.3. The Problem of Organizational Control

Change will disrupt the normal course of activities within the organisation, and therefore it is important to pay attention to the existing systems of management control. Goals, structures and people can shift, so it becomes more difficult to monitor performance. (Nadler and Tushman, 1997). Again, communication is key.

More actions can be done, and table 1 gives an overview of the problems, and the actions, with their purpose and techniques. A recurring technique is communication and information, and therefore the next chapter will be about integrated knowledge systems for sustainable development.

Table 1: Change Problems, and Actions, with their purpose and techniques (based on Nadler and Tushman, 1997)

Problem	Needed actions	Purpose actions	Techniques
Problem of Power	Get support key power groups	Build internal critical mass of support for change	Stakeholder analysis, let stakeholders participate, bargain, isolate, remove
	Demonstrate leadership	Shape power distribution, influence behaviour	Lead by example, articulate vision of future state, reward system…
	Use symbols	Create identification with the change	Communication with names, graphics, languages, symbolic acts, small signals…
	Build in stability	Reduce anxiety (see next problem)	Allow time to prepare for change, consistency in communication, communicate what will not change
Problem of Anxiety	Surface, create dissatisfaction with the current state	Team motivation	Present information on environmental, economic impact… , let them organize information...
	Obtain appropriate level of participation in planning and implementing change	Get benefits and control costs from participation	Create opportunities for participation, use a variety of participation methods

	Reward desired behaviour	Shape behaviour	Give formal and informal rewards
	Provide time to disengage from current state	Help employees, internal strengthening	Have farewell ceremonies
Problem of Organizational Control	Develop and disseminate clear image of future state	Provide direction	Design and Communicate
	Use multiple and consistent leverage points	Recognition systemic nature of changes and reduce potential for creation new problems	Use all four organizational components
	Use transition tools	Create organizational space to manage transition	Appoint a transition manager, resources, tools, plan…
	Evaluate success	Determine the progress of transition	Use formal methods, informal channels, participation

2.2.2. Integrated Knowledge Systems for Sustainable Development

Hansen et al (2013) pointed out the importance of communication lines, tools through which actors exercise power and influence decision makers. Integrated knowledge systems are also an important key building block for circular economy (or sustainable development in general).

2.2.2.1. Social Norm Campaigns

Communication to consumers/customers can be understood in different ways. Often it takes the shape of social norm campaigns (policy makers) or marketing (businesses) where they nudge people into a behavioural change (for example purchase of other product, or service). The basis is often to change the social norm. "Social norms are informal norms as opposed to formal, codified such as legal rules. They are functional in regulating social life. There are two types: descriptive and injunctive norms. The injunctive ones reflect perceptions of what others approve or disapprove of, and motivate action because of the social rewards and punishments associated with engaging or not engaging in the behavior. The descriptive norms reflect perceptions of whether other people actually engage in the normative behavior themselves and motivate action by informing people about what is likely to be effective or adaptive behavior in a particular context. (Smith et al, 2012). Smith et al. pointed out that some studies have found that individuals from an individualist culture (as US or UK) were more guided by descriptive norms and not injunctive ones, while those from a collectivist culture (like China, Japan, or Thailand) were more influenced by the injunctive norm (Smith et al, 2012).

Also, social norm campaigns require time to have effect, need to be done continuously and influence only the consumption, but not the production. In circular economy, everyone - not as a collection of individuals, but as a collection of alliances- is responsible. Small steps lead to small changes. In the past, one of the dematerialization strategies was the focus on eco-design of products or shift from product to service, but then the aforementioned rebound effect made clear that decision makers should look to the wider system. For instance, when a car becomes more energy-efficient, people will buy bigger cars or make longer

journeys. When people shift from ownership of a car to car-pooling, they will use the saved money to purchase an long-distance airplane flight. It is not sufficient to improve the energy and resource efficiency of products and services at the micro level, because rebound effects can lead to increased consumption at the macro level and call for reducing environmental impacts by a variety of policies and focusing on the supply system (not the demand system) (Herring (1999) as cited in Roy et al, 2001).

2.2.2.2. Boundary Management (Cash et al, 2013)

As aforementioned, sustainable development is central in all socio-technological innovations in these era, because of big global and local challenges, like material scarcity and air pollution. Many people believe that science and technology (S&T) are the building blocks in sustainable development. Taking into account the departure point that building circular economy is one of the possible pathways in sustainable development, you could say that S&T are the building blocks. Technological innovations in especially ICT (which drives the sharing economy or collaborative consumption), waste management and treatment, energy engineering etc., material, infrastructure and product design… made global and some local economies more circular. The knowledge and the case studies about enabling S&T are there, and there are even new business models (another key building block) that would bypass the high initial costs, if decision makers are ready to change from ownership to usage. AIT has regional acclaimed expertise in for example environmental management, engineering and energy. How is it possible that AIT does not mobilize this knowledge into practice? Why does AIT preach sustainable development in its mission and vision, but not effectively harness S&T for sustainable development, or circular economy? Often, despite the presence of the expertise in S&T, the management of higher education often does not succeed to link knowledge and action. Alänge and Holmberg (2016) pointed out that decision makers, especially in smaller organizations like companies, have difficulty to make the sustainability concept useful of decision-making and action.

Cash and his colleagues from universities in several countries published an article which “suggests that efforts to mobilize S&T for sustainability are more likely to be effective when they manage boundaries between knowledge and action in ways that simultaneously enhance the salience, credibility, and legitimacy of the information they produce. Effective systems apply a variety of institutional mechanisms that facilitate communication, translation and mediation across boundaries. “ (Cash et al, 2003)

Cash et al (2003) defines salience, credibility and legitimacy as following:

- ***Credibility*** involves the scientific adequacy of the technical evidence and arguments.
- ***Salience*** deals with the relevance of the assessment to the needs of decision makers.
- ***Legitimacy*** reflects the perception that the production of information and technology has been respectful of stakeholders’ divergent values and beliefs, unbiased in its conduct, and fair in its treatment of opposing views and interests.”

Cash et al (2003) characterized the three functions that contributed most to a ‘‘boundary management’’ which manages “boundaries between knowledge and action in ways that simultaneously enhance the salience, credibility, and legitimacy”:

i. ***Communication*** implies having channels where knowledge is transferred, in best practices this transfer happens from both ways, continuous and is inclusive

ii. ***Translation*** means that there is mutual understanding between experts and decision makers, which all have different jargons, languages, backgrounds, experiences and presumptions

iii. ***Mediation*** means conflict management necessary to improve the mutual understanding, because often this improvement can imply tradeoffs

Table 2 gives an overview of these three functions and indicators based on the conclusions of Cash et al (2003).

Table 2: Functions for boundary management, based on Cash et al (2003)

Function	Indicators	Data collection
Communication	* Active, two-way communication * iterative, continuous * inclusiveness	Document and media analysis interviews
Translation	Mutual understanding * amount of official and main unofficial languages * awareness about history of other stakeholders * usage same definitions	Workshops and interviews
Mediation	* Transparency * Attention for all perspectives * Rules of conduct * Presence of Decision making criteria	Media and document analysis Interviews

These functions can be institutionalized in “boundary organizations, organizations mandated to act as intermediaries between the arenas of science and policy” (Cash et al, 2003). Boundary organizations would have three features:

i. “they involve specialized roles within the organization for managing the boundary;
ii. they have clear lines of responsibility and accountability to distinct social arenas on opposite sides of the boundary;
iii. they provide a forum in which information can be co-produced by actors from different sides of the boundary through the use of ‘‘boundary objects’’ (Cash et al, 2003)

Higher education institutes *should* be considered as boundary organizations, certainly if they call for sustainable development. In conclusion, Cash et al (2013), call for an inclusive communication between people with information and insights (experts) and people with influence (decision makers) to have a more sustainable campus that can adapt quickly to the changes of the challenging and competitive environment in which higher education institutes operate. Pritchard et al (2013) wrote about “governance

models that are inclusive of faculty, administration, students, boards, and external business concerns are deemed to be adaptive or resilient if the institution is governed by a “collective mindfulness.” This concept “calls for flexible strategies and mindful reading of signals from both the institutional environment and the organization itself” (Pritchard et al, 2013). “

2.2.3. The Five Disciplines for Organisational Learning (Senge)

Senge became famous with his book about the Five Disciplines of a Learning Organisation. He wrote that not only leaders can implement change, but that the whole organisation has to learn and co-evolve together. These learning organizations are organizations “where people continually expand their capacity to create the results they truly desire where new and expansive patterns of thinking are required, where collective aspiration is set free and where people are continuously learning how to learn together”. (Senge, 1990). He wrote that the organisations that “will excel in the future will be the organizations that discover how to tap people’s commitment and capacity to learn at all levels in an organisation” (Senge, 1990).

These five disciplines can be described as following:

1. Systems Thinking	Discipline that integrates the disciplines, fusing them into a coherent body of theory and practice; a discipline of seeing wholeness, a framework for seeing interrelationships rather than things, for seeing patterns of change.
2. Personal Mastery	Being aware of yourself, personal awareness
3. Mental models	Deeply ingrained assumptions, generalizations, or even pictures or images that influence how we understand the world and how we take action
4. Building shared vision	The capacity to hold a shared picture of the future we seek to create
5. Team learning	Start with dialogue, the capacity of members of a team to suspend assumptions and enter into a genuine thinking together

(after Senge, 1990)

2.3. Organisational Transition and Circular Economy

In his circular business model, Lewandowski (2016) added adoption factors as a building block. These adoption factors could be internal or external factors. Lewandowski defines internal factors as the needed organizational capabilities, such as intangible resources, like team motivation and organizational culture, knowledge and transition procedures. According to the report “Business Transformation and the Circular Economy: A Candid Look at Risks and Rewards” from the Conference Board Center of Sustainability, the main barrier is not the objection, but the inertia. Change management takes time, because you have to communicate the value of the transformation both internally to employees and externally to customers. (Anzilotti, 2017[11]) The report calls to also break down communication barriers and embrace transparency between units. Strategic alliances and collaboration is key to success, as well motivation and leadership. (Lewandowski, 2016, Anzilotti, 2017)

Joustra et al (2013, p.11) identified eight elementary skills for any circular economy project team:

“1. Entrepreneurial and developing	Is your team able to create business models with a focus on the future and Circular thinking? If they have “room to move”, do they protect the status quo or will innovators step in (because they feel there is space for change?)
2. Craftsmanship aimed at product/services	Does the team have an eye for the wishes of the end user or is he/she oriented on technical issues?
3. Systems thinking and capability of identifying causal loops	Do the members of the team acknowledge relations and have an open attitude to feedback?
4. Future oriented and out-of-the box	Is your team future oriented and do they focus on the solutions of tomorrow?
5. Celebrating diversity	Does your team see the value of diversity in social, economic and ecological contexts, and do they know what it means for the stability, resilience and quality of the organization?
6. Addressing insecurities	Is your staff and management team able to challenge or address insecurities: insecurities, ignorance, denial and create positive action?
7. Designing circular systems, products and services	Designing directly or guiding the designers with a focus on the quality of Circular thinking and taking care of innovations is an ability your company can enhance through internal discussion and connections with stakeholders.

[11] Anzilotti E (2017), If These Giant Companies can Switch to the circular economy, so everyone can, accessible at https://www.fastcompany.com/40425022/if-these-giant-companies-can-switch-to-the-circular-economy-so-can-anyone, last accessed 7 July 2017

8. Being creative, innovative and connected	Creating a sense of openness for new solutions and looking for other network arrangements transforms your professionals into cooperative thinkers. That is what you need for management, sales and product/service development.”

In practice, it is imperative that the organisation provides dedicated training programs, performance and rewards schemes, personal targets and bonuses (Lewandowski, 2016). This is also an indicator of leadership.

Leadership is essential. Leaders build relationships internally and/or externally, invests in change methodologies and/or space for others to design change. Often there is also a conflict between different leaders which can slow down the process. Alänge and Steiber (2009) published an article about "The board's role in sustaining major organizational change” where they wrote that change is a long term process and needs a body (of leaders) who are guards of the change process, because a president or CEO typically only operates in a period which is not long enough. In a company, also short term thinking among shareholders can dominate the corporate agenda. Even if the leader(s) have the vision, it is also important that the employees are aware of the importance of CE. Motivation is also very important. Lastly, often circular economy is also not really understood, because it is complex.

Another set of adoption factors could be external. These external adoption factors refer mostly to the macroeconomic environment and comprise *political, economic, sociocultural and technical* issues (the so called PEST factors). Political factors are support of government in the shape of financial incentives, or the resistance from powerful stakeholders with large interests in status quo. Economic factors that hinder are the high investment costs or the high costs for monitoring and management. Veselinov (2016) remarked that recycled materials are often more expensive than virgin materials. Proximity can enable industrial symbiosis or other partnerships that contribute to circular economy, but if the partners are too far then the likelihood for industrial symbiosis is small. Also supporting technology is important, especially IT and data management. Mohanty, who did energy efficiency benchmarking with companies in different sectors, pointed out that the difference between best and mediocre performers was not because the lack of technology and knowledge, but the management of these supporting systems. (lecture from Mohanty, 2016[12]). Also, the wider ecosystem, the supply chain, matters. In his book “the Wide Lens”, Ron Adner stresses out that innovations work if the suppliers also adapt themselves. Even if a higher education institute wants to implement a circular economy service, if there are no suppliers providing the service, it would be very difficult to implement this. But it is not only the market that has to be there, also the organisational or leadership capabilities can hinder; Adner stressed out that “failure and implementation depends from the ability of the innovator to see, shape and shift a broader ecosystem”.

[12] The lecture “Rational Use of Industry” was taught by Dr Mohanty, from the Energy department at AIT, in the fall 2016 semester.

Another important factor is the customer behaviour. As aforementioned, the time of transition depends on how the employees understand the need for circular economy, but also on how customers value circular economy. EMF, Rau et al and other advocates of circular economy also call for the shift from paying for a product to paying for a service. Although “ownership of products is still of utmost importance to consumers in developing countries, research shows that in most saturated markets consumers tend to realize the downside of ownership (…) New, collaborative, business models now allow for access instead of ownership, which increases the capacity utilization and thus the efficiency of the deployed resources. This, however, can only be a first step towards performance-oriented business models. These business models presume that consumers don’t want access but rather want to have a certain performance (...) Finally also these business models can only be seen as an intermediate step towards result-oriented business models, which are targeted at the desired outcome, e.g. fixing a shelf on the wall.” (Planing, 2015) . He categorized the business models from customer perspective in the following:

i. Ownership-based business models
ii. Access- or Usage-based business models
iii. Performance-based business models
iv. Result-based business models

The shift from ownership to performance and result-oriented would require stronger take back management, would foster the development of more durable, recyclable, repairable products and resource efficient, which would counter Planned Obsolescence, one of the symptoms of the linear economy, and would reduce the extraction of material. It is also very beneficial for the customers: they bypass high initial costs or maintenance costs of a product that they not always use and need. Thomas Rau and his colleague (2016) are big advocates for this shift, and give the example of Philips’ circular lighting project, where customers do not buy the lightbulb but lumens and pay a monthly fee for the agreed amount of lumens, instead of the full price of the light bulbs. By letting the producer still own the product, the responsibility is back under the producer instead of the consumer, who do not have time to see if all things he consumes, are ethical, eco-friendly etc.

Also, another problem, also aforementioned, is that consumers can also be reluctant to change, certainly if they do not understand the value. “Consumers are not always rational, objective and utility-maximizing.(…) This paradox is generally explained by consumer resistance to change learned purchasing behavior. By using products repeatedly over a long period of time, consumers form habits and routines. In general, they aim to preserve these habits and strive for consistency and status quo rather than to continuously search for and embrace new behaviours. This leads to a form of passive resistance, which is mainly caused by satisfaction with the status quo. (...) In general, non-functional motives, like enjoyment and entertainment, have been found to be more influential than the pure utility function ” (Keeling, 1999, as cited in Planing, 2015).

According to the report “Business Transformation and the Circular Economy: A Candid Look at Risks and Rewards” from the Conference Board Center of Sustainability, clear external communication is essential to enable the acceptance of these models. (Anzilotti, 2017[13]).

2.4. Higher Education for Circular Economy

The introduction states that HEIs are considered as hubs of capacity building in sustainable development (by educating the future leaders, carrying out cutting edge research to solve challenges…) and as large organisations with educated staff, students, buildings, networks etc. they have also the opportunity to orchestrate change within their own practices, and therefore HEIs can have two roles:

i. Providing the service of education and research to help the outside world
ii. Providing the service of an healthy environment to all stakeholders who live, study and work there

The departure point is that higher Education institute are crucial in the acceleration towards a circular economy, not only by educating and research, but also by leading by example.

According to the University of Edinburgh, which is implementing new circular economy activities, “the benefits for taking Circular Economy thinking and action further at the University include:

- Innovative ways of doing things; new research ideas and collaboration opportunities”
- Potential financial savings from efficient use of resources
- Reduction in emissions and landfill
- Employment opportunities and skills development for existing staff and students and the wider community
- Opportunity for the University to differentiate itself and sit itself as forward-thinking exemplary University “ (University of Edinburgh, 2015)

A search on Google Scholar for literature with the combination of keywords “higher education” and “circular economy” did not give many results, with exceptions like Andrews (2015) calling for including sustainable design in the curriculum of designers in UK. Another source was the Ellen MacArthur Foundation, which aims to build “global teaching and learning platform based on the circular economy framework.” (EMF, 2017[14]). They have a network of Higher Education Institutes across the world, which have the following focus areas:

- Teaching and learning
- Research
- Capacity Building and Knowledge Exchange

[13] Anzilotti E (2017), If These Giant Companies can Switch to the circular economy, so everyone can, accessible at https://www.fastcompany.com/40425022/if-these-giant-companies-can-switch-to-the-circular-economy-so-can-anyone, last accessed 7 July 2017

[14] https://www.ellenmacarthurfoundation.org/programmes/education , last accessed 24 May 2017

They have three sorts of higher education partners:

i. Pioneer Universities are “Higher education institutions entering the CE100 membership group with a formal agreement to further the collective understanding of the circular economy model through pioneering research and/or teaching programmes.” (EMF, 2017)
ii. Networking Universities are “enabling collaborative circular economy ventures and knowledge exchange across policy makers, business and academia outside of the Foundation’s formal programmes.” (EMF, 2017)
iii. The Partner Universities can nominate postgraduate students and their university tutors for the Schmidt-MacArthur Fellowship, which is an international programme with the aim of developing the skills and innovative thinking required to transition to a circular economy, and includes a one week summer school in United Kingdom, where other partners of EMF were present.

Appendix F provides a list of pioneer and networking universities in this network, ranked according to geography, which shows that most partners from this UK-based thought leader come from USA, Europe and to less extent from other regions. These are however not the only universities that are doing research in circular economy. Geissdoerfer and colleagues (2017), who did a literature study on circular economy, noted that the research interest for circular economy did grow a lot. One of their figures shows the geographic location of reviewers and researchers with at least 3 publications. Chinese, European and North-American scholars in particular have taken up this topic and there is an exponential growth in publications, which could be linked to the existence of the European Circular Economy package (European Commission, 2015 in Geisdoerfer and et, 2017) and the Chinese Circular Economy Promotion Law (Lieder and Rashid, 2016 in Geistdoerfer and et, 2017.). A hypothesis is that the funds under these policies also enables the growing interest of higher education for circular economy.

An interesting next point comes also from the research of Geistdoerfer and colleagues (2017), who were interested in the conceptual similarities and differences between sustainability and the circular economy. A search in Google Scholar for papers under the combination of “higher education” and “circular economy”” does not give many results, but it does for “higher education” and “sustainability”. Geistdoerfer et al (2017) wrote that “Despite often being used in similar contexts, the similarities and differences between these concepts have not been made explicit in the literature, therefore blurring their conceptual contours and constraining the efficacy of their use. “ They found that “the Circular Economy is viewed as a condition for sustainability, a beneficial relation, or a trade-off in literature.” (Geistdoerfer et al, 2017). According to these researchers, EMF (2013) and UNEP (2006) see circular economy as a condition, while European Commission in 2014 sees it more as a beneficial relation.

The rest of this paragraph will provide insights on higher education and sustainable development, and connect them with higher education for circular economy.

HEIs are often struggling, like many companies, with sustainable development. Alänge et al (2014) pointed out that decision makers, especially in smaller organizations like companies, have difficulty to

make the sustainability concept useful of decision-making and action. They refer to the “dilemma of deciding under ignorance” discussed by Croy (1996) which says that decision makers do not have the knowledge or understand the whole picture to forecast the possible negative impacts in the future, and that the complexity is too big. (Alänge et al 2016). Kaplan researches if capacity building is a prerequisite for shifting the idea of development into practice. “Is it possible that capacity building demands such a radically new form of practice, such a radically new form of thinking, that our current approaches are doomed to failure, not because we lack adequate models or ‘technologies’, but because our very approach to the issue is inadequate?” (Kaplan, 2000). He pointed out that the technologies and knowledge are there, but often that the management is lacking some organisational capacity. He calls for capacity management, which is a long term continuous learning “process by which people, organizations and society systematically stimulate and develop their capacities over time to achieve social and economic goals. It is a concept that extends the term of capacity-building to encompass all aspects of creating and sustaining capacity growth over time. It involves learning and various types of training, but also continuous efforts to develop institutions, political awareness, financial resources, technology systems and the wider enabling environment.” (UNISDR[15], 2007)

Apart from management and capacity, there are also other issues. In Industrial Ecology, the term “rebound effect” is addressed when the impact of emergent "green" technologies, renewable energy, polyculture agriculture, decarbonized transportation systems, reduced product packaging, which could be considered to contribute to circular economy, is outdone by a increased resource consumption as a result of economic costs savings. (Ghisellini et al, 2015)

Another issue is the capitalist economic-growth promoting system itself in which higher education is embedded. Circular economy calls for adding value and aims to decouple economic growth from environmental impact and from material resource intensity. Is that possible? According to people in movements like the degrowth association[16], the economic growth itself is the evil that leads to the depletion of society and environment. Professor Maniates (2017) is initiating a research project on higher education and social innovation for a post-growth world. “higher education can reclaim its beacon of sustainability by attacking an altogether different but immediately relevant question: How do complex human societies thrive — environmentally, equitably, and justly — in a post-growth world?” (Maniates, 2017)[17]. He writes that universities in USA and Europe drive economic growth, that “by design, not by happenstance, that higher education in its modern form is a core component of "the great acceleration" — the rapid increase in production, consumption, and environmental assault since 1950” (Maniates, 2017). He writes that “most college’s sustainability initiative center on four practical goals: increasing efficiency, reducing waste, decarbonizing energy use where affordable, and improving the institution’s image.”, because it leads directly and indirectly to the growth of the institution. The growth of the institution could be seen positive, when a higher production of knowledge enables a higher accessibility (towards) knowledge, which can lead to a circular economy.

[15] https://www.unisdr.org/we/inform/terminology, last accessed 20 June 2017

[16] https://degrowth.org/, last accessed 30 August 2017

[17] http://scorai.org/wp-content/uploads/wordpress/Maniates-CHE-2017.pdf, last accessed 25th August 2017

Maniates emphasized that higher education, at least in USA, is improving its environmental impact, which is proven by sustainability reports and indicators of different associations, but then he criticizes that “with few exceptions, these initiatives accept and often facilitate a social logic of unrestrained economic growth. Campus recycling initiatives marginalize questions about the growth of disposables in industrial society; instead, recycling is often experienced as a reward for consumption. Composting of food waste is admirable, but it may sideline questions about the drivers of waste or the ecological affordability of meat.” (Maniates, 2017). He states that “colleges and universities are not just agents of economic growth; they also depend upon it, which makes it doubly hard for them to envision a post-growth world. Bigger budgets, new buildings, better-paid faculty, an expanding student body — all are markers of institutional success, and all become difficult to achieve amid tepid economic growth and pinched public funding.” He calls that higher education should focus on resilience which means “ zeroing in on non-economic foundations of human prosperity: social capital, mutual trust, strong community, loving and respectful relationships, local knowledge, community self-reliance, and limited inequality. As colleges and universities cultivate these elements in their own operations and within their communities, they are laying the groundwork for human flourishing in a post-growth world. Students, staff and faculty members, alumni, administrators, and funders would thus do well to encourage colleges to infuse resilience thinking into existing environmental initiatives. “ (Maniates, 2017). Sustainability, as aforementioned, can be interpreted in many ways. It is not only about changing and improving what is considered to be “not good enough”, but also about identifying what is good for the system. Systems, also universities, have limits, and the capitalist economic growth can push socio-technological systems to cross their carrying capacity. Based on Maniates’ reflections, the discussion will dive if maintaining the structure, the buildings and the number of students (and faculty and supporting management) is also not a way of doing circular economy, a way of keeping the university environmentally as well economically sustainable.

3. Methodology

To answer the research questions, one base subject will be studied: the Asian Institute of Technology. The researcher has lived and studied in this system for a semester before the thesis, and will continue to live, work and research in the system during the thesis. She is also one of the stakeholders and this research can be called an action research.

For especially the objective of understanding the current circularity in AIT, an action research approach is chosen. A good way to understand a social system is to take part in the system (plan), try to move the equilibrium (act), take notice what happens (observe) and evaluate this (reflect) and then plan a next step. Action research has not a linear structure, but a “spiral” or cyclical structure. Berg and colleagues (2004), and O’Brien (1998) mention both the structure of plan-act-observe-reflect. After reflection there will be another cycle of plan-act-observe-reflect.

Besides this, action research is not only about collecting and analyzing data, but also is a more holistic approach to solving a real problem (O’Brien, 1998). As an exchange student in AIT, the researcher is automatically part of the system, but her “external status” also protects her from conflict of interests. Her supervisor and examiner are from outside the system, and not faculty members who have a history in AIT and could be biassed. Participating, or “interfering in the system”, can happen through different tools, such as asking questions to other stakeholders which let them think critically, through focus groups, interviews, or through organizing activities that raise awareness, or even organize an activity that solves a problem. More passive tools, which are necessary for the preparation of the more active tools, are document analysis and participatory observation. An action research “is one of the few research approaches that embraces principles of participation, reflection, empowerment, and emancipation of people and groups interested in improving their social situation or condition.” (Berg et al, 2004).

3.1. The Researcher’s Background and Interests

Every researcher will approach the same subject from different perspectives, because a researcher is first of all an individual, who had different experiences that had an influence on her/his view. Especially in action research, where the researcher becomes an insider in this socio-technological system, it is important to also reflect about the background and interests of the researcher, because it will help to understand how action research can support the implementation of new practices.

The thesis describes and names the researcher in the singular third person, except in the grey reflection boxes, where the researcher writes in the first person. These are not part of the scientific results, but provide an insight for other researchers to reconstruct the context and also contains her opinions, learning process and outcomes. These reflection boxes would contribute to the fourth research question and the discussion.

Reflection 1: Researcher's Background

I was born in January 1989 in Antwerp, which is located in the Flemish part of Belgium. My years as teenager were spent in a secondary school, which was a bit different than most schools in Belgium, because it has an entrance exam and demands from every student to learn one of the two western ancient languages. It was founded by Benedictine nuns and the slogan was "Ora and Labora". Hard work was a value. I studied Latin for four years and graduated in Ancient Greek and Science. I remember especially the classes of Ancient Greek. The classes were very small. We talked especially about philosophy and I remember especially the lessons of Socrates, who always kept asking questions and advocates for reflexivity.

Afterwards I started my Bachelor studies in Geography, minor social and economical science, at the Katholieke Universiteit Leuven (KUL) in Belgium. I remember the first guest lectures, by professor Jared Diamond, from UCLA, famous for the book "Guns, Germs, and Steel" and "Collapse: How Societies Choose to Fail or Succeed" which gave me insights about the interactions between humans and other environmental systems, humans and humans and between other environmental systems. A professor also told that geography provided a helicopter view, and not a deep view, on the world, and aims to connect the dots.

I joined in my first year an exchange of an European student organisation, called EGEA, to Finland. Other geography students from different years and I stayed for a week with Finnish students, and explored the student life, as well the nature and culture of that country. In the following eight years I would be involved by participating, and later, organising exchanges, seminars, and even congresses.
In the second and third year of my Bachelor, I took credits from social, economical science, and organisational psychology. In the summer after my second year I went to Ghana in a volunteering program. This was a milestone, because I realized that my academic insights did not give me the tools to help practically, and I also started to see development in a different light. I was disappointed about my own naive belief on development. In my third year of my Bachelor, I took classes, even extra credits, in development studies which helped me to reflect on development and the world. I realized that development and change should come from inside, and not from outside.

After my Bachelor, I decided to start a preparation Master, because I wanted to do a Masters in Applied Economic Science, because I felt that this applied science could teach me more than geography, which seemed to be more about theory. I quit after a couple of months, because the classes were focusing too much on profit, and not about environmental externalities and social implications.
I had to look for a professor for a thesis in this preparation Master outside this school. The only project I finished was a paper on "Sustainable tourism", with a case study in the only national park in Belgium. I remember that this was the first time that I was reading about the triple bottom line, of economical, environmental and social, or, then, profit, planet and people. Instead of going back to university, I decided to work for almost a year and then travel around the world for ten months. In this time, I learned a lot about myself and the the world. I ended up in Prague, where I followed an one year long practical course in filmmaking, because I wanted to tell stories about the world. In fact, geography -too- is Ancient Greek for "writing about the earth". I worked for Belgian television and then for a video art documentary house in Brussels, where international activist filmmakers were working on a project on ecology and one on arm trade and wars. In that time I learned a lot about communication, but also about systems thinking and design thinking.
In the meantime, I was still involved with this European student organisation. When I worked for this documentary house, I was elected as a Board member on European level and was the legal representative, as well in charge of internal communication of thousands of geography and tourism students in more than 30 countries. In that time I was also involved in a project to change the corporate identity and was really advocating for a social and environmental awareness. I initiated a project group on diversity and inclusion, with different activities, as well supported the project group working on raising awareness on the environment. In the same time I also followed a course of one year on "environmental philosophy and politics". Monthly, I joined a group of thinkers for a whole Saturday to listen to experts from academics, activists… on their view about "another world" and the transition to this world. It sharpened my critical thinking and see climate change for example not only as an environmental problem but as a societal problem. In that time I dived also into feminist theories.
In August 2015 I started my Master in Industrial Ecology, where I also encountered the concept of circular economy. I do an Erasmus Mundus Master, which means I have to study in universities in two

different countries in these two years. An European student can also do an exchange semester in a partner university outside Europe. My first and second semester was in the University of Graz (Austria), while my third semester (my exchange semester) was in the Asian Institute of Technology. My thesis had to be done under supervision of Chalmers University of Technology in Sweden.

During the third semester I lived and studied in AIT. I became member of the Student Union Magazine and conducted some interviews. This is how I got to know more people and learned more about AIT. Also my professors let me reflect on the campus, which resonated with my own observations that waste was not separated. In the end of October, I established the Student 2 Student Sessions, as an informal weekly platform where students could express themselves. One month later the Student Union president introduced me to an external advisor, who wanted to meet students. I gave my opinion and he forwarded it to the AIT president. He invited me for a face to face interview and also let me speak and make a team of other students for the Institute Forum in December, where we could share our ideas to improve AIT. This also lead to my invitation to an external event by other directors. In December, I got also offered a student assistantship to work for AIT Extension. This brings me in an unique "inside" position in AIT, but due to the fact that this thesis is under supervision of professors of Chalmers University of Technology I am also an outsider in some way.

3.2. Ethical Issues

This research could be defined as action research, because it is "carried out in real-world circumstances, and involves close and open communication among the people involved. (... therefore…) the researchers must pay close attention to ethical considerations in the conduct of their work." (O'Brien, 1998).

This study aims to make Asian Institute more a model of circular economy, where resources are utilized optimally, social impact increases and environmental impact decreases. Although the purpose of this study is to have an impact at the institute and the stakeholders positively in the long run, some individuals may be affected negatively. The desired overall impact would be positive, so this would not be wrong. Also it will follow the values of action research which could be considered as positive:

- "The democratization of knowledge production and use
- Ethical fairness in the benefits of the knowledge generation process
- An ecological stance toward society and nature
- Appreciation of the capacity of humans to reflect, learn, and change
- A commitment to nonviolent social change" (Berg et al, 2004)

Ethical issues can arise at a variety of stages in management research. Diener and Crandall (1987 in Bryman and Bell, 2011) identified four domains of issues around ethical principles:

i. whether there is harm to participants;
ii. whether there is lack of informed consent;
iii. whether there is an invasion of privacy,
iv. whether deception is involved

O'Brien gave a list of principles for ethical considerations for action research, using the list as cited by Richard Winter (1996) and his additional principles:

i. "Make sure that the relevant persons, committees and authorities have been consulted, and that the principles guiding the work are accepted in advance by all.

ii. All participants must be allowed to influence the work, and the wishes of those who do not wish to participate must be respected.
iii. The development of the work must remain visible and open to suggestions from others.
iv. Permission must be obtained before making observations or examining documents produced for other purposes.
v. Descriptions of others' work and points of view must be negotiated with those concerned before being published.
vi. The researcher must accept responsibility for maintaining confidentiality.
vii. Decisions made about the direction of the research and the probable outcomes are collective
viii. Researchers are explicit about the nature of the research process from the beginning, including all personal biases and interests
ix. There is equal access to information generated by the process for all participants
x. The outside researcher and the initial design team must create a process that maximizes the opportunities for involvement of all participants."

These principles were taken into account as much as possible. For principle 6, the names of the interviewees were kept secret and this thesis does not contain quotes, because insiders could be recognized easily, certainly because AIT is a small community. The participants were informed about the purposes and the nature of the research, and what is going to happen with the data, so they can freely choose whether or not to become involved is reducing the lack of informed consent. There were also moments of validation.

Kaplan also raised some ethical issues concerning organisational capacity building. It could be considered that this research is done from the point of view of the capacity builder. The efforts of the researcher consisted of giving training courses, providing resources (information) and need assessments. In this process it is imperative to pay attention to stay in facilitation rather than advice-giving. "External capacity builders" often are trapped in trying to "get organisations to make changes which we think will be good for them, which in itself can diminish the robustness of those elements at the top, rather than strengthen them through a form of facilitation which enables organisations to come to grips with their own issues, thus developing those top elements." (Kaplan 2000)

It is also important to point out that the researcher comes from a West-European country, the examiners from a North-European country and that the base subject is an institute in an Asian country, with mostly stakeholders of Thailand, India and other South and Southeast Asian countries. These intercultural interactions could limit as well benefit the research. The researcher has to invest time in cultural context and dimensions and the associated cultural norms, which could raise some conflict. Also her western background in combination with her role as capacity builder this can create some not desired effects. On the other hand, she can bring in new ideas and approaches that could benefit the organisation and community. Besides this, this would also give a first insight if this study could be universally applicable, or only in a Thai, Asian or North and West-European context.

3.3. Mixed Research Specifics

This study aims to create new concepts on assessing, building and even managing capacity for circular economy in HEI; therefore qualitative research is required. Interviews, participatory observations and focus groups will be organised.

Some parts of the assessment tool, such as resources, even skills and organisational structures and systems can be easily assessed and quantified (and even benchmarked), because they are visible, but the most essential elements of this capacity building and assessment are invisible. As Kaplan noted, even if there are documents with visions, strategy, an attitude declaration, a policy etc. this does not indicate the extent in which this is translated in practice. These elements are “ephemeral, transitory, not easily assessed or weighed. They are largely invisible—observable only through the effects they have—to the organisation itself as well as to those practitioners who would intervene to build organisational capacity.” (Kaplan, 2000). Therefore the biggest part of the results are mostly qualitative data, with few quantitative data.

3.4. Research Process: Method and Validation tools

In order to answer the research questions, a literature review is the base for this research and complemented by secondary and primary data. All steps taken, all observed events and the contributions to the study are noted in a field diary, and digitized in a tally sheet, which could ensure a possible reconstruction of the study.

Table 3 points out how the different research tools contribute to the different research questions and when some specific tools happened. Please note that while new data was collected, new areas of interests and concepts arise, and consequently, the literature research and research process got updated, which gave this process also a cyclical nature. All method tools will be discussed in the following paragraphs.

Table 3: Method tools and timing for each research question

RQs				Method Tools	Timing					
1	2	3	4		D	J	F	M	A	M
X	X	X	X	1. Secondary Data (academic literature, case studies…)	■	■	■	■	■	■
X	X	X	X	2. Participant Observation	■	■	■	■	■	■
	X	X	X	3. Four Focus groups students (word clouds, stakeholder analysis, facebook group interactions…)			■	■	■	■
X	X	X		4 .Emails and/or Face to Face Interviews and/or on-line calls with Faculty or Key Actors in other Higher Education		■		■	■	
			X	5. Informal sources	■	■	■	■	■	■
		X	X	6. Design fishbone diagrams and time lines				■	■	■
X	X	X	X	7. Validation by other insiders			■	■	■	■

		X	X	8. Design workshop						
X	X	X	X	9. Reflecting with diary and other outsiders						

3.4.1. Secondary data

3.4.1.1 Literature review on academic theory

The base was a literature review. The following academic databases were used for the literature search; Google Scholar, ScienceDirect and the Library of AIT. Key words were *circular economy, circular economy in Thailand, circular economy in higher education, sustainable development in higher education, capacity building, circular economy and human resources, learning organisations.* Also other students and professors in my field or close to my field suggested additional references.

3.4.1.2. Secondary data from case studies

“Case studies are useful in exploratory research for understanding existing phenomena for comparison, information, or inspiration, but can also be used to study the effects of change, new programs or innovations.” (Hanington et al, 2012)

Especially to answer the first research question and to collect sources of inspiration, the departure point is retrieving secondary data from selected case studies (see table 4, in subsection 4.1.)

3.4.1.3. Secondary data about the specific case study of AIT

Secondary data could “establish what has already been done and what hasn’t, gathering comparison data and helping to suggest a research direction or methods that should be used in this study.” (Hanington et al, 2012). Sources of secondary research included:

i. Master thesis research: reports and presentation slides
ii. Records and statistics from the administration units
iii. Project, program and policy documents
iv. Photographs, maps, diagrams, photographs, texts etc. published on the website(s) or official social media

This secondary data is collected with the help of the secretaries of departments, members of the student union and other insiders who got to know about my thesis during the research process. Analysing secondary data was a process that happened through the whole period, because new insights and relationships arise which lead to access to other materials.

3.4.2. Participant observation

“Participant observation is an immersive, ethnographic method for understanding situations and behaviour through the experience of membership participation in an activity, context, culture, or subculture.” (Hanington et al, 2012)

3.4.2.1. Marginal Observations during field visits to other HEIs

"Marginal participants blend into an environment as natural observers of an activity or event." (Hanington et al, 2012). Some photographs and notes were taken during field visits to other HEIs in the research period.

Reflection 2: Inspiration from other universities

These field visits were not planned to be part of this research, but during visits to different universities in Thailand (Kasetsart University, Thammasat University, King Mongkut University (KMUTT)), Singapore (National University of Singapore), and Sweden (Chalmers University of Technology), my interests let me observe and let me ask questions to insiders about education and campus practices regarding circular economy thinking. Also, other persons from AIT (from students to the president of AIT himself) started to share websites, ideas and self-taken photographs from circular economy practices especially in other HEIs, with me, or mentioned ideas during specific meetings about sustainable campus.

3.4.2.2. Full Participant Observation in the case study

An insider herself in the case of AIT, the researcher participated also in events and projects, and even initiated and/or catalysed some initiatives.

Hanington et al (2012) point out the importance of systematic observations and recordings, but also the combination with other ethnographic methods, like interviews, to not only describe what is physically evident in the environment, but also the behaviours, interactions, languages, motivations and perceptions of the insiders. By being a student and also a student assistant, the researcher can be considered as a "full" participant, because she is a complete member of the organisation. The observation is also done with guiding questions, but also with an open mind which resulted in findings which challenged previous research questions. Because of its informal structure, the observations are systematic and carefully documented with notes in a field diary and photographs.

In the end of this research (April and May), meetings were held with different stakeholders to build relationships that could bolster circular economy. The researcher even initiated some meetings and got here more the role of a facilitator, and tried to stay away from giving advice.

3.4.3. Focus Groups

Focus groups are small groups of well-chosen people which are guided by a moderator, in these cases, by the researcher. Focus groups are a qualitative method tool which could be used to collect opinions, feelings, attitudes, ideas, want/needs, stories, even fantasies from a group. Hanington et al (2012) emphasize the importance of the selection of the recruitment of the students. In initial observations, the researcher noticed that power distance in Asian context, and especially the so called "seniority" could have an impact on the group dynamics. This is taken into account.

In February, there were four “focus groups” of 2 hours with 36 students who are student leaders, have insights and/or influence in the ecosystem or about sustainable development, and represent different communities. The first hour was a general introduction to the definition, origin and principles of circular economy, because many people do not understand the concept. After this theory part, the participants can share ideas about AIT as well identify windows of opportunity and barriers for circular economy activities. The participants were asked to write down or draw what they like to share in the research. The researcher also took notes.

The set of guiding questions were:

i. Who are the stakeholders in AIT?
ii. What are their needs?
iii. What are circular economy activities in AIT?
iv. What could be possible circular economy activities in AIT? Why did they not happen yet?

Remarks and feedback of students were taken into account for the next workshops. For example one student said he missed some information about a certain focus area, and this feedback was then integrated in the next ones.

3.4.3.1. Word Clouds

“Word clouds are a method of information visualization that organizes text-based content into interesting spatial arrangements.” (Hanington et al, 2012). They are collages where words are assigned different font sizes based on word frequency. So, how bigger the word, how more it occurs. To understand how the members of the focus groups perceive circular economy and/or see what does appeal them the most, they were asked -after the theory part before the discussions- to write the first words that pop up in their mind when they hear circular economy. To assess the impact of the introduction, they were asked the same task also at the beginning of the workshop, before the theory. So, during the workshop associations were collected twice.

3.4.3.2. Stakeholder Maps

In the beginning of each design or change management process, it is beneficial to identify who are the (key) stakeholders that might be affected in this transition. The two last focus groups made also stakeholder maps.

3.4.3.3 Creation Private Facebook Group

After these workshops with aforementioned focus groups, the AIT students and some external experts who the researcher met during her journey in Bangkok, were invited to be part of a social media group about CE in AIT, where they are informed and invited to share more ideas, or examples of other higher education institutes, especially in Thailand or other countries.

3.4.4. Emails and/or Face to Face Interviews

Other important tools are interviews face-to-face or by email with three directors of service centers, one unit director, faculty members (four face-to-face), two vice president and the president. These interviews were semi-structured and held with an open approach for a possibility of letting to new data and findings, because this research has the intention to find new concepts. (as suggested by Bryman and Bell (2011).)

The interviews were about the (implementation of) the environmental policy, sharing economy initiatives, waste management, value recovery from materials, lifelong and organizational learning in AIT, need assessments, measurement or indicators of environmental performance, human well being… The context changed depending on the background of the interviewee.

3.4.5. Informal sources

Information from informal sources were not planned and therefore not recorded, but brought some guidance in direction and perspective as well. This could be conversations with students, staff, professors… One of the main sources were the Student 2 Student Sessions, a weekly informal platform the researcher initiated in October and managed during the whole academic year. The topics were not about circular economy, but provided me often new insights and perspectives on how AIT works as an organisation, or about some issues in the campus and curriculum.

3.4.6. Design of fishbone diagrams and time lines

In order to understand the current state of circularity, it is imperative to dive into the history of AIT to identify the failed, stopped or still going circular economy activities and the reasons behind failure and success (research question 3). These chronological evolution will be visualized with time lines and root-cause by fishbone diagrams. Fishbone diagrams break down the root causes that potentially contribute to the occurring effect, in successive layers (Ishikawa, 1968). These diagrams reveal key relationships, causes as well as effects, which on the surface maybe do not seem related. Root causes are often categorized, such as to the 5 M ‘s:

i. Man: man and mind power, so physical and brain work
ii. Machine: the technology and tools
iii. Method: the process
iv. Material: resources such as water, energy, land, information, time …. and consumables, products…
v. Medium: the environment (culture, climate…)

The focus groups and interviewees are asked to identify current problems and needs in the campus. For the most named problems/needs, fishbone diagrams will be designed.

3.4.7. Validation moments and final workshop

Regular meetings with the contact person in the top management and project leaders of initiatives were held to validate what the researcher learned during her research. On May 15th, a final workshop is held with a top manager, staff and student leaders, where she validated the current circularity of AIT. This workshop was also the closure of the data collection phase.

3.4.8. Design workshop(s)

In April, the researcher got the opportunity to design a 3 day workshop for 20 undergraduates in industrial design about capacity building in social business, she integrated also capacity building for circular economy. This contributes also to research question 4 (role of action research).

3.4.9. Field diary and other tools of reflection

During the period, the researcher recorded observations and events (interviews, workshops…) in a field diary and worked this out in a tally sheet (Google Spreadsheet). This diary was also an instrument of reflection. Also, during this time, the researcher wrote an on-line public monthly blog for a Flemish mondial magazine where she reflected about intercultural experience, circular economy, waste management in AIT and Bangkok. (See Appendix D). Besides this, skype meetings with the supervisor, examiner and other students in Industrial Ecology were also moments of reflection and feedback. The cyclical nature of the action research approach allows that research tools and even research questions could be revised and redesigned, to integrate new key findings which helps to build circular economy in AIT.

3.5. Quality of the research

Subsection 1.5 mentions the delimitations of this research. The choice for a more qualitative action research about a socio-technological system means that the researcher is influenced by the selected insiders, who also become co-researchers in some way. By researching a socio-technological system, the researcher intervenes also this system and will therefore experience negative or positive feedback from the system, which affects the researcher and research, which has also a negative or positive feedback on the system. Some feedback reaches the action researcher in non-formal settings and has an impact on her next decisions. The action research itself, as aforementioned, has a cyclical nature, because action researchers act, get reactions, reflect and act upon these reactions. The action researcher learns by continuously doing and learning from previous experiences and feedback.

The researcher tried to reflect as much as possible about the influence of other insiders and the negative and positive feedback she experienced, by talking with her examiner and supervisor, and other outsiders, but also by writing down ideas in the reflection boxes. These reflection boxes are documented in the whole report, to remind the reader that the researcher and research is subjective and influenced by the

feedback of the socio-technological system as well as to give the reader more insight in the learning process of the action researcher. She wrote the reflection boxes after she left AIT and Thailand, and extracted the reflections from the result sections in previous versions of this thesis report. In the previous versions, the results were more loaded with subjectivity and often written from the first person. With the help of her examiner and supervisor, the researcher examined why she wrote some results in previous versions in a certain way, why she selected which data, which stakeholders etc.. In the final stage of the writing process, the researcher decided to write only in the first person in the reflection boxes and the discussion, which are based on her learning experiences, to make clear the difference between the more objective results and the less subjective reflections and discussion points.

Regarding trustworthiness, the objective results come from primary and secondary data which are shared by stakeholders for different reasons and have to be read with that thought into account. Even stakeholders select certain knowledge, certain data, with the action researcher. The action researcher tried to validate as much as information by asking, often in more non-formal settings, other stakeholders about new data (without not always sharing the source, for ethical reasons) and reflecting often why which information was shared with her. She interviewed stakeholders from different groups, about the same issues, to get other data that previous stakeholders did not have, i.s. as a way of triangulating data collection (Bryman & Bell, 2015).

The researcher invites to read the results, discussion and conclusion with the understanding that the researcher was part of a socio-technological system, experienced feedback from this system and that this feedback had an influence on her results, but it does not make this research less trustworthy. By sharing personal reflections the researcher wants to make the results more trustworthy.

4. Results

The results are described in the order of the research questions.

4.1. Circular Economy Practices from other Higher Education Institutes

Case studies of other Higher Education Institutes could be a source of inspiration for how the future state can look like, as well define the circular economy perspective, with which the current state will be assessed. The selection of case studies springs from

- The list of pioneering and networking universities of the Ellen MacArthur Foundation (see Appendix F)
- Universities in the Erasmus Mundus Mind Program, Industrial Ecology, to which Chalmers University of Technology and AIT belong
- Universities in South-East Asia, the region of AIT, which are visited during the research journey

All pioneering and most networking universities are in countries with high HDI 2016[18] (UNDP, 2017), i.e. in very high developed countries. Only the countries of the Asian networking universities in EMF do not have high HDI rankings. The researcher looked up the contact persons in higher education institutes from EMF among the TACTICS countries, because Thailand is seen as one of these seven countries which have some economical and social factors in common. The seven countries are Thailand, Argentina, Chile, Turkey, Iran, Colombia and Serbia. In EMF's network, there are only two universities in TACTICS-countries: University of Chile (Chile) and Universidad Nacional de Quilmes (Argentina). The 7 TACTICS-countries, are identified by Times Higher Education, in collaboration with the Centre for Global Higher Education at the UCL Institute of Education, in early 2017 to become the next high education powers and are even doing better average in terms of higher education than the BRICS (Brazil, Russia, India, China and South-Africa). "In all these countries, GDP is below $15,000 per head, at least half the youth population is enrolled in higher education and participation grew by at least 5 per cent between 2010 and 2014. " (Times Higher Education, 2017).

Table 4 provides an overview of the selected case studies and some interesting features, like the HDI of the host country, the presence of a national circular economy vision, or a strong environmental focus in national policy.

[18] http://hdr.undp.org/sites/default/files/2016_human_development_report.pdf, last accessed 31st August 2017

Table 4: The 10 selected case studies: reason, host country, HDI index (2016) and presence policy

Reason 1: member of EMF network, 2: member of MIND consortium, 3: HEI in South-East Asia

HEI	Reason	Host Country	HDI	National Policy
Yale-NUS	1,3	Singapore	5	National Environment Agency is supporting, with pilot projects, dissemination etc.
TU Delft	1,2	Netherlands	7	The Netherlands has a circular economy vision, provides green deals and other incentives.
Arizona university	1	USA	10	Since Trump came in power in USA, there were major changes in policies regarding sustainable development, climate change etc.
Yale	1			
Chalmers	2	Sweden	14	Swedish government has strong and pro-active environmental focus.
Edinburgh University	1	Scotland, UK	16	Scottish government is very supportive, with Zero Waste Scotland policy
University Ghent	1	Belgium	22	Since early 2017, Flanders (Belgium) has also its own circular economy vision and produces a lot of information about this.
University Chile	1	Chile	38	N.A.
National university Quilmes	1	Argentina	45	N.A.
Kasetsart University	3	Thailand	87	N.A.

4.1.1. Education and dissemination about circular economy

The documentation from EMF on the HEIs in its network is mostly on education and dissemination: having courses for undergraduates, graduates in environmental engineering, business and design, or professional certification programs, MOOCs, workshops, seminars, informative congresses, or including it in the research agenda. Some provide professional certification programs (Arizona State University) or MBA (in case of Bradford University). For example **Arizona State University** developed an “Introduction to Circular Economy” course for upper-level undergraduate and graduate-level students, introducing them to “CE principles and implementation strategies; application of biomimicry-based technology development and product design principles; sustainable supply chain management practices; urban anatomy; life cycle analysis; industrial ecology; and living buildings.” (EMF, 2017)[19]

[19] https://www.ellenmacarthurfoundation.org/programmes/education/pioneer-universities/arizona-state-university, last accessed 20th June 2017

The **University of Edinburgh** conducted a research in 2015 where they looked to the pioneering universities in EMF and collected ideas for activities they could implement (in compliance with Scotland's zero waste policy):

> "**Hubs and centres:** Hubs and centres can help to embed Circular Economy principles in taught courses and research activities across different disciplines and create places and spaces
> **Specific courses or programmes:** All the Pioneer Universities had examples of specific courses or programmes related to the Circular Economy. Some Universities are developing online courses, including Massive Open Online Courses (MOOCs), in this area.
> **Academic champions**: Identifying a senior academic champion can be useful to act as a lead contact within the University and with external partners. A specific research Chair may be appropriate.
> **Working with others:** Close collaboration with the government and relevant agencies and researchers is important. Engagement with businesses is fundamental to being a leader in Circular Economy.
> **Funding opportunities and creation of challenge/innovation funds:** Sources of internal and external funding need to be scoped and assessed for their suitability for any of the Circular Economy- related initiatives proposed in this report.
> **Seminars and Conferences:** To promote university-wide thinking, seminars could be integrated into existing speaker series. A high profile Circular Economy conference could facilitate knowledge exchange and lead to collaborations.
> **Toolkits:** Practical toolkits can provide information, ideas and guidance on applying Circular Economy thinking to staff and students." (University of Edinburgh, 2015)[20]

An interesting case to zoom in, is **TU Delft**, because TU Delft is together with Leiden University also part of an Erasmus Mundus master programme Industrial Ecology, where the Asian Institute of Technology is a partner (emmind.eu). The Technical University of Delft has developed a MOOC about circular economy and even a toolkit (EMF, 2017)[21]. When this got launched in 2015, there were already 7000 pre-registrations from more than 155 countries (TU, 2015)[22], which indicates that there is interest and shows the opportunities in internet to diffuse the circular economy concept. TU Delft has also the chair in the highly-funded H2020 Research & Innovation Action project REPAiR (REsource Management in Peri-urban Areas: Going Beyond Urban Metabolism) will develop and implement a tool that helps local and regional authorities reduce waste flows in peri-urban areas. (TU, 2017)[23] The University of Ghent is also involved in this REPAIR project.

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[20] http://www.ed.ac.uk/about/sustainability/news/archived-news/2015/circular-economy-report-published, last accessed 15 March, 2017

[21] https://www.ellenmacarthurfoundation.org/programmes/education/pioneer-universities/delft-university-of-technology, last accessed 20th June 2017

[22] http://www.leiden-delft-erasmus.nl/nl/nieuws/lde-mooc-circular-economy-starts-20-october-2015, last accessed 20th June 2017

[23] http://www.bk.tudelft.nl/en/current/latest-news/article/detail/urbanism-leidt-h2020-project-circulaire-economie/ last accessed 20th June 2017

Collaborations with other universities, like University of Leiden and Erasmus University Rotterdam initiated the "Leiden-Delft-Erasmus Center for Sustainability, aiming to find solutions for scarcity and environmental impact of resources and the transition to circular economy, where resources will be kept in the loop". The first two organize also a two year Master in Industrial Ecology, where students analyse sustainability dilemmas, design innovative technical designs, instruments and strategies for management and policy.[24] In 2016 and 2017, the "Week of the Circular Economy" took place[25], promoting principles and best practices, by organizing events and open company visits.

NUS University (Singapore) organised at least two seminars on circular economy in Singapore. (Mantiates, 2017). One event, with free entrance, on 26 August 2017 invited speakers of not only within the university, but also of the government (The National Environmental Agency), NGOs (like Zero Waste SG, which explicit mentions circular economy in its mission), industry (e.g. IKEA South East Asia) and media. Earlier in the year, Bachelor students of the environmental studies organised a workshop under guidance of a faculty member. (NUS, 2017)[26]

In the late nineties of the previous century, **Chalmers University of Technology** (Sweden) put a goal of contributing to a sustainable society in its mission and opened six new professor chairs with a focus on sustainability. At Chalmers, all students take 7,5 credit hours' worth of classes in environment and sustainable development, which guarantees that each students also hears about circular economy. Chalmers aims that sustainable development thinking is integrated also in additional courses in each study programme and invests in training the faculty (Lundqvist, 2017, [A][27]) Professor Alänge added[28] that this 7,5 credit hour's worth of classes came after Chalmers tried to integrate sustainable development in each course, but that not all lecturers had the competence how to integrate sustainability. Another interesting initiative is the Challenge Lab, where students "learn in a co-creation fashion through action-based projects and through tools fine-tuned to help the student work with complex challenges. In the Challenge Lab, the students get the opportunity to develop unique skills in working across disciplines and from a challenge-driven educational paradigm. The education is given through a preparatory course and a following master thesis." (Chalmers University of Technology, 2017) Some Master thesis topics are related to/about circular economy. In the entrepreneurship school, all students are trained to analyze ideas from a societal utility perspective as a complement to the traditional focus on customer and and company utility (Alänge and Lundqvist, 2016).

Kasetsart University (Thailand) is one of the oldest universities and known to be a green top university. It is not part of EMF network, but an interesting case study in the same city as AIT. They aim to integrate sustainability in its curriculum. Even in its mission it mentions the course "Knowledge of the Land", that each new student has to take. It is a course on sustainable development, especially in the field of agriculture and environment. (Luilao, 2017, [B]) The goal of Kasetsart University is "to become strongly

[24] http://www.leiden-delft-erasmus.nl/nl/themas/duurzaamheidn
[25] https://www.uneto-vni.nl/nieuwsberichten/2016/week-van-de-circulaire-economie-van-16-t/m-24-januari
[26] http://www.science.nus.edu.sg/newshub/2208-symposium-on-futures-sustainability-2017, last accessed 28 August 2017
[27] A letter between square brackets means that this data does not come from literature review, but from an interview.
[28] This information came from my examiner, who read a previous version of my Master thesis report.

sustainable as the 'University of the Land' by combining its strength in agricultural sciences with the King's philosophy, as well as local and global science. It is hoped that this combination will produce academic output and impact to ensure the leading status of the university, making it become: 1) a green university; 2) a happy university; 3) a research university; 4) a world-class university; and 5) a socially responsible university." (Kasetsart University, 2017). One of the highlights is the Scraplab and Scrapshop, which does research on and designs solutions in upcycling and industrial symbiosis for the university and industries. Scraplab also organises courses and workshops for students. (Luilao, 2017, [B])

4.1.2. A Circular Internal Environment

The HEIs can talk about sustainability, but by walking the talk, HEIs become institutes that people want to follow and join. The researcher did website research and talked with five key persons in 4 HEIs about how their HEIs improved the internal environment. EMF made a framework of six categories (Regenerate, Share, Optimize, Loop, Virtualize and Exchange) under which circular economy practices in businesses are divided. (See section 2.1.2.). The following paragraphs are a result of this website research and these interviews with key persons. (See Appendix C.1 for the list of persons with their names, HEI, function, etc.)

4.1.2.1. REgenerate

Regenerate is about cleaner production through the use of renewable energies and materials, returning recovered biological resources to the biosphere and about reclaiming, restoring and retaining environmental (and human) health.

Kasetsart University (Thailand) is doing different projects which could be categorized under "regenerate" as part of the KU Green Campus Policy. It has a rooftop garden with an aquaponics installation, is converting food waste from the cantines into fertilizer, experimenting with wind and solar energy etc. (Luilao, 2017, [B])

As a result from a collaboration with several actors in the region, there is now an electrical bus which connects the two campus sites of **Chalmers University of Technology.** (Lundqvist, 2017, [A])

One of the landmarks of **Arizona State University** (USA) is the Memorial Union. This brick-and-glass community center, which was at the heart of the campus, was a greenhouse for four months each years, because of the summer temperatures in Arizona. In 2014, they installed PowerParasol, a tall shade canopy which is composed of many photovoltaic solar panels. (Website Powerparasol, 2017[29]). The place becomes a source of energy as well a more viable place for students.

[29] http://powerparasol.com/portfolio/memorial-union-at-arizona-state-university/ , last accessed 10th June 2017

The **University of Ghent** (Belgium) tries to integrate waste management and pollution reduction in their purchase and procurement practices. They choose for FSC-wood, green materials, green inks for printing etc. in their offices, as well in their giftshop. (University Ghent, 2017)[30]

The **University of Edinburgh** (Scotland) planted a local community orchard on the campus in cooperation with a social enterprise fair trade provider (University Edinburgh, 2015).

4.1.2.2. Share

In different universities, there are formal or informal collaborative consumption initiatives, where assets (cars, houses, appliances) are shared, or where assets are sold secondhand, or where people lend and borrow assets.

In the **University of Edinburgh**, students lead a cooperative, called SHRUB co-op, with an aim to reduce waste, share skills and promote a smarter, more sustainable way of meeting people' material needs. This includes allowing students to donate, buy or even swap excess items (like clothes). The group holds regular workshops and practical events demonstrating upcycling and reusing. (University of Edinburgh, 2015).

Yale (USA) promotes sustainable transport. Since 2016, they made 50 shared-use bicycles available, through a partnership with Zagster, which provides city cruiser-style bicycles, registration and reservation software and maintenance services. The students (and other insiders) can register with their university email address, reserve via a mobile app, and return the bike to the same location from where they picked it up. The bikes are available in ten locations. (Yale website[31], 2017). In Gothenburg, people, especially students from Chalmers, also use shared-use bicycles that they can get from spread stations and can bring back to the same or another station. They click in or click out the bicycle from a station, with a card. They pay a monthly subscription for using this service.

4.1.2.3. Optimize

As many organisations, universities are under pressure to do more with less. They try to serve more students, improve campus life, provide the best education etc. and this all with less and less support from governments or other donors.

Yale-NUS College (Singapore) has done away the trays in its campus dining rooms and is preparing a shift to smaller plate sizes, moves that can cut food waste by as much as 30 percent. (Maniates, 2017) An electricity meter in every dorm room means that students receive individual bills for their air-conditioning use, which prompts them to cool their rooms during only the hottest hours of the day, or not at all. (Maniates, 2017)

[30] https://www.ugent.be/nl/univgent/waarvoor-staat-ugent/duurzaamheidsbeleid, last accessed 10th June 2017
[31] http://to.yale.edu/bikeshare, last accessed 10th June 2017

Chalmers University of Technology (Sweden) is opting for energy-efficiency. The lightning in the corridors will go off automatically when the offices are closed. (Lundqvist, 2017, [A])

Some institutions leverage technology to optimize storage solutions. Some universities look in their libraries and other archives. Geographic Information Systems (GIS)[32] are also improving the campus life and organisations worldwide. First of all, GIS is more used by other fields, like criminology, medical science, agriculture etc. Thomas Rau et al use GIS to make material portfolios of buildings (Rau et al, 2016). GIS improved transport as well could help to design or assess environmental policies. The **University of Ghent** (Belgium) partners with Bubble Post, a Belgian transport company, to lower the carbon emissions when they have to move products, paper etc. in the city or to other cities (University of Ghent, 2017). Bubble Post reduces the trafficking of goods within the cities to combat urban warming by having depots there, and only uses light, ecological transport for "the last mile". They use ICT, shared warehousing and shared packing. (Website Bubble Post, 2017) **Kasetsart University** (Thailand) is investing a lot in water monitoring and conservation, using modern technology. (Luilao, 2017, [B])

4.1.2.4. Loop

The University of Edinburgh (Scotland) invests in more sustainable buildings (modular design), constructed in such a way that natural light passes through the windows and skylight therefore reducing the need for artificial lighting, and installation of more efficient and renewable energy systems. They also support informal (online) networks where equipment, tools and resources are internally cascaded and reused wherever possible. They also ensure that all cooking oil is fully recycled and taken away to be converted to bio-diesel by Olleco Scotland. (University of Edinburgh, 2015). **Chalmers University of Technology** (Sweden) goes for separating waste in different fractions. (Lundqvist, 2017, [A]) The **University of Ghent** (Belgium) integrated sustainability principles in its purchase, procurement and waste management, and also integrate these together in their activities. They have a "Circuit Shop", which sells old furniture, things, that still can be used… to the university units and individuals. Their project "urban mining" invites their staff and students to donate their old mobile phones. (University of Ghent, 2017[33])

In **Kasetsart University** (Thailand), the Scrap Lab and Scrap Shop was initiated by industrial designers (faculty, staff and students) as a reaction on the waste made by their university. Since 2007 they upcycle waste of their university, industries and even hospitals in designs such as accessories, furniture etc. Part of these products are sold in the Scrap Shops. They also design for free in some cases and even everyday, because all employees are motivated to give waste "a second life". Kasetsart University has an eco library, a place which shares knowledge about the eco-concept to users and staff. Apart from providing knowledge about sustainability, they also lead by example. The furniture is made of waste from

[32] Geographic Information Systems are designed systems, software programs that "visualize, question, analyze, and interpret data to understand relationships, patterns, and trends." (Esri, 2017). It contributes to cost saving through greater efficiency, decision making, communication, record keeping, to understand what is happen and will happen in geographical space etc. For more information: http://www.esri.com/what-is-gis

[33] https://www.ugent.be/nl/univgent/waarvoor-staat-ugent/duurzaamheidsbeleid/duurzaamheidsbeleid/aankoop-en-afvalbeheer.htm, last accessed 10th June 2017

the campus and companies by Scrap Lab. Also the lights are lamps woven from leftover threads. (Luilao, 2017, [B])

The **National University of Quilmes** (Argentina) relaunched a recycling program in cooperation with "*cartoneros*", litter pickers from the poor suburbs in Buenos Aires, and recycling cooperatives. The interviewed key persons are working on a framework for "circular economy in global south" which also integrates solutions for the more poor people in their country. Informal recycling provides also money for the poor people. (Carenzo and Becerra, 2017, [D])

4.1.2.5. Virtualize

The **University of Ghent** states that more paper work is digitized (University Ghent, 2017). Many universities also change the idea of library. It transforms from a storage place to a learning place.
Chalmers University of Technology is also experimenting with exams at the computer, instead on paper. (Lundqvist, 2017, [A]) The **University of Chile** works with apps, because Chileans are very used to smartphones, but the interviewed key person noted that technologies do not reach all persons. Only highly educated people can use smartphones in a sophisticated way. This maintains a gap in society. (Mac-Lean, 2017, [C])

4.1.2.6. Exchange

Exchange is the application of new technologies, like 3D printing, and selling new products and services. Not so many examples were found in the selected case studies.

Reflection 3: Circular Business Models in Higher Education

During my research journey I realized that sorting practices according to the RESOLVE framework are an "inventorization" of the (pilot) projects according to some themes. Subsection 4.1.3. tells "what" is done, but not "how" (which business model) and "why" (the context, the factors). During the process of writing, I felt that especially the business model is still very traditional and that many positive "internal environment" projects are happening because of "charity", CSR or a management's vision for sustainability, but that there is not much information about innovative business models in higher education institutes that make these green ideas "rendable" (like sharing economy, pay per use, lease) This is a topic for further research.
Also, the "inventorization" did not feel enough, and in the end of my research, even after the oral presentation, I decided to contact key actors in selected case studies, including Chalmers University of Technology, with a question list or invitation for a skype call (see Appendix E), to learn more about the why (factors). The results are written in Subsection 4.1.4 as well interwoven in the previous subsections under 4.1.

4.1.3. Factors for other HEIs

In the context of the research, on-line discussions were conducted with a selection of key actors in the selected universities to gain insight into the circular economy in education and internal environment of higher education, the factors, the practices and the opportunities (see table 4). Appendix C.1 displays the data of the online conversations, the interviewees, their university and role. As the interviews were

semi-structured and the questions served more as guidance, different topics emerged, which are categorized in **ten themes**, which are described in the sub-sections below.

4.1.3.1. Defining Circular Economy

Circular Economy has different definitions and approaches. The interviewees were asked to define circular economy to see how they interpret this.

Dr Ulrika Lundqvist (Chalmers University of Technology, collegial pedagogical developer for education for sustainable development) told that circular economy activities and strategies are ideas and strategies for dematerialization, to optimize the use of resources in society, which already exist within the field of Industrial Ecology, but in circular economy a business model is coupled to these ideas to make these ideas and strategies also economically feasible. [A]

Dr Roongtip Luilao (Kasetsart University, business director and designer in Scraplab) describes circular economy as a loop economy and is focused mostly on industrial symbiosis and upcycling/recycling. She talked especially how upcycling and the right design can create value and jobs, also for the (poor) local Thai. [B]

Ms Claudia Mac-Lean (University of Chile, Director of Sustainability Office in the faculty of engineering) sees circular economy as closing the loops. It is about keeping material flows, energy flows etc flowing and also creating value. She told that before she studied in Cambridge, she assumed that everything is infinite, but there she learned a more realistic view of the world. She said that this view changes the way how engineers design projects and processes. She called the word “design thinking”. [C]

Dr Sebastian Carenzo and Dr Lucas Becerra (National University of Quilmes, senior researchers at the Institute of Science and Technology), see Circular Economy as an alternative way to address development and underdevelopment issues. Before they learned about the concept of circular economy, they had been developing a framework on socio-technical analysis of waste management. Circular economy and their framework have similarities: the cradle-to-cradle perspective, nonlinear production processes etc. [D]

4.1.3.2. Awareness, acceptance and marketing of circular economy

In Thailand, Luilao, mentioned that almost nobody knows the concept of circular economy. She learned about circular economy from English online sources, because she, as director of the business unit, had to couple her upcycling and design ideas with feasible business models. (Luilao, 2017, [B]) Also Dr Siwaporn Tangwanichagaporn, a researcher in AIT, who did her PHD research on “Mainstreaming the Circular Economy Concept for Sustainable Resource Management: Case of Packaging Waste in Thailand' emphasized that most Thai people, and her interviewees, did not know the concept of circular economy. After her explanation they recognized the practices and strategies like improving resource efficiency, recycling/upcycling, but the whole concept is not known. [9] An opportunity for higher education

in Thailand is to be the pioneering university offering full courses, modules, programs etc. on circular economy. As Thailand seems to follow trends in Europe (and in Korea, Japan, USA etc.), as both Thai experts also mentioned, circular economy, which is becoming popular in EU and member states, will also emerge eventually in Thailand. The development of a course, module, or even a whole program requires time, planning and other capacity, so it would be interesting to invest in the preparation and then be at the frontier of circular economy in Thailand.

Besides this, it is important to make a distinction between recycling and circular economy in Thailand, especially because of the perception of recycled by Thai people. In Thailand, many people do not like to use recycled and second hand materials, because they perceive it as dirty and are not aware of environmental impact. Luilao from Kasetsart University and also the Thai focus group in AIT mentioned that Thai people do not like recycled, secondhand materials, that Thai people -apart from some exceptions- would not buy designs if they know it is made from recycled materials and that sellers should not mention this. (Luilao, 2017, [B]) Luilao mentions that branding and marketing is a very important part of the Scrapshop. She suggested that Thai people look up to celebrities and that media campaigns showing a beautiful celebrity doing the desired behaviour, the desired social norm is more effective than government regulations to nudge behaviour. (Luilao, 2017, [B]) A conclusion was that a circular business model in Thailand would need a strong focus on marketing.

In Sweden, more people are aware of environmental challenges, are experimenting with sharing economy and other business models etc. The government has also a green party, which reflects the environmental consciousness of Swedish people. (Lundqvist, 2017, [A])

In Chile, five to ten years ago, people were not so aware of sustainable development, but in the last years people want change on issues like gender equality and environmental improvement. Mac-Lean remarked that Chileans have become activated citizens who come to the streets to ask for change. There is also a socialist government which also facilitates this change. She told that Chileans would wait for the market to be ready and are not market innovators, like Germans, but now it seems that the energy market especially is ready in Chile, because it is cheaper to get renewable energy. She also mentioned that they had a course in circular economy, but this was cancelled two years ago. In the survey a big share of students stated that they were interested, but only a few were willing to pay for this. This was an indicator for their office that the students were not ready for it. (Mac-Lean, 2017, [C])

4.1.4.3. Support from the national government

Chalmers' education is in line with the Swedish national requirements for learning outcomes, in which competence in sustainability is included. The Swedish government consists of the Social Democrats and Environmental party, which invests a lot of money in the environment. In 2017, there is an evaluation of education for sustainable development at all universities in Sweden. There will be a conference where universities can share good examples. (Lundqvist, 2017, [A])

Kasetsart University (KU) is a governmental university. They get funds from the Thai government and also have to report annually on their (internal) environmental performance, research projects. The Thai government is having policies, conducting projects around energy, power, water etc, But has also many other problems, like corruption, to deal with, that slow down the transition towards a more sustainable (or circular) Thai economy. (Luilao, 2017, [B])

Mac-Lean told that since several years Chile has a National Council for Clean Production, which issues clean production agreements for sectors, and they selected universities as one of the sectors. University of Chile had to comply to these goals, but the driver for investing in sustainability came not from the government, but from a movement of students. Later, more people went on board, because they saw also the political advantage of doing sustainable development in their teaching, research and operations. (Mac-Lean, 2017, [C])

In Argentina, Carenzo and Becerra shared that, they participate in public debates with local, provincial and national governments, to not copy the ideas of the global north, but to go for integral and transversal policies. These researchers are interested how to apply circular economy on local scale, and not only in big companies. (Carenzo and Becerra, 2017, [D])

4.1.3.3. University: strong vision, supporting body and management system

Chalmers and KU have both strong visions, in which sustainability is central. “Chalmers is a pioneer in regards to how a university can take on, work with and take responsibility for sustainable development.” (Chalmers University of Technology, 2017). As aforementioned, Kasetsart University also mention their class “Knowledge of the Land” in their vision and see themselves as a green university. The University of Chile has not a vision, because the investment of sustainability came from bottom-up. A dozen of students pushed for change. They were upset that the university did not invest in recycling and started campaigns. They got the support of a small group of professors and asked many times for meetings with the dean, the vice-president etc. and communicated their wishes very strongly, also to external audiences. A sustainability committee was founded and then finally an office was established. With the key actor of University of Chile, the researcher talked about the importance of few “true believers” who lead the change and can change a whole institute. Right now, there are three key persons for change management in sustainability, one for energy, one for recycling and one for education. (Mac-Lean, 2017, [C])

At Chalmers, there is an office which takes care of the internal environment. It started with one person, but is now a whole team (Lundqvist, 2017, [A]). At Chalmers, they strive “to reduce the environmental impact of our daily activities through, for example, safe handling of chemicals, waste separation at source and reduced car commuting to and from Chalmers.” (Chalmers University of Technology, 2017). They use an environmental management system (ISO 14001) “to achieve continuous sustainability improvements

in everything from education and research to the internal environment." (Chalmers University of Technology, 2017; Lundqvist, 2017, [A])

Also, in Kasetsart, the staff has to follow many standards. There is a green campus policy (and a website, also in English) and a system to collect data on sustainability and indicators such as transportation, water and waste, so KU can participate in surveys like the UI GreenMetric World University Ranking, an initiative of Universitas Indonesia since 2010 which compares hundreds of universities. Kasetsart University also won different awards for not only the research, but also for internal environment improvements, like the Metropolitan Electricity Authority Energy Saving Building Context in 2016. (Kasetsart University, 2017)

4.1.3.4.Global and local collaborations and partnerships

Chalmers has good collaborations with the municipality of Gothenburg and local industries, as the car industry (as AB Volvo) and petrochemical industry. Chalmers participates in research and education projects which are collaborations between different universities on European level, like the MIND program. (Lundqvist, 2017, [A]) Kasetsart University has also a good relationship with industry, companies and the government and a strong network. (Luilao, 2017, [B]) University of Chile has also strong private-public partnerships. The office of sustainability tries to be as resource-efficient as possible, but often gets money of the private sector for events, projects etc which also benefit the companies donating money to this. (Mac-Lean, 2017, [C]) The key persons in National University of Quilmes talked a lot about connecting actors from different groups. They shared that one of the opportunities in circular economy is that many actors in the countryside and social economy are already doing circular economy practices (but they do not call it circular economy). The challenge is to link private sector with social economy actors and how to train government officials. (Carenzo & Becerro, 2017, [D])

4.1.3.5. Financing and economical feasibility

The internal environment at Chalmers is funded by the overhead costs, which are internal taxes. The office is asking for more money to improve the internal environment and to expand their capacity, but are dependent of these internal taxes. According to Lundqvist, if activities do not go well, it is mostly because of economical barriers and/or it has not a good business model. At Chalmers, there is a lot of furniture that is being replaced, which does not get reused and there is also critique for that, but this not happening, because there is not a good business model (yet). For her circular economy is not only about strategies and ideas to reduce materials and other resources for same product service, but also couple these ideas with a business model to make it economically also feasible. (Lundqvist, 2017, [A]) Alänge[34] added one reason given by administrators for sending old furniture to destruction instead of reuse is that Swedish tax laws demand destruction.

[34] This comment was given by the examiner after reading one of the previous versions of the Master thesis.

In Thailand, companies like to invest in “green projects” of higher education institutes, because giving donations to environmental projects gives a lot of tax reduction. Luilao talked about finding donations, but also about the value that upcycling can create. It is important that the end designs look beautiful and attractive for the consumers. She mentioned that most customers in the Scrapshops in inner Bangkok are mostly foreigners who are more environmentally aware and do not have a bad perception on recycling. (Luilao, 2017, [B])

According to Mac-Lean, the “economy” aspect of circular economy is not strong in Chile, because most sustainability initiatives do not create much value. She also remarked that the socialist government takes care that Chile is progressing in society and environment, but not in economical sustainability. (Mac-Lean, 2017, [C]) Carenzo and Becerra talked more about socio-economical aspects which were hindering the transition towards a circular economy; the economy is more driven to have high profit than to solve problems. They noted that companies and institutions are not interested to improve processes and only want to reduce costs, especially labor costs. (Carenzo and Becerra, 2017, [D])

4.1.3.6. Communication and management of ideas/innovations

Chalmers tries to improve the communication about the practices. (Lundqvist, 2017). The researcher also noticed e-panels with explanations about f.e. use of solar energy in the campus.
Lundqvist communicates with different stakeholders in education for sustainability, like the vice rector, the program directors who are responsible for the syllabus, and the management, but to less extent with students. When students approached her for a platform to share secondhand educational materials, she had to refer them to the internal environment office, but she is not sure what happened with that idea. (Lundqvist, 2017, [A])

The problem with engineers is that they are not trained in communication, according to Mac-Lean. A lot of her work is communication, including external communication. Before she also stressed out how the students who pushed for more sustainability in the University of Chile, were very communicative and creative. (Mac-Lean, 2017, [C])

4.1.3.7. Competence & Leadership

At Chalmers, they try to integrate sustainable development in each study program. Lundqvist told that previously teachers had to be told why they should do that, but now that is more that they had to be taught how to integrate sustainable development. She noticed that some staff were insecure about that. There were no education for staff, but Chalmers is investing in this. Lundqvist noted that it takes time to have all teachers on board of integrating sustainable development in courses, and that is not only the lack of education for teachers themselves, but also that their “boss” needs to tell them that. (Lundqvist, 2017, [A])

At Kasetsart University, management is not 100 percent in order. At the campus there are many stores, like 711, Lawson, which gives free single-use plastic bags. First, Luilao said that they cannot forbid the shops to give free bags, because the shops can only take orders from their headquarters, but then it was stated that Chulalongkorn University, another top university in Thailand funded by the government, which also has a green campus policy, is planning to ban the plastic bag. Then it was opted that Chulalongkorn University had maybe a stronger management and that KU would probably follow soon, after the transition period is finished. (Lundqvist, 2017, [A])

In the University of Chile, the change came from bottom-up. The students pushed for more sustainability. The leadership came from “true believers”. (Mac-Lean, 2017, [C])

4.1.3.8. Take Back Management

At Chalmers, they have a system for taking back and separating waste. In Sweden, there is also an extended producer responsibility (EPR) which supports this management. Thailand has not the same waste management facilities as Sweden and a lot of waste still ends up in landfill.
Kasetsart University and Chalmers have also a bigger scale in terms of consuming people (compared with AIT) to collect enough waste for transformation into fertilizer, compost etc.
The movement of the students in the University of Chile came as a reaction on the lack of recycling in the campus. The students started creative projects and pushed through meetings for measures regarding waste. They have now a recycling system based on the results of a big survey. This survey indicates that people will not bring their waste to a collection point if the distance is too long and the effort is too big. Therefore they have different small collection points instead of a big collection point. A recycling person brings then all the stuff to the big collection point and a waste company picks up the waste. (Mac-Lean, 2017, [C]) The National University of Quilmes aims to include the *cartoneros*, the litter pickers, and cooperatives as much as possible in their take back management and recycling programme. (Carenzo & Becerra, 2017, [D])

4.1.3.9 Social Dimension

As Thailand has a lot of poor people, and informal recycling is part of the life of the poor, recycling and upcycling was often discussed as job creation opportunities for the Thai poor people. Kasetsart University aims to let students think about the impact on and integration of less advantaged Thai people, and the next generations. Luilao told how the university can help poor people, by preparing ideas of new lives for “waste”, design new products and help them to sell the new products. Also the course “Knowledge of the Land” goes about poverty. (Luilao, 2017, [B])

Chalmers University of Technology integrates social dimension of sustainability by developing a course on ethics (in line with Swedish national learning outcomes) and also building competence among teachers to be able to give more space in their classes on ethics and the social impact of technologies and strategies. (Lundqvist, 2017, [A])

Mac-Lean named two working points. Chile is one of the pioneers regarding use of mobile phone, and it is normal that each Chilean has one or two mobile phones and has access to internet and services. People buy many things through internet. She talked about the gap between high educated people who know how to access sophisticated apps and more knowledge and the low educated people who only use internet for simple things. She said that technology only helps a certain share of people, not everyone. Virtualizing, which is seen as circular economy, is only for people who are digitally literate. Another working point is the internationalisation. She wants Chileans to expand their local vision to a global mindset and open their mind for other countries in the world. She mentioned a couple of times that her experience in Cambridge helped her to bring ideas to Chile and noticed that many other Chileans bring progressive ideas regarding society and environment back to Chile. (Mac-Lean, 2017, [C])

Carenzo and Becerra from the National University of Quilmes (Argentina) approached EMF to investigate what circular economy in Global South means. They want to incorporate socio-technical system thinking into the design of new products and processes. They say that technological progress should co-evolve with institutions and communities and be aware of social inclusion/exclusion dynamics. Circular Economy in Global South is different from Circular Economy in the North. In developed countries, they gave as example, circular economy related to waste management, which stresses out engineering solutions. In the Global South they have many people that make living by working with waste. A circular economy solution must include this social phenomenon. The chat between the researcher and these two key persons of Argentina was mostly about the social dimension, which was not researched properly as the engineering applications (technology), environmental impacts (environment) and the business models (economy). They emphasised the importance of not only working with big companies, but also with cooperatives, to foster the transition towards circular economy. Their university relaunched for example a recycling program in cooperation with cartoneros, litter pickers from poor suburbs, and cooperatives. (Carenzo and Becerra, 2017, [D])

Reflection 4: Is Circular Economy just a name for something that already exist in more poor environments, and can we learn something from the "poor"?

While I am writing down the previous paragraph about the social dimension, in my home in Belgium, my brother and his friends are mowing the lawn. His two friends fixed our lawn mower, even if other/elder people recommended my brother and me to throw away the lawn mower and buy a new one. These two friends said that was not necessary, and after writing so much about circular economy, I went against the advice of older people and gave them a chance. They repaired it. They come from poor background, and live in a van in forest, but are the most resource efficient people I know in Belgium. Even their car is more green than electrical cars. They drive on LPG, because it is economically more feasible, and they also told me (because they know what I study) it's more green than an electrical car. They are not highly educated, but are more circular than I am. They also talk about the future as an Industrial Ecologist would talk (they are aware that resources are not infinite etc), and describe the middle class of Belgium as spoiled people who just throw away resources.

Is Circular Economy, I ask myself, more a concept for middle class and high class people, who "need" it more than the poor people? When I interviewed also people in Thailand, or other "developing countries", they told me that circular economy already exists and referred to practices especially done by poor people, or "enlightened" high-educated CEOs (who often have been abroad and got their idea from there). Also, during war-time, like World War II, or in the Soviet Union era, people were also more resource-efficient, but do we want to copy these conditions of "war" and "security" and "poverty" that fostered this resource-efficient use? No.

But we can learn that people saw the world differently, more realistically, where not everything is "infinite,". Mac-Lean told that the problem is that when engineers and other designers have a worldview where they do not see the planet as an island, but think everything is infinite. Education is key for this world view. As Mac-Lean suggested, it is important that education open the doors to other parts of the world, and also other parts of society. The approach of Carenzo and Becerra is great, in my opinion, because they want to link poor and rich, social and private economy, government and informal sector etc. in this transition.

Carenzo & Becerra talk about making a different concept of circular economy for Global North and Global South, but I think you cannot divide it according to geography. I have seen rich and middle class people in "global south", who are behaving the same as rich and middle class people in "global north", and also in global north "poor" people as my brother's friend exist. It is important to acknowledge that countries like Sweden, Belgium, Netherlands and Austria have more "money" and other resources and can experiment more regarding engineering, but circular economy is also about "behaviour" and "participation", about "market" and "marketing", so it is beneficial in my opinion to understand the social dynamics and how to include, let participate, as many people as possible.

4.1.3.10. A continuous process

Roongtip mentioned that educating people on circular economy is a continuous process, because each year new students come. It is a never-ending task, and therefore some projects, workshops, campaigns etc. have to be hold annually, when a new stream of people (students) arrive. Although KU does a lot, there are always ways to improve the university more.

Mac-Lean also mentioned that she was appointed after the student movement. She said that bringing institutional change is very difficult and also mentioned that change needs time, but that time is also very scarce.

4.2. AIT's current state from a circular economy perspective

4.2.1. General Background

AIT is a postgraduate institution located 40 km north of Bangkok, Thailand, which promotes "technological change and sustainable development in the Asian-Pacific region through higher education, research and outreach" (AIT, 2016). It was founded as SEATO[35] Graduate School of Engineering and received funding from organizations and governments around the world. In 1967, "the Constituent Assembly of Thailand approve legislation for the Charter of the newly named Asian Institute of Technology in October. AIT becomes independent of SEATO as an institution of higher learning empowered to grant degrees." (AIT, 2017)

In 1973, the present campus was ready. The Master institute plan is since then not more updated and already forty years old. A lot of infrastructure is also from the seventies. In August 2010, a new chapter was designed to transform AIT from a national to intergovernmental institute, but that did not go through. In 2011, two-meter-high floodwaters made AIT not operational for several months and damaged the institute a lot. (AIT, 2017)

Besides the usual labs and academic buildings, the main campus includes housing, sports, and medical facilities, a conference center, and a library (AIT, 2016). According to the website, it has more than 1700 Students from more than 60 Countries/Territories, 75 Internationally recruited Faculty members from more than 20 Countries, 101 Adjunct/Visiting Faculty and more than 500 Research and Support Staff members from more than 30 Countries. It has a very international network of alumni in more than 90 countries. (AIT, 2016) One of the strongest qualities of AIT is also its international orientation. On 30 March 2017, U-Multirank released their "Institutional Rankings 2017". AIT scores the highest grade in all six indicators in the category of International Orientation. (AIT, 2017).

[35] SEATO stands for the Southeast Asia Treaty Organization and was created to block communist gains in this region. Among its members were Australia, France, New Zealand, Pakistan, the Philippines, the United Kingdom and the United States. These countries also provided a lot of investment in this postgraduate institute.

Reflection 5: Is AIT's international orientation and nationalism contributing to campus sustainability?

When I look back to this period, I learned the most from the intercultural interactions and am happy with the social capital and the friends from countries I even had not heard before (like Timor-Leste), or would not connect easily (like Bhutan, Afghanistan).

Coming from Europe, with the Balkan wars in my memory (through my European youth work I know personally people who experienced it), I see the negative impact of nationalism and often reflected a lot on nationalism in the field of sustainable development. Many problems, such as climate change, floodings etc are transboundary and requires an international cooperation. Also Joustra et al (2015) noted "celebrating diversity" as one of the key skills for circular economy. AIT is a great platform for shaping and sharpening international networks, as long as it invests in removing the roots for the negative impact of nationalism among students and even faculty.

I was also the only Belgian and Dutch-speaking student and had no other students with the same nationality or mother tongue to bond with, so I was "forced" to have intercultural interactions. I noticed that mostly students from "minorities" were the ones who had friends outside their national circle. I was excluded from some activities organised by certain nationalities, even if I asked if I could join to learn more about their nation. Also during the Cultural Show, the biggest event organised by the Student Union, the atmosphere was very nationalistic. In the summer, after I left AIT, I talked to the other MIND student who did an exchange in AIT, but some years earlier. Even before I mentioned it, she remarked that she did not like the nationalism she faced (as the only North-American).
This nationalism was one of the drivers why I initiated the Student 2 Student Sessions in the end of October 2016, to have an "intercultural platform".

In the beginning of my research, I wrote also an email to a faculty member to ask "if AIT students and other residents are not behaving "pro-environmentally" because they are poor in terms of time, money and (social) space, because time and money is mostly invested in learning, or at least more than compared with traditional students. (...) going to farmer's markets like Talad Thai, or Future Park with organic shops selling organic soaps , or resource-efficient equipment etc... are quite far for people without a car, and also that students, because of limited budget, buy cheap, but energy-consuming appliances (even if they know they should not have cooking equipment in their kitchen etc.)"

The answer was: "I think the social space and time of AIT students are quite rich and intimate because they have a lot of social gatherings among their nationality groups. From my understanding, socializing time of AIT students is quite long, and I do not think it is because of study pressure that deprive them of time to do other social work. They also hurry back home during breaks, and they also think that they are here temporarily, so do not develop attachment to the local place, although they develop a lot of attachment to their peers and the social capital that they develop here. But I think the largest reason why there is no environmentally related activities in AIT is because AIT prohibits political gatherings. They do not encourage or rather prohibit students to express any political statement in public on campus. Not having such culture of expressing opinions in public does deter other types movement-type activities." [10]

I noticed also that opinion making and politics happened in closed circles, but the rumours were rich, about for example national associations buying positions in the student union in exchange for votes for the president (who also makes the whole team), or even faculty members nominating people of their own nationality.

The AIT president is also aware of this nationalism and promotes especially diversity. We talked about this during our first meeting. He was also a supporter of changing the sport competition, where teams would not fight for nationalities but for houses. The change happened in the Spring '17 Semester. There was some protest, initially, but the registrations went well and positive feedback was shared on Facebook. I heard, when I left, that this measure would be taken back by the next SU president.

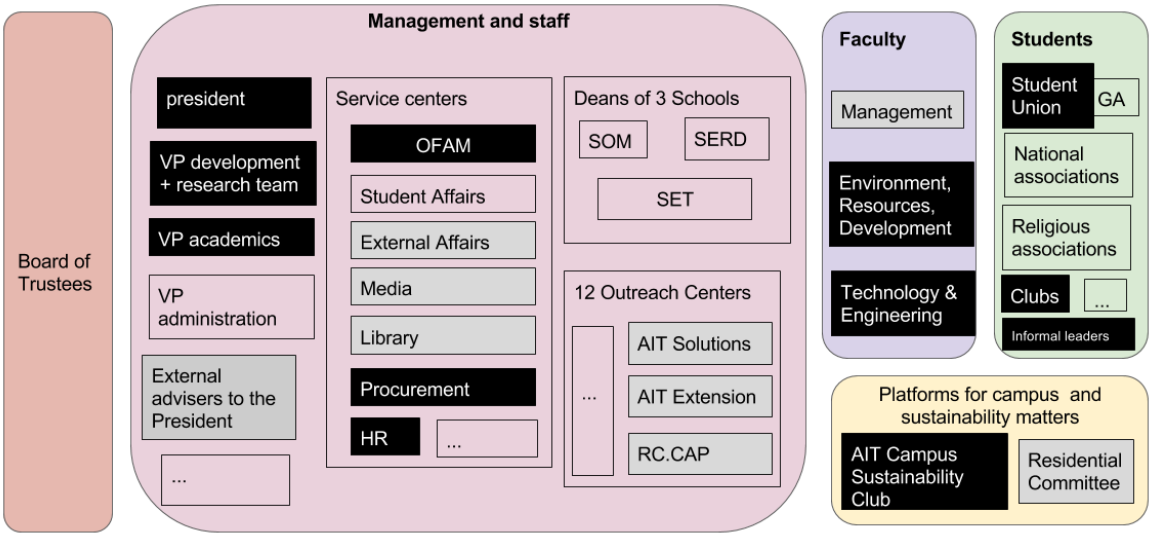
4.2.2. The “insiders” of AIT

In the context of the research, discussions were conducted with a selection of key actors in AIT’s education and internal environment (campus, residential area and administrative area).

Figure 4 gives a stakeholder map, based on designs made and feedback given by selected AIT students. The color code displays which key actors were selected to learn more about the current state and the past state (especially last 5 years, including the flooding in 2012) of AIT, but also to identify other key actors, root causes and opportunities for AIT. The insiders in black displayed on the figure are the ones who participated in the research on circular economy, the insiders in grey are the ones with who the researcher also interacted, but for other matters, which are indirect related in her view to the transition towards a circular economy.

As the researcher herself is a student and this group is the biggest in terms of numbers, the themes in which the factors, root causes and opportunities would be described in a later subsection, has a strong student’s perspective.

Figure 4. Stakeholder Map AIT from a circular economy perspective



Within the boundaries of AIT, four big groups could be identified according to their role:

i. The Board of Trustees, External advisors and top management, who are at the left in figure 4, have a lot of influence on the strategy of AIT
ii. The Service Centers are responsible for the operations under these strategies
iii. The Deans, faculty and outreach center are responsible for research, consultancy and teaching. AIT Solutions use faculty members for consultancy, AIT Extension uses faculty member for short term courses for professionals etc., but they are often described as different groups.
iv. The Students are the “clients”, “the end users” and “final products” of AIT.

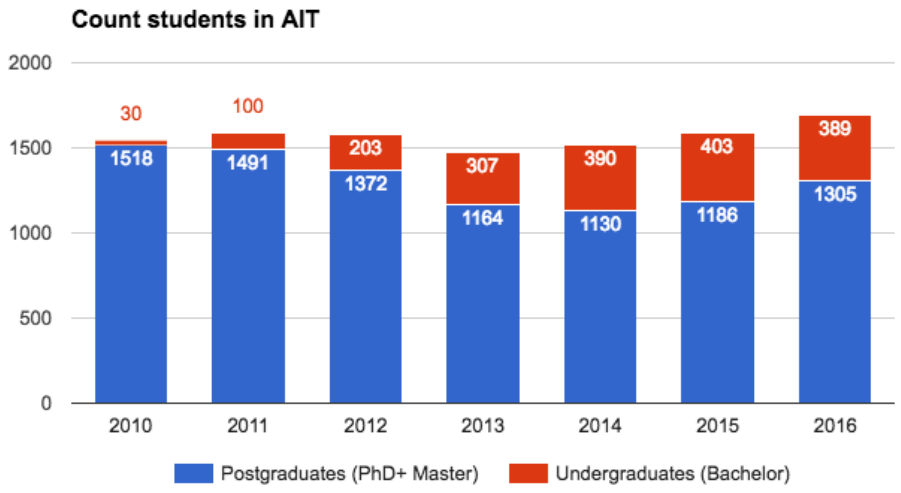
There are several platforms for interactions between the different subgroups. For campus and sustainability matters, the AIT Campus Sustainability Club (AITCSC), as a result of the AIT Sustainable

Laboratory Initiative, and the Residential Committee were identified. The researcher participated in meetings of AITCSC, but did not attend the meetings of the Residential Committee. She talked with people who attended it, like the SU president, and read the agenda and report of two meetings. For a list of contacted persons and groups, see Appendix C.2.

4.2.2.1. The Students and other residents

The main customers are the students. In 2016 there were more than 1700 students. The statistics of the last 6 years point out that AIT had a small decline around 2012 (figure 5), after the flooding that let close AIT for four months.

Figure 5. Count of students in AIT from 2010 until 2016
design by author, based on data from AIT (2017)



Regarding the campus and environment, there are circa 3000 people residing in the campus, of which most of them are students. (AIT, 2017)

The departure point is that in higher education institutes the students are the main customers, the key stakeholders and have a lot of influence, because they are the biggest group in terms of number. To guarantee that a big amount of them participates in the sustainability activities and some of these group would not sabotage the activities (by not participating, by discouraging others to join, by mocking the activities and decision makers, by going against the decision makers etc.) it is important to involve them and even create space to learn from their insights and wisdom. This insight is also present in Deep Democracy[36], a South-African methodology coming from the post-Apartheid period, where the voices of the majority and minority are equally valued. Due to this departure point, the researcher decided to use insights of other students to design of the stakeholder map.

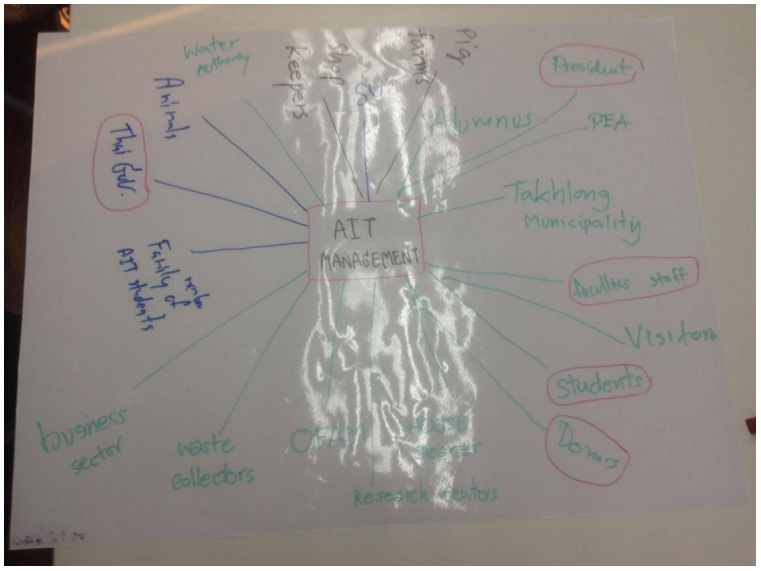
[36] For more information: https://deep-democracy.net/draft/#DD-explained - The researcher participated herself in a workshop in Belgium which uses the methodology of Deep Democracy.

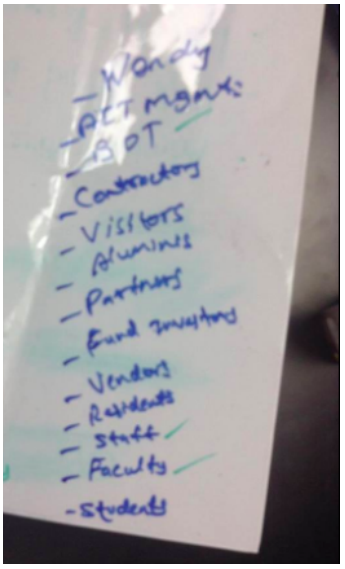
The students of the last focus groups were asked to map the stakeholders “which are affected and could affect the transition towards a (more) circular AIT”, and choose the most important ones (red circle or green indication in figure 6 or 7) . Figure 6 and 7 are pictures of the original drawings. The students who are part of the “Student 2 Student Sessions”, an informal weekly platform, were asked to give feedback on versions of the stakeholder map.

Reflection 6: The Process of Mapping the Stakeholders

In the beginning I tried to design the map of stakeholders myself and also let validate one design by the contact person, but in a later stage I realized it would be beneficial to collect inputs from students and staff and learn from their insights. Even afterwards, I received feedback from students and my examiner and supervisor from Chalmers. It is an iterative process and there is no one right way of expressing the stakeholder map. Making the stakeholder map was a continuous mutual learning process.

Figure 6. Photographs of the stakeholder maps designed and drawn by students
Figure 7. Photographs of the stakeholder maps designed and drawn by students





According to the 20 participating students, the most important stakeholders, in facilitating or hindering implementation of new circular economy activities, are:

- AIT management, and some named the president as separate unit
- Staff
- Board of Trustees
- Faculty
- Students
- Partners, like donors and the hosting government

Reflection 7: Is the researcher also a stakeholder?

When the final focus group made a stakeholder map, they added - half as joke, half to say something- my name. (See Figure 6). Then I felt a bit uncomfortable, because it feels morally wrong to talk about "myself". Before, people from Europe, from especially my feminist circles, warned me not to become the "white saviour" who thinks she can save the "poor people". Later, this event taught me that a researcher is also a stakeholder, because a researcher can learn the most about a social, and also a socio-technological system, by interfering with it. In the August semester I was a student, and in the January Semester I got also a role of student assistant, so automatically I belong to a group of stakeholders, but the intersectionality of my two different roles, my background and my research made me a different sort of stakeholder, a new group.

Back in the end of the August semester, I had found another student doing research about the sustainability of the campus, with whom I had 3-4 conversations about his thesis, his approach, and his ideas for testing some technologies (f.e. LED street lighting and installing water filters) that could enhance the sustainability. He had to drop one idea, namely LED street lighting, after he heard that OFAM is installing already new street lights, so this is an example how the the system can also affect the researcher. It is not only an one-way relationship.

In section 4.4. upon this will be elaborated more.

4.2.2.2. AIT President

According to a vice president (2017), AIT is founded by Americans and based on the governance model of a North-American university, which means that the president has the most influence and final authority. The power is very centralized. The deans of the 3 faculty schools, 3 vice presidents and the dozen directors of service, research and outreach centers work under him.

4.2.2.3. The three vice presidents

One of the vice presidents committed himself as a contact person and was updated from the beginning. He was chosen by the researcher as a contact person, because during one of the career talks in August he talked about circular economy to the students. As Vice President of Development, "his current areas of responsibilities include the planning and development of strategic relations with all UN agencies, international organizations, partner countries, and alumni, with the goal to enhance our resources generation." (AIT, 2017) This vice president started his term in August '16 and aims to lift up AIT from his survival mode. He works on a roadmap towards sustainable development [1,26,36][37] and worked on a project for eco-housing for students, mobilized money from alumni, but this project lost momentum and will not be implemented. [36]

A second vice president is the head of the committee of the residents, worked on strategies to green the campus, collected funds, even paid from his own pocket to green the campus and advocates for years to change the old light into LED light and other energy saving measures. [36,51] Besides being a faculty member and Vice president of Resources, he is also Vice President of Academic Affairs. (VPAA)

[37] The numbers between square brackets refer to events during the research period in AIT (January-May 2017) about which the researcher noted in her field diary. These events can be interviews, informal talks, events in which she participated or even organised, workshops with focus groups etc. Appendix C.2. is the digitized and summarised version of her field diary.

The third vice president is the head of administration. The researcher did not meet him.

4.2.2.4. The Office of Facilities and Asset Management (OFAM)

OFAM is responsible for handling waste collection and overall management and is one of the service centers. According to the president, “campus environment is a matter under OFAM. So members of the Community who care about improving our environment can advise OFAM. This has been the practice. In addition, we have Campus Residential Committee chaired by VPAA, who also advises OFAM on campus environmental issue. OFAM has the task to implement all the suggestions as OFAM sees fit.” [38] OFAM takes care of all technicians, food vendors, janitors etc. Before this was all outsourced, but to reduce the costs, OFAM has taken over this role. [39]

4.2.2.5. Other service centers

These offices support the AIT institution and community. During the period of time, the heads of the following offices were interviewed (semi-structured): Procurement and Purchase [43] and HR Management [45]. The researcher had also informal talks with the director of AIT Extension and AIT Media and Communication Office, but they are not registered in Appendix C.2.

4.2.2.6. Campus Residential Committee

Campus Residential Committee is chaired by VPAA, who also advises OFAM on campus environmental issue. In this committee, there are SU president, interested students, staff and a representative of OFAM. This is one of the mediation platforms. The researcher did not attend their meetings, but had access to the agenda points and outcomes. Other members shared also their opinion about the choice of projects, the speed in which they are implemented, the scale in which they were diffused etc during informal talks with the researcher.

4.2.2.7. Student Union (President, her/his team and the General Assembly)

“The Student Union (SU), the student wing of AIT, is run independently by motivated and energetic student representatives serving all AIT students in order to facilitate academic requirements and enhance better student life during study in AIT. Student Union consists of Executive Committee and 10 functional committees. The executive committee includes President, Vice-president, General Secretary, Treasurer and General Assembly Speaker. Member of the executive committee is elected by the vote of the students of Asian Institute of Technology in each semester. The Chairperson and Secretary of the functional committee of Student Union is selected by the executive committee and approved by the general assembly members.” (Student Union, 2017). The Student Union President has also a chair in the Board of Trustees. The Student Union changes every semester. The new president is elected in the previous semester and becomes first the vice-president. The General Assembly exists of heads of (major) nationalities, fields of studies and religions.

4.2.2.8. Informal student leaders

Some students organise activities, independent from the Student Union, or oppose the work of the Student Union, mostly on social media. Also thesis students, who work on a project to improve the campus life, could be considered as informal student leaders, because they had to initiate projects and activities in the campus, which also requires some leadership.

Reflection 8: Being a student, a foreigner, an informal leader, to create space

In some way, as I was not part of the Student Union or the General Assembly, but still a student (and insider), I could also be considered as an informal student leader, especially because I was opponent in some issues to different insiders or groups of insiders, or because I initiated also some projects.
I believe, that for action research, you need some leadership. Leadership, in the field of change management, can also be described and interpreted in different ways. When I heard Dr Peter Senge during the International Sustainable Transition Congress 2017 in Gothenburg talking about leadership as driving change (which he called masculine) or creating space for others (which he considered more feminine), I thought that my leadership was more the passive kind, where I aim to connect people from different "places" in the system, or the organisational hierarchy. As a foreigner I can even travel across the different layers of the organisational hierarchy, what locals cannot do easily. As a student I can also access the other students more easily. There is not so much trust among students for staff and faculty. I heard rumors of students who are afraid to give honest feedback about teachers, because they are afraid for the revenge. As a student they see me as one of them, so they trust me more with feedback.
Again, the intersectionality of my role, my background and my skills allowed me to create space.

4.2.2.9. AIT Campus Sustainability Club (AITCSC)

"AIT Campus Sustainability Club is an initiative by students of AIT to conduct activities related to sustaining and supporting the management system of water, waste, environment, energy, natural resources and transportation inside campus. Working with reference to the "AIT: A Sustainability Laboratory" concept, we will strive to make AIT a model campus in the region. Along with that, our objective is also to make the AIT community more conscious about reducing wasteful activities and increasing their participation in spreading awareness about the harmful environmental effects of consuming more energy, paper, water & producing more waste etc." (AIT CSC, 2017).

During the August 2016 semester they did not implement any activities, except from organizing carpooling trips to a nearby farmer's market Thalad Thai. In the end of this semester, the club came back alive, on initiative of SU campus and environment, and the researcher attended meetings where they evaluated the former activities, the barriers and made new plans.

4.2.2.10. "Sustainability Officer"

Since Fall 2016, a graduated student became this officer. It is a new function under the new vice president of development. She is conducting a roadmap together with the campus which "not only includes environment, but also social and economical aspects". It was expected to be ready in May 2017. She is also part of the AIT Campus Sustainability Club. In her function, she is not really called

Sustainability Officer, but Researcher. The people who mentioned her, often referred to her as the Sustainability Officer.

4.2.2.11. The Academic Senate

"The Academic Senate is comprised of all full-time Professors, Associate Professors, Assistant Professors, Instructors and Visiting Faculty with a period of appointment of not less than one year, and is led by its Chairman, who is elected among its members for a duration of two years. "The Academic Senate meetings are normally held once a month, and is responsible for recommending to the President policies for developing and conducting academic programs and policies, reviewing and establishing curricula, awarding of degrees and diplomas, and evaluating faculty productivity and performance." (AIT, 2017).

Reflection 9: Lack of data about future of education in AIT

There are no updated reports on the website since 2012. I contacted the head of the senate a couple of times, but he was often on mission. He is also a faculty member. My insights about education comes mostly from other students, my own observations and a few faculty members. A Vice president told during [52] that almost any students do not provide critical feedback about the courses they took.
In AIT, students are asked to give feedback about each course before a certain deadline. If they do not do this, they will not see their grade until the end of their year. In this workshop, a student said that she heard from other students they are afraid that their opinion can affect their grades. Some students have the same faculty member for more courses in their curriculum and do not want to take the risk to be recognized. The same Vice president is also working on an institute wide course on sustainable development, "but it takes time".

4.2.2.12. The Faculty

Looking to the calls for faculty (AIT website), faculty have four main tasks:

- develop and teach postgraduate courses
- supervise Master's and Doctoral students
- conduct independent research (secure external funding, undertake consulting assignments, work with donor agencies and industrial partners)
- carry out outreach activities

In the January 2017 Semester, there are 78 faculty members (11 female, 67 male). Due to time limitations, interviews by email or face-to face were held in January-April with only 7 faculty members (almost 10%). See Appendix C.2 for an overview.

4.2.2.13. The three Deans

There are three schools, and each school has a dean. In September 2017, a new dean from outside was chosen for the School of Management, who works hard to lift up this school to a better level after decay in terms of number of qualified faculty and (not-Asian) students.

Reflection 10: Is information from informal talks and (participatory) observations also scientific?

Appendix C.2. displays a list of events which are registered in my field diary (and my agenda). I used also a Google Spreadsheet as a tally sheet where I wrote down what I learned, sometimes as a new small question. In my field diary, I kept notes of ideas collected from focus groups, the few interviews, the e-mails… but also interesting ideas I collected from reading documents of project proposals, thesis reports etc. I had this notebook in my bag, which I often carried, and sometimes I wrote also down ideas (or new questions) in my notebook after I had an informal talk.

If you record something, with a camera, photograph, on paper, on audio, does it make the data more scientific?

I also recorded only the audio of the faculty and one time of the vice president, because I felt students would not like to be recorded, and would open more, because I felt that there was some distrust between students and faculty. This feeling comes from two sort of events:
I heard from different students that some AIT students are afraid that "gossiping" would have an affect on their grades.
One time, I realized, after a student 2 student session on sexual harassment, that AIT has very strict zero-tolerance policies on issues like sexual harassment, and that some students feel the punishments are too harsh and do not want to be whistleblower that get their colleagues expelled from AIT, especially because some students come from difficult backgrounds and developing countries where a degree is also a way to get higher in their country than their parents.
That's why I let the students write down ideas on paper, and told them that I would use only what they wrote down, so they are in control what will be in the report.
I collected some recorded data, but of course I also get influenced by what I hear, see… off-record.

When we're 'off-record", people open up more, because they can tell more, without risking to be a whistleblower. Suddenly some off-record data from informal tasks also bring me on new trails, gives me new perspectives and insights (which make recorded data more meaningful), and especially you learn more about the group dynamics between and in groups of stakeholders. This can lead to conclusions which are more difficult to root back, because not every researcher would get the same "informal talks" as another researcher. The question is if a research is scientific enough even if another researcher cannot reconstruct the research, using the same methodology, even same key actors… because the action researcher itself cannot be reconstructed. The action research is a mix of new findings, the research environment but also the background of the action researcher, which is a process of decades. During this research it was for me often very difficult to determine what is scientific.

Also, informal talks happened, because AIT is not only my research subject, but also my personal space. I was not only a researcher, but also lived there, made friends and also want to protect my friends. I reflected often if it is ethical to use data provided by friends, but at some point everyone in AIT felt as my friend, as a co-researcher, that it made sense to integrate their ideas in this report.

4.2.3. Need Assessment

This section describes several needs and issues, which are often the topics of students and other insiders on social media, other fora and in student research: waste management, water shortage, food security and waste, internet, accommodation and transport issues. Additional information from primary data collection is added.

Reflection 11: The researcher's dissatisfaction with the waste separation as motivation

One of my first "cultural shocks" in AIT was the waste management system, and the lack of waste separation. I felt a bit confused what to do with all my waste, because there was only one bin in the dorm, no collection points for glass, paper… and also the waste in the containers outside the dorms was in the wrong container. (...) I knew I asked people about this, commented on social media about this and also I followed a class "solid waste management", and also the professors there let us reflect on why "educated people cannot separate waste" and come up with better practices.

One month later, I even wrote a whole blog for a Flemish mondial magazine about reflecting on separating waste. Figure 8 is the photograph that I took for this blog which was published on the internet. I was aware that this is not the desired external image.

Some days, or even weeks later, the bins were removed some days or weeks. I know that the Media and Communication Office reads (and translates) my blogs. Some of my blogs are even shared on the official Facebook page of AIT. I cannot say if this article was thé drop, or one of the many drops, that let remove the bins. Also other people made comments about the not aesthetic view of the waste in these bins, or the bad separating behaviour of other people.

Later, I realized, it would have been interesting to also research how social media, blogging… can contribute to change management in an organisation and its stakeholders in a positive way. That is why I also spent time on theories on knowledge management and communication (like Cash et al, 2013)

This shock also motivated me to do research on waste separation in AIT and Thailand in the next weeks, and even then tackle this in this thesis research.

Figure 8. Waste collection in AIT, in front of Lawson (end September 2016)
Photograph by the Author

4.2.3.1. **Waste Issues**

According to Khaing (2015), AIT campus generates (and collects?) 528.6 tonnes/year. “While AIT’s orientation is purely international, their waste management handling practices follow Thailand’s law and regulations. Tha-Khlong Municipality has the direct responsibility to collect and transport waste generated on the campus for final treatment and disposal.” (Tangwanichagapong et al, 2017). In AIT, the Office of Facilities and Asset Management (OFAM) is responsible for waste management. According to the director of OFAM and Reddy (2016), waste collection and janitorial services are sub-contracted to Pro-Maid company. OFAM takes care of waste collections facilities, like the dorm and community bins, the waste collectors, and material recovery facility (MRF) for temporary storage of the collected waste until the local municipality takes away the waste for final disposal (twice a week). Each month AIT pays around 12000 baht (around 350 USD) [36] [38] for sending their waste to a landfill in the Klong Municipality.
The collection fee for the landfill is too low, according to Tangwanichagapong et al (2017), and does not encourage to take measures in reducing the weight and volume of waste.
She and professors in AIT also conducted a behaviour campaign to raise awareness about Reduce, Reuse and Recycle and researched the impact on AIT residents, because the waste separation at source is poor in their opinion. An important reason for not separating waste at source is that many AIT residents know that “a small fraction of the recyclables (especially the packaging waste including plastic and glass bottles and metal cans) is sorted and sold by the housekeeping staff and waste collectors (janitorial staff) to earn extra income.” (Tangwanichagapong et al, 2017), as well that a lot of waste will end up mixed together downstream. (Tangwanichagapong et al, 2017) When AITCSC asked for a ban of the plastic bag at the campus, OFAM also mentioned that plastic bags could be recycled and that it creates value in the informal recycling sector. [48]

“Although waste generation rate in AIT and many of Thailand HEIs does not exceed the 1 kg per capita limit targeted by national government, it is gradually increasing as can be noted by comparison with previous studies (Soulalay, 2006; Dev, 2007 as cited in (Tangwanichagapong et al, 2017) and a field survey on the AIT campus in 2014 (see table 5 for an overview of waste audits in AIT for different years) because the use of packaging is increased in the last years. (Tangwanichagapong et al, 2017). On the campus, most students do not cook or eat in the student cafetaria, snackbar and other food places, but purchase food from food shops that offer single-use packaging, which is often not recyclable. (Tangwanichagapong et al, 2017)

Table 5. Waste Generation in AIT, based on Reddy (2016)

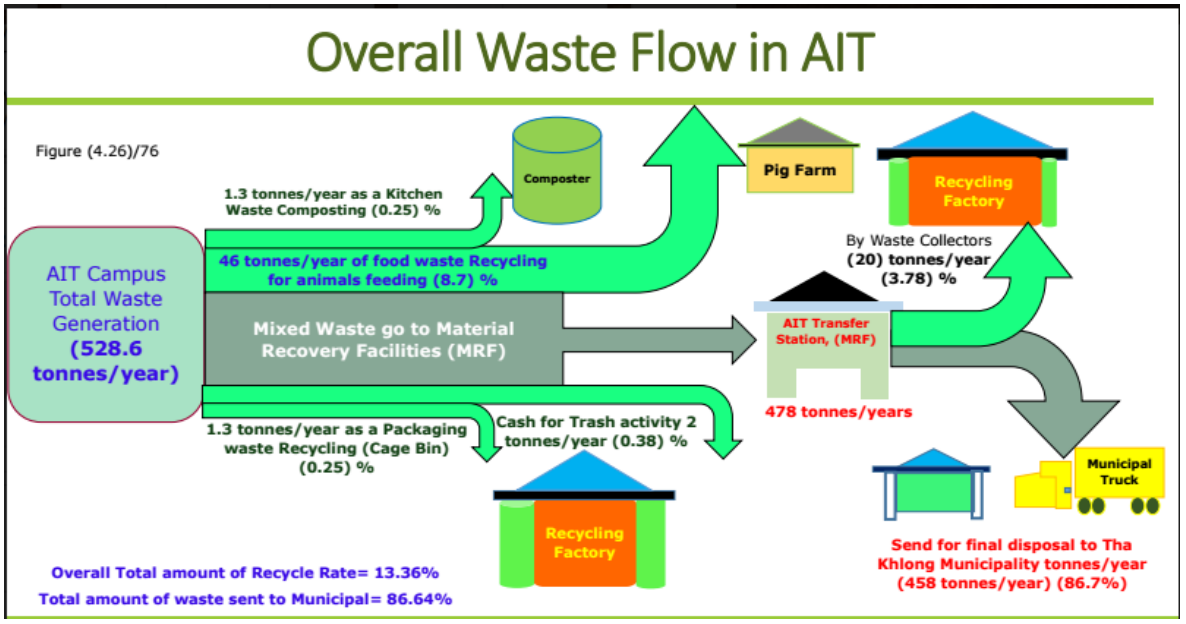
Research	Year	Population	Generation ton/day	kg/capita/day
Dev, 2007	2007	3800	2	0.53
Pietikainen, 2008	2008	3800	2	0.53
Khaing, 2015	2014	2943	1.5	0.5

[38] The numbers between square brackets [ ] refer to the primary data collection events registered in Appendix C.

Reddy, 2016	2015	3020	0.92	0.31

The following figure based on thesis research by Ms Khaing (2015) gives an overview of the waste flow in AIT:

Figure 9. Overall Waste Flow in AIT
Source: Khaing (2015)



According to Reddy (2016), the highest composition of waste in AIT is food waste (40.6%), followed by plastic waste (29.1%). The biggest issues -apart from the fact there is so much food and plastic waste which can cause pollution, attract diseases and can cause smell - are the littering and the lack of waste separation (see figure 8). Regularly a student posts a photograph of litter in AIT on social media and points out that such bad behaviour does not belong in “an educated environment”.

4.2.3.2. Food (waste) Issues

AIT is a very international oriented organisation, which brings a rich variety of different cuisines, for a very affordable pricing. Almost each major nationality has an own food vendor. People from Pakistan, India, Thailand, Myanmar, Sri Lanka, Bangladesh, the Philippines and Cambodia can find their “own food” in AIT. Only Nepal and Afghanistan do not have a vendor for their cuisine. The main vendors are situated in the Cafeteria (open from 7-21) or SU Snackbar (open from 9-23). Popular sources of food are also UFM (Thai bakery), Hom Krun (Thai version of Star Bucks, a bit more pricy vendor compared with the other vendors in AIT) and the three main shops (711, Grocery Shop and Lawson), where most food is processed and packed in single-use package.

Apart from the variety, the pricing is really affordable for students. AIT management is also aware that some students have limited of money (for food) and implemented a rule that each vendor should offer at least one meal of 20 baht (=0,5 euros). There is also an Indian supplier which comes to the campus, once

a week, and sells Indian spices, tea and other ingredients that you cannot find easily in Thai convenience stores.

From a circular economy perspective, there are some issues. First, most meals contain meat. The vegetarians and vegans in the circle of the researcher often complain of the low variety of food in AIT. Bangkok, where vegetarian restaurants are emerging, is also 40 km of the campus.

Second, not all students have direct access to cooking facilities, because there are only a limited number of rooms with kitchens. Only the student villas where three persons live together, there are shared kitchens. AIT management plans to experiment with a shared kitchen in a new student accommodation that they are building. Shared kitchens are not favored by OFAM and the janitors, because they observe that students do not take responsibility of cleaning the shared kitchens. For OFAM and accommodation, the janitors make monthly reports with photographs. The researcher saw these reports during an interview and observed that few students did not maintain their rented rooms. [36] A conclusion is that this idea of a sharing economy, which could be considered as a circular economy practice, is partly not successful because of attitude and behavior of the students, who are clients. The students pay (automatically) a fixed amount each month for the janitor's services.

Reflection 12: Do fixed fees for a sharing service hinder or facilitate the transition?

As an Industrial Ecologist, I am familiar with the concept of the Tragedy of the Commons. When people share a public good, and there is clear governance, free drivers can take more than what they should and this would lead to a decay of the public good. I noticed that AIT let pay most students a monthly fixed water tariff, fee for the janitors, despite how many liters, or many hours cleaning etc. they consume. If residents (not only students) break something, they have to pay extra and the janitors also have to take a photograph, to have an argument why the resident is billed extra. Also for the maintenance of extraordinary services, which not everyone uses, like tennis courts, the swimming pool… there is a fixed "annual fee", which is part of the tuition fee. This makes tennis courts, swimming pool a public good.

During a lecture with Dr Mohanty, of AIT, he talked about a business model idea for public goods with which the Indian government is experimenting. Water is a right for everyone, but there should be a model that hinders people spilling water, or using more water than they need. He told that the government gave water for free, but then it implies that water has no value. The government gives now "pocket money" to the people to buy water, instead of "free water" to teach to value more water. If they are efficient with the water use, they can save water. They can spend the money to other things, but then they bring themselves in problems. As an Industrial Ecologist I believe also that resources should have more value, and a "cost" and thought a lot about giving money instead of free resources to people. It is not only taking care that citizens got their rights, but also a sort of education and policy instrument to learn people valuing resources more.

In AIT, I talked with students who only get 9000 Baht (=circa 230 euros = circa 2160 sek) pocket money each month from their scholarship. Often this is their only money resource. The fees for AIT are very high, double compared with other private universities in Bangkok, so a lot of money of the scholarships goes into this. My suggestion would be to research the impact of lower the tuition fee, but install a system where residents have to pay a certain fee for the use of extraordinary services and to give back a part of the scholarship to students, as their pocket money. This gives students more responsibility and ownership. Some students will make mistakes and maybe not manage the money well, but learning to make personal budgets is a skill which is useful for their life after graduation. A safe environment as AIT, where there are a lot of social safety nets, is a great learning environment for young people to learn the first "life skills". In my opinion, AIT spoils the students too much and I see a lot of opportunities of saving money, but preparing the young people for life after graduation, which is not only work.

Extraordinary services such as tennis courts, swimming pools etc would not be a public good and could go according to a pay for access business model. Paying for water should be based on pay for use. This requires installing water meters for each dorm. Students, like Nizar, suggested before in their thesis on installing water meters and calculated payback times. The same can happen for cleaning. The price could be higher and calculated according to the time in which people invest time, but there should be a (digital) system, a virtual space, where students can address which services they want (for that week, month, semester etc) In Catholic University of Leuven I could choose to pay extra for a service of culture (almost 15 euros), for using sport facilities, still sometimes with a fee, but very affordable (almost 10 euros), etc, and these choices were saved in my student card.

Pay for access model is already in use for the gym. The Student Union asks a semester fee for the use of the gym, which is owned by the SU, and work with membership. There are complaints about the lack of maintenance, so it would be also recommended to the SU to reflect on the pricing of the membership fee.

To return back to the Tragedy of Commons, as AIT is working with a lot of "commons", it would be good to invest time and competence in the residential committee, which is now the medium for governing the commons, to reflect about what should be a common good, and what not, in AIT, and reflect which business model is good for which service in AIT. For each different product and service, a different strategy should be applied. F.e. to deal with plastic bags, AIT can decide to ban the plastic bags. For plastic bottles, AIT can work with a deposit system (like Trash-for-Cash-project). For food in the cafetaria, AIT can work with a pay-what-you-can or a pay-what-you-waste model. For food from a convenience store, AIT can work with a food waste collecting cooperative in Greater Bangkok, which donates the food to the poor people. This requires time, to design and involve especially the people

who do not participated before in “sustainable campus initiatives”, but also to test out if this strategy is the right fit for the right product.

Thirdly, the researcher observed that different students complained through social media on several occasions about the food quality and safety (by posting pictures of their purchases in the biggest Facebook group). The SU president of the Spring 2017 semester, who is a food engineering student, pointed out several times, to the use of the certain plates, cups etc. During these informal talks and a networking event on zero waste in Bangkok [28], the researcher learned about the environmental and healthy impact of styrofoam packaging, and the widespread use in Bangkok.

To keep the pricing affordable, the OFAM Director told that the vendors make low profit and also work long hours. “Students even want to have food during the night.”[36] During the April lunch meeting between students (SU and AIT Campus Sustainability Club), OFAM and the president [47], when students told that students go to the university next door, because “it is cheaper and better”, the OFAM Director said that they have “economy of scale, because of 15000 students.” He even added that many vendors flee to this university, because they can earn more. He says it is difficult to find vendors. There are less people working in the cafeteria, compared with previous decades. In the previous decades there was not a neighbouring campus. The economy of scale is an important factor, because for certain industrial symbiosis processes (circular economy), like bioconversion of organic waste into energy, a certain scale is necessary.

Reflection 13: Not my first action research in AIT (the past matters)

As aforementioned, I took a course in solid waste management in the Fall 2016 Semester in AIT, as well that this action research is built on previous life and research experiences.

One of the professors thought it was more beneficial to give student duo's a research assignment about the waste management in the campus itself. Another student and I volunteered to find out what kind of energy the vendors use in the cafeteria, and why they choose this. An alternative is the use of biogas (a mixture of gases which mostly exists of methane gas and carbon dioxide) made from the anaerobic digestion of for example food waste from the cafeteria itself. It would be more circular than LPG (liquefied petroleum gas), but they choose the latter. First of all, LPG has a higher energy content than biogas (26 KwH/m^3 compared with 6-6.5 KwH/m^3). To produce 1m^3 or 6-6.5 kwH you need 10 kg waste. Besides this, we learned from the vendors themselves that they choose LPG out of convenience and investment cost of alternatives . They use 2-3 cylinders each week, and for each cylinder they pay circa 1000 baht /cylinder (like 25 euros or 240 SEK), while biogas would be for free, but installing the facility needs an investment cost (and they do not make high margins with their business) and the support of OFAM, who is facilitating the vendors.

When I started my formal action research in January, I had already a certain background and ideas why some "circular economy practices" did not work and why. That semester Dr Mohanty had also showed us a benchmarking analysis of companies which he consulted on energy efficiency, and he says that the best companies are good in management and technology, but that the mediocre tell the most interesting story: the technology is there, but the management is not optimal. Competence matters. Biogas is one of the better alternatives on long term in terms of operational costs, reducing waste and also climate change (if the biogas is captured well, without any leakage), but it is a matter of looking beyond the investment costs, the will to leave the comfort zone, and then we talk about the social aspect of the socio-technological systems. It is easier to work with machines and technologies than with people. That is what I learned before I started my action research and this thought accompanied me also during the whole action research.

Figure 10. Photograph collage of a mini research about energy use in AIT cafeteria (early October '16)

Food waste has the highest composition (44% of total solid waste in AIT, according to Reddy, 2016, 52% according to Khaing, 2015, 55% according to Tangwanichagapong et al, 2017). Only the food waste of the cafeteria and SU Snackbar gets separated and composted or fed to a pig farm, but all other food waste ends up in the "Material Recovery Facility" and then in landfill (Khaing, 2015, Tangwanichagapong et al, 2017). One problem is that most food waste comes from dorms and that there is only one bin

system. There were initiatives to let students separate at source or do composting on-site, but there were complains about the smell (an issue especially in tropical areas), which indicates there is a certain degree of lack about education how to do composting in a way to avoid smell.

4.2.6.3. Water Issues

In the early morning of Monday April 24th (in the middle of exam and thesis examination time), there was no water for the whole community. The evening before, OFAM mentioned that some dorms will not have water, because of repairs. [41] In the biggest facebook group, more than twenty students from different dorms, complained that they had no water even before the given hours. The SU president called OFAM and heard that the municipality had no water. Students complained on social media about "the bad management" or lack of or late communication of OFAM." [41] One week later, several students again complained about no water in various dorms, and the lack of communication. This is an indicator for communication (see later) and also the need that AIT has to invest in water management.

Reflection 14: Culture, behavioural campaign and Circular Economy

An interesting observation is that students participated in big amount in the celebration of Songkran, the new year festival celebrated by people from Myanmar and Thailand, where they spill a lot of water. It would have been interesting to test if they would have used the water if it was charged, certainly because the water festival is also celebrated in the month when it is extremely hot. Circular economy, and industrial ecology, is about reducing the use of (virgin) resources.

Songkran is one of the most important days in Thailand. Would it be "right" to take away the access to celebrate this "properly" by charging for the water? Would people then take less safe/hygienic options? In Chiang Mai, people use the water of the dirty canals (where rats live) to throw on each other? By researching circular economy I had to reflect a lot about the ethics, because in many cultures, also in North and West-European cultures, there are practices which are not "circular".

A question which was raised during this research and is not answered, is if part of the transition towards a circular economy is also about sacrificing old things, even traditions and cultural heritage, and investing in for example behavioural campaigns, and if yes, where to put the boundary? During this action research, even more questions arised, which are not answered, and also were of such nature that they could not be answered after such a short time.

According to Nizar (2015), an EEM student who did his master thesis on "Sustainable and Efficient Water Use Strategies for Greener Campus", AIT consumes 456 liters/day/capita (in Bangkok this is 200 liters/day/capita). The reasons for this high consumption are:

- 26.5% from water leakages. The flooding damaged the piping system.
- The chiller plant is too old and consumes a lot of water (and energy).
- People are not aware of the value of water, because there is no separate bill for most of them
- Treated wastewater is not reused

A staff member wrote the researcher "I am not sure if water consumption meters are expected to be installed. But a flat rate for water was being considered, however this did not go to well with the residents and the idea has not been explored further. AIT's plumbing is old and inefficiency, further very often needs maintenance. I am sure you aware of the water shut down emails from OFAM." [16]

Nizar (2016) proposed to install better toilets which consumes less water/flush (but payback time seems long), changing the chiller plant and reusing the water for sanitary reasons. There is even a geographically close demonstration of circular thinking in water management. In Future Park, a nearby shopping mall to where many AIT people go, there is a grey water system in the toilets.

One of the directors mentioned that the waste water treatment system is also not optimal, because the residents use detergents which lead to eutrophication. [44] An observation is that the water of the canals is used for irrigation of the landscape. This brings us to the wetlands of AIT. “Ironically, out of all numerous campus wetlands (ponds, canal networks, reservoirs, lakes, semi-natural swamps, etc) the worst water quality is found in the most prominent one, the front fountain pond near AITCC and Administration building, as well as in its adjoining canal along the SERD building. This was the state over at least last decade, and the quality even exacerbated after the Flood, even after a thorough post-flood pond clean-up and sediment removal.” (AIT Green Campus, 2014). EEM students did research on the wastelands under supervision of the professor who submitted this issue to the Green Campus website. “During the second weekend of July 2014, some dead fishes were noticed in the pond. The amount of dead fishes were increased in in the following days. It happened suddenly after the rainy season started. It is reported that almost 90% of the fishes were dead in the pond. It drives AIT to find the reason for the tragedy happened.” (AIT Green Campus, 2014). This Master thesis research will not dive deeper into this, because the results were also not published on this website.

4.2.3.4. Internet

Circular Economy is also about dematerializing the economy. One of the strategies is to virtualize services. No cash money, no paper invoices, use of bitcoins, augmented reality and virtual traveling are examples of a more virtual world. In the world of education, it includes on-line classes, seminars and congresses for example. A lot of sharing economy could emerge in a short timespan, because of the highly improved ICT. EMF also talks about “virtualize” as one of the strategies in its ReSOLVE framework. The quality of and access to internet plays an important role in the emergence of virtualization. One of the most observed recurring complaints on social media is about the internet speed. In the end of the Spring ‘17 semester, it was observed that students sell on-line mostly their routers they purchased to handle the low internet quality in AIT (apart from airconditioners, fridges and bicycles). This indicates that one of the enabling factors for a more virtual AIT is not optimal. Further research is needed to understand the impact of internet, and ICT, on virtualizing strategies within the circular economy context.

Reflection 15: Low access to the internet can also be a "policy/economical" instrument

During the lunch with the president, two directors and other student leaders, internet was one of the topics. When we were brainstorming how to make the cafeteria more popular, we said that a good idea is to transform a part of the cafeteria (the part in the back) into a co-working space, which has the best internet connection and wifi in the whole campus. Now already some students take their laptop to the cafeteria, but the cafeteria is not very comfortable to sit long, because of lack of A/C, the design of the chairs (ergonomics) etc. Also, in the library, people cannot eat or drink (only water), so a co-working space where people can eat does not really exist, except Hom Krun that could be seen as a co-working space, but only for students who can afford the higher prices in Hom Krun.

When more students come and stay longer to work on their school work, they might not go for take-away options (in single-use packaging) from the vendors of convenience stores, but consume its food at place (bolstering slow food instead of fast food), the food waste which is already separated in the cafeteria would be bigger and more interesting for bioconversion etc. If the co-working space is designed well, it could be a showcase of circular economy and progressive thinking.

4.2.3.5. Accommodation issues

The Campus was designed in the seventies for 1000 residents, but currently there are almost 3000 residents, of which most are not Thai. This exceeds the original planned carrying capacity of 1000 persons. The campus was built in the early 1970s. Since then the infrastructure has not been replaced, but only retrofitted and several new buildings have been built. According to some people, the fact that more people than originally planned are accommodated, translates in overutilization of infrastructure and resources as well a sprawled campus design. To give an example, due to the new buildings especially being located at a long distance from the chiller plants (as well as due to poor insulation), 30% of all energy is lost in the chilled water distribution network itself.

The demand for housing at the campus is increased, which results in that students need to find housing elsewhere (mostly in the dorms of the nearby Thammasat university), that the management invests in new housing, and seems to leave the original houses in their original structure. Renovation means new painting, furniture etc. and for example not making it more modular, so in the future only components of the infrastructure have to be replaced. The original student dorms seem the same as in the seventies, some alumni remarked. According to the Environmental Policy of AIT (AIT Student Handbook, 2017), the master institute plan is four decades old and there are plans to update this. There is a big opportunity to go for strategies which would enable a better reuse of buildings, building components and materials in AIT.

On the other hand, the prices of the housing are very low (starting with 70 USD/month). Some students come from countries with a low income and are dependent of scholarships which provides only 300 USD/month for accommodation and food.

Reflection 16: The competence is in AIT, but what is missing?

Circular economy is about using less resources. When I translate this to housing, I consider modular houses, consumers choosing to live in smaller homes, vertically buildings which use the same heat/cooling system, passive housing etc. For AIT, I have the idea that the "problem of housing shortage" could be addressed by building vertically, instead of adding new housing too far from the resources (like chiller plant, water), where a part of these resources can get lost through distribution. AIT has very strong structural engineers, especially in AIT Solutions, who already designed nice new projects, like the new clock tower, entrance gate, and I heard also they build vertically on the AIT Solutions office a second floor for the iLab project, so the competence is present. I also know that AIT has energy engineers, waste management and wastewater experts, because some were my teachers in the previous semester. When I interviewed (and recorded) a faculty member and asked why some technologies and ideas were not implemented, or some existing buildings were not maintained or not or only partly retrofitted, he said that "the system" did not work. [24] He did not elaborate upon this, but from the context I understand that the technology and knowledge is there, but it is more an issue of continuing, maintaining and follow-up rather than implementing. He said that some parts were retrofitted, but did not know why the others were not retrofitted. Before, another professor asked me to find out why only one building (in his knowledge) is retrofitted and not the other buildings in the campus, after I told him about this research. [04]

4.2.3.6. Streetlight and other safety issues

One of the recurring concerns in many conversations with students and other residents in the campus are that there are not enough streetlights, they do not shine bright enough etc. A dozen of students told the researcher that they do not want to run in the darkness, certainly because the roads are full of holes and cracks, and because of all the creatures (like snakes). The roads are also not maintained and this also worries many people.

4.2.3.7. Transport (in the campus) Issues

A good feature in the campus is the bicycle culture. The AIT accommodation is in a closed area and there are only two entrance gates, so cars do not use the AIT domain to cut travel time as observed in other Thai campuses. Also motorcycles are banned. In the Junk-to-Jade Facebook group, bicycles are also the most sold and bought item. Like the trees, the bicycles are not something new. Besides this, there are recurring problems that even cause hate speech, like the bad parking behaviour that blocks roads, the monopoly of a bicycle shop to repair bicycles (students complain he does not repair it properly), a lot of "bicycle waste" (not used bicycles), and last but not least the "borrowing vs stealing" debate. This last even caused a lot of hate speech. Some people "borrow" bicycles of their friends or, not so close friends, without even asking. In some cultures, that is normal; in others it is not. Very often, on social media, people posted a photograph of their bike, to ask who "borrowed" their bicycle.

Reflection 17: Bike Sharing Service

I reflected on exploring a bicycling sharing model, because many insiders are upset with the current state. There are software engineers in AIT who can create this. I even talked with the director of OFAM about an electrical system, where students paid monthly fee for access to bicycles which they always have to park in bicycling places, which would also be maintained and monitored. In Bangkok, I also saw some shared bicycle initiatives, even in very bicycle-unfriendly places, while the campus seems a perfect place. Before I left AIT, I shared this idea with the new SU president, who is a computer engineer.

Update: In the stage of writing my thesis in Europe, I saw a Facebook post with photographs that "oBike launched Thailand's 1st Station less Bike Sharing Service in AIT on 26 July 2017. The service was inaugurated by AIT President (...). The app-based bicycle service is available at a discounted rate to AIT students." (AIT, 2017). I asked on-line a few AIT students who were still there, and a staff member about it, but nobody knows from where/why the initiative came. The comments I got, was that it is used by few students, but it is was perceived to be still expensive. There are no fixed parking places, so the people can still park their bicycle wherever they want.

4.2.3.8. "Space" issues

Space, or land, is also a resource which is getting scarce and creates societal problems. Prices of housing and factories increase especially in places where this resource is getting scarce. Circular economy, as it aims to reduce the number of resources for the same product service, means that space is more optimally used. Shared spaces and multifunctional/polyvalent spaces are all means to reduce space. Shared spaces could be commons or public spaces, but in context of businesses and institutes this could be the space that is used by more stakeholders. The first example in higher education is the library. The library building was funded by the Japanese government in 1979. (AIT, 2017). But it got flooded in in October 2011: the building got damaged and a lot of books got lost. After a new president came, this "(...) 7th President of AIT would like to rebuild AIT Library to be a modern library since the way faculty, researchers and students access and use information is totally different from that of 40 years ago when AIT Library was designed. According to him, libraries are no longer just places to check out a book or to do homework. They are meeting places, media centers, digital repositories and wonders of modern architecture and design. In the renovation plan, all books, print materials, theses and special collections were shelved on the upper floor. The ground floor of the Library would be modernized with massive reading space, a large number of group study room, computer & multimedia stations, meeting rooms and video conference room." (AIT, 2017)

To rebuild the library according this vision, he fundraised money among especially alumni, but that took time. In a conversation with the researcher, he said that he asked successful alumni to pay back what AIT and sponsors gave them to do their studies in AIT some years ago. He also donated money to the library. [47] In the Fall '16 semester, several AIT students could not answer the researcher when the library would be open. During the Institute Forum in December 2016, five years after the event, this question was raised by the students and the president answered officially on the question of the students that it would open in January. It did. The only negative feedback was about the air-conditioning. Some places are so cold that people, including the researcher, have to wear sweaters.

Reflection 18: Not Smart Technologies, but Shared Spaces are the beginning of a sustainable future

As a geographer I have also a lot of interest for the concept of space. Shared spaces are places where people have to (learn to) live together, work together… despite their different backgrounds. Some places, especially like gardens, markets and even circular shops are places that everyone can visit, poor or rich. My first thoughts for my thesis started with the idea to do something technical, but it became more a journey about the social aspect, because I realised more and more that people management is more crucial, and the base, rather than technology management. “Creating space” is an important method in transition, because transition is in the first place about people. (Creating) space is about connecting people. I created space by initiating the student 2 student sessions in October 2016, and created more space, by connecting people through workshops, focus groups and even on-line through creating a facebook group on circular economy in AIT (and Thailand). That is why my own ideas were about space. When a staff member talked about his dream to have a community hub/coffee bar/social business addressing the sustainable development goals, I supported him as much as I can to “create this space”. That is also why I was asking to the president and directors during this lunch meeting in cafeteria [47] to consider transforming a part of the cafeteria in a coworking space. AIT feels like a collection of islands. In my opinion you can not connect these islands, virtually, but by actually “nudging” people into the same space for work, research, living etc as much as you can, you can connect these islands. That is why the community farm is one of my favourite projects in AIT, because it is not only addressing environmental sustainability, but also social sustainability and solidarity. A vice president who was one of the persons behind this, shared his dream to upscale this [51] , which I think is a great action for the future to make AIT more solid and united.

There are many other issues, but these seemed the most relevant from a circular economy perspective. The following subchapter also describes needs, but in more economical terms:

4.2.4. Finances in AIT

Circular economy is also about making ideas and strategies economically feasible. Therefore a look into the finances of AIT can lead to interesting insights. On 22 October 2011, the flooding caused substantial damage in AIT. The water was about two-metre-high in AIT and the school had to close for almost 4 months (AIT 2012). Many materials and buildings got destroyed and lost in the floodwaters. Currently the income is generated from tuition and fees (60% in 2016), payroll recovery (26%), overhead[39] from projects (8%) and netto income of assets (6%). (AIT, 2017)

The combination of exceeding the carrying capacity, the ageing infrastructure, the sprawled campus design and the damage caused by the flooding translates in a high energy bill, water bill, high landscape management and waste management bill. AIT spends 15.6 million Baht/year for purchased pipe water and 8.4 million Baht/year for wastewater treatment. Implementing efficient toilets, taps and showers and repairing leakages, AIT could save money (OFAM in AIT, 2015). Further AIT spends about 44 million Baht/year for its energy needs (OFAM, 2016). Not only a large scale renovation is required, but also a systematic and structural change, like process improvements in the field of energy and water.

Currently, AIT is working on a strategy to re-orient itself to continue their contribution to the world and the region in achieving sustainable development. AIT staff members are working on a proposal plan to

[39] Overhead costs refer to an ongoing expense of operating an organisation. This cannot be identified with any particular cost unit and could include mostly administration costs, utilities, telephone bills, rent, repairs, supplies etc.. When AIT (Extension and Solutions mostly), do a project, they let the customers also pay overhead costs.

collect funding for new technologies and measures to “green” the campus. This team identified three sources of funding: donation from AIT’s well-wishers, loan at 2% interest and tax benefits from its partners. (AIT, 2017).

Reflection 19: Should AIT invest its resources (money, time etc) in other things?

As a not-for-profit organisation since 2013, AIT should invest all the money back in the services. It can be indicated that AIT spends a lot of money in salaries, but not so much in facilities. This can be observed in the campus, but also in the financial figures. In a previous reflection box, I stated also that access to certain public goods, like the tennis courts, squash rooms, swimming pool, which are not answering a basic human need, but are extraordinary services, could be charged and that this money could be used for maintenance of these extraordinary services, which would free budget for investments in facilities, process design events with as many insiders of AIT as possible (and going for deep democratic processes to avoid that people of the minority sabotages decisions, from making jokes/insulting memes about certain persons or not participating in activities to even destructing in the most extreme case) etc.

4.2.5. Initiatives and Activities to build Circular Economy

4.2.5.1. The Vision of a Sustainability Laboratory

In september 2013, a faculty member (previously a dean) and a vice president worked together with a visiting professor on a concept note to transform AIT into a “Sustainability Laboratory”, which is a roadmap for the following 5 years (2014-2019).

*“This initiative is designed to involve all AITians, schools, centers, administration, residents, concessionaires, etc to create an unique experience for anyone visiting AIT and to be a model for others. All aspects of AIT life - academics, research, transport, environment, buildings, etc - will be favourable impacted. Partners will be involved, but with distinct business models for a win-win collaboration. A team needs to be formed with clear directions and support. (...) To start with, four initiatives could be envisaged - involving energy, water, waste and IT - to demonstrate the economic , social and environmental benefits of sustainability. Based on preliminary discussions, ADEME (French Environment and Energy Management Agency) is willing to provide a seed funding of Baht 2 million[40] for this purpose if AIT shows commitment to this effort.” (*Visvanathan and Kumar, 2013)

They proposed to the AIT management the following action plans:

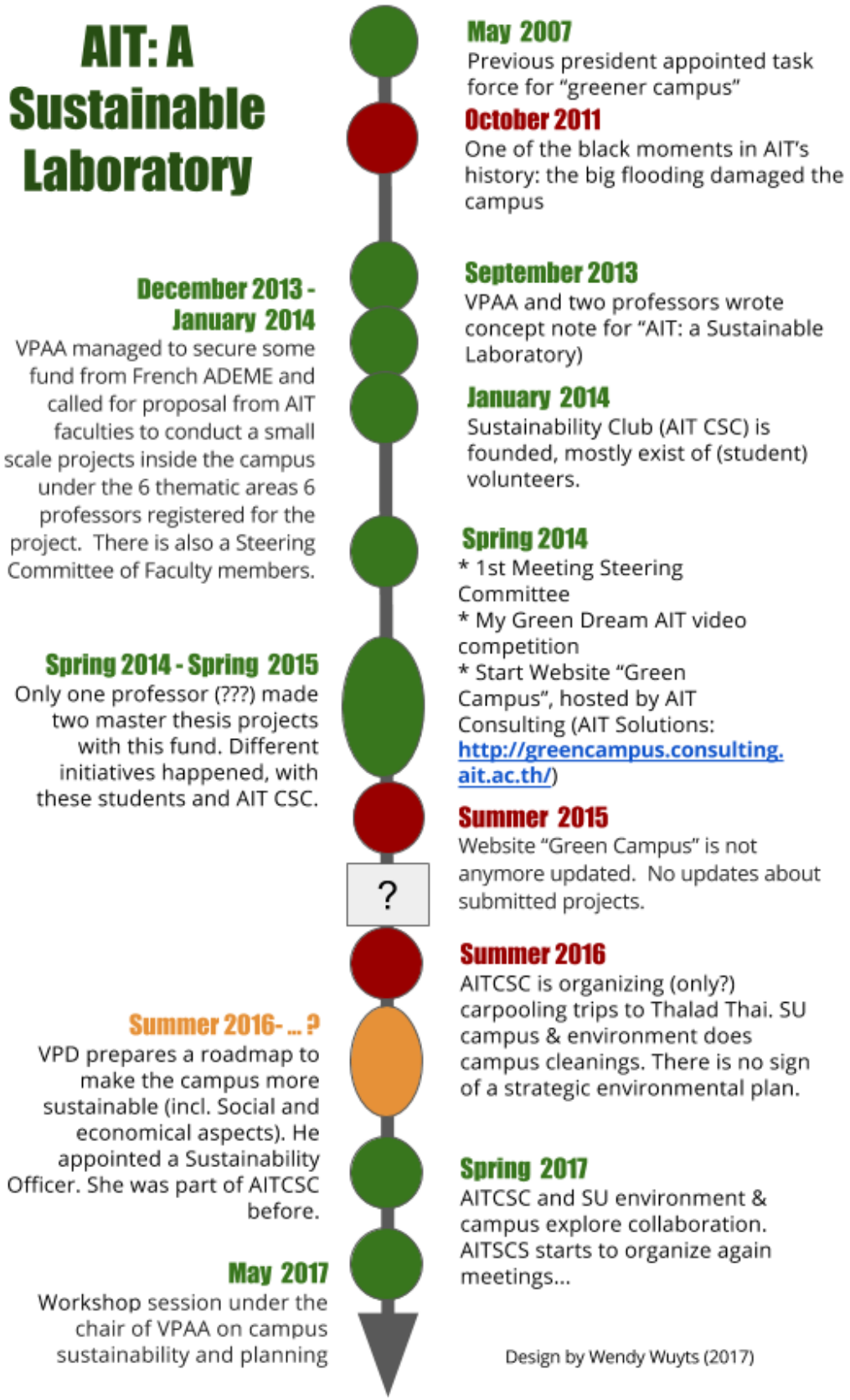
i. “Adopt sustainability support policy - this will signal to AITians and others on the commitment and interest of AIT in this dimension
ii. Create a team and structure - to oversee and guide activities
iii. Allocate seed funding for research / application - on conducting baseline studies on issues and for documentation/dissemination
iv. Implement specific projects - showing what we teach

[40] According to Google (12 Jun’17), this equals 52k euros or 512k SEK.

v. Disseminate and expand - outside AIT through successful business models”

This roadmap was at the basis of different initiated projects, like the set-up of a Campus Sustainability Club, a set-up of a Steering Committee and a website, some projects, especially in waste and energy areas .(see Figure 11) However, most of these action plans do not seem implemented or sustain. There is for example no sustainability support policy. In the Student Handbook, there is an environmental policy, but it is very general and most ideas are also not implemented. Section 4.3 will zoom in why some initiatives succeeded, stopped, or were not started at all.

Figure 11. A timeline of the initiative to make AIT into a Sustainable Laboratory



It is important to know that initiatives have been taken before the start of this research, and even before this “Sustainability Laboratory” project, but according to the writers of this concept note these projects were more capacity building or technology transfer projects. In August 2016, another vice president came in AIT and also started to work on a roadmap, with an objective about the campus and an objective about education. When the research started in January 2017, the researcher contacted one of the persons who wrote this concept note in 2013 and he asked her to dive into the past and see why some activities did not “sustain” or why some ideas were not implemented at all. Change should come from knowledge about what, how and why happened before and is still happening. [04]

The following activities are mostly a result of the vision of this Sustainability Laboratory and will be categorized according to the RESOLVED framework.

Reflection 20: To think circular you have to think out of the box

One of the skills that Joustra et al (2013) named for circular economy, is to think out of the box. I was not thinking out of the box. In the beginning I wanted to describe the activities according to the same focus areas as done by other AIT students, like energy, water etc. but then I struggled with some issues like food waste which could become food for other animals, can be source of energy or should just be reduced. Should I discuss food waste then under food, energy or behavior? Then I realized that circular economy approaches call us to look beyond the “boundaries” of fields. Therefore I decided to use the RESOLVE framework, because it is better suited to describe the “complex actions” needed for “complex problems”.

4.2.5.2. Regenerate (and become resilient)

One of the vice presidents had the vision of an AIT community farming that would provide organic vegetables, fruits and even fish to the AIT community. He was one of the driving forces behind the community garden. Students, staff and faculty can register for a piece of land which they can cultivate. AIT did the ploughing. Only one/third of the people who expressed enthusiasm towards the proposal, worked on the campus. AIT has for sure land enough, but one big part is not accessed and wasteland. Around thirty AITians do community garden. It is a sign of community reliance: some AIT people cherish the things they grow more than the things they buy. This could bolster circular economy. In March 2017, with the help of an external financial fund, energy students and faculty installed solar panels, to allow people to work after office hours, in the dark, to raise the yield. The vice president has the vision to make the community farming big enough that other AITians can buy the organic food from there, instead of going to a market.

Figure 12. Solar panel at the community farm in AIT (March '17)
Figure 13. Community garden in AIT (March '17)
Photographs taken by author


4.2.5.3. Share

One of the most successful practices, regarding collaborative or sharing consumption, is the Facebook group, called "AIT J-J Terminal (Junk to Jade)". The facebook group was started in June 2013. "This page is mainly for AITians who want to sell their old things and who want to buy good quality 2nd hand things with cheap price." (AIT J-J Terminal's description). In the end of the semester (when students start to leave for home), the first 60 things on the chronological list and the most sold things were bicycles (13), kitchen appliances (10), A/Cs (8), music instruments and installation (6) and hair straighteners (4). This Re-use practice is for sure one of the more successful "informal" "waste management" or circular economy practices. It is also a sign of community reliance, which is one of the trends that (can) bolster(s) circular economy.

Every Saturday, there is a carpooling project to the Thalad Thai, organised by AITCSC, where students and staff share (the costs) of a van to a farmer's market. The success that this initiative is happening, is because of the good will of one student volunteer, who arranges the van weekly, because he needs this service. This student was going to graduate in the end of the January Semester and AITCSC was discussing who would succeed him. [49]

There are no shared cooking facilities, unless in student villages (three people share kitchen), but some students have no access to a kitchen or therefore buy rice cooker and kitchen utilities, even if there is no facility in their room. The new student hostel will have shared cooking facilities. [36]

4.2.5.4. Optimize

During the January 2017 Semester AIT starts to replace and install LED lights. [36] More utilities are optimised. A distribution which is getting optimized is the water supply network. This is a long process. Examples of process optimization were not found by the researcher.

4.2.5.2. Loop

One of the visible “Loop” practices is the Paper Ranger Project on February 22nd, organised by the Department of Industrial System Engineering. Students and faculty collected used papers to create colourful note books for the school children of the rural countryside. Procurement and Purchase Office sends back papers and other materials to factories for recycling, and also tries to take care that furniture and other assets do not end up in landfill. [44]

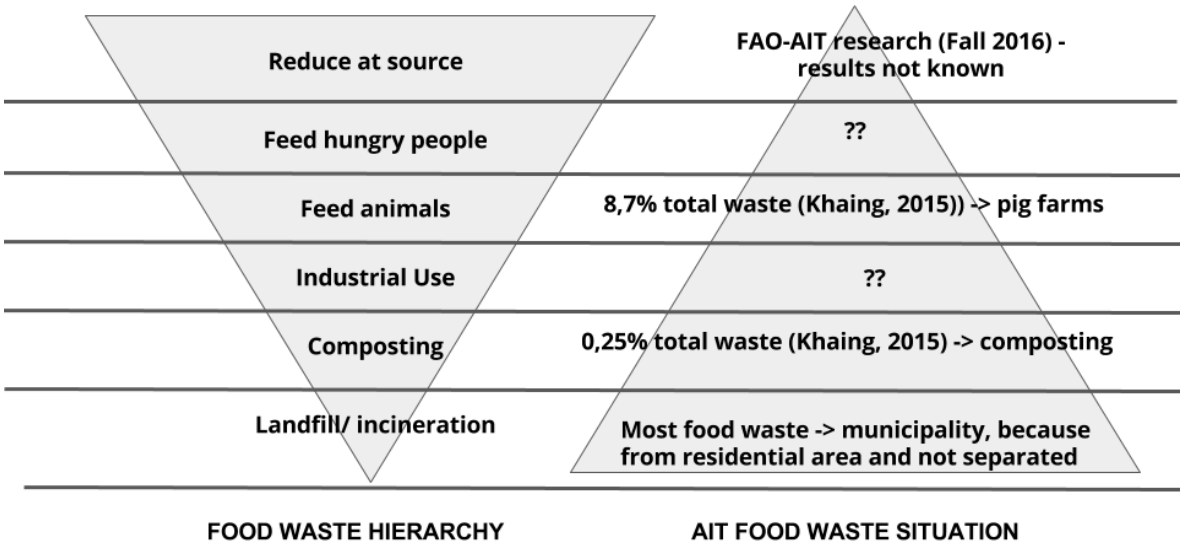
Another “loop” can be found in the management of (part of) the food waste. The AIT cafeteria separates food waste from the other waste (contrary to the residents, see issues). There are different practices. More than 8 % of the food waste is fed to pigs (Khaing, 2015).

Reflection 21: Can or could all circular practices be sustained?

Some part of the food waste of the cafeteria is given to the pigs, including animal by-products like meat, eggs etc. In European Union, this would not be allowed, due to legislation as effect of the Mad Cow Disease. If Thailand will adopt this law for example to be able to export meat to Europe, this practice will probably have to be re-evaluated. The political context allows this “circular economy practice”, but it is interesting to reflect how “safe” some circular economy activities are.

Since 2014, there is also a composting project. "Three aerated in-vessel barrel composters were designed, fabricated, and distributed to residents who showed interest in participating. (…) Composting guideline posters were placed at these locations and the participants were given clear information and instruction about the composting process. The performance of these composters were monitored regularly (once a week) by measuring parameters such as moisture, temperature, pH, odor, and presence of vermin and flies.” (Khaing, 2015) These composters were decentralised and involved individuals, not community. The composting project was not very successful. One of the reasons was the lack of participation, or education (not optimal C:N ratio was an indicator that the participants did not know to put how much of what). Khaing (2015) called for a community composter, but wrote that it would be better to use the food waste for strategies higher in the food waste hierarchy, and to focus more on actions that motivates people to separate food waste from the rest. (See figure 14)

Figure 14. Food waste hierarchy and AIT's Food waste situation
Design by author



4.2.8.5. Virtualize

Since January 2017, the new library is introducing on-line reservations in AIT. The students are also obliged to work with a electronic card in the snackbar and cafeteria, but they still have to change paper money at a counter. Also all invoices for each payment are still in paper. Also, as many students come from another country and Thailand's banking system is not part of a payment-integration initiative like Europe's SEPA, money gets lost in transfer costs. Digitalization goes very slowly. According to some insiders, AIT staff are reluctant for change and learning digital skills required for a more virtualized working environment.

4.2.8.6. Exchange

In May 2017 the iLab in AIT Solutions was opened. Students have access to 3D printers and other tools to experiment and design innovations. [32]

There were campaigns to use a cotton shopping bag instead of plastic bag, but they were perceived to be not very successful. [44,50]

4.2.8.7. Behavioral change

This is an extra subchapter about the behavioural change campaigns. These are activities which nudge people to participate into the previous aforementioned activities (categorized in the RESOLVE framework).

According to Tangwanichagapong et al (2017), the initiatives of the AIT Sustainable Campus Club in 2014 and 2015 "were introduced and communicated continuously from the beginning of the project by distributing information door-to-door, internal e-mails, the AIT webpage, posters/banners, presentation of

3R initiatives to students at special annual events, e.g. orientation day and food fairs. Information was given about project activities, locations and the number of waste separation facilities, as well as information to raise awareness to inform people about the ways in which they can participate and to encourage the residents to contribute toward greening of their campus. (...) the 3R programs did have positive effect on awareness and environmental attitudes, but not on disposal and waste management behaviors." (Tangwanichagapong et al, 2017). But Tangwanichagapong et al separated the participants of their questionnaire into people who participated and who did not participate. They did not measure the attitude before and after these campaigns to see if these campaigns attracted new people or already conscious people to these initiatives.

One of the campaigns was also to let students make a Green AIT video as part of a competition, but the outcome was disappointing according to one of the organisers and did not give the message that the project leaders wanted. [51] Also in the Fall semester '16, students were asked to take photographs that show the "Green AIT", but the photographs were also mostly focused on trees and bicycling.

In fall 2016, the food and bioprocessing engineers did a project, funded by FAO, to reduce food waste in the campus. They hung stickers everywhere, with slogans at the food counters, calling to just choose what you will eat, to eat healthy etc. There were raising awareness events, like speech and poster competitions. There was a survey on change of behaviour. Unfortunately the results are not published yet. One of the interesting calls was to have food labels in the cafeteria etc, which could help students to make more sound and conscious decisions.

4.2.3.2. Curriculum and Research

Circular economy thinking is maybe also a "too new" term to establish an institute wide course, module or even programme, or integrate it in any course, but there are other terms like sustainable development and life cycle thinking that could be considered as circular economy thinking. During the time of research, AIT is promoting sustainable development (even in their mission: "Asian Institute of Technology promotes technological change and sustainable development in the Asian-Pacific region and beyond through higher education, research and outreach." (AIT website, 2017).

AIT has the approach that sustainable development should be integrated in each course, and aims that each professor, even in fields where sustainable development was left out, should be able to integrate this. The researcher witnessed professors who invest a lot of time in providing the state-of-art and current ideas and theories in the industry and research. The researcher also observed or heard from other students that several professors do not think it is a problem to recycle their slides of the last years.

Some professors who are big proponents, call even for department or even institute wide courses which would take care that *all* students learn properly about systems thinking, sustainable development and circular economy and reflect how they can contribute to sustainable development in their field. [27,47] Some measures are now taken to install wider courses, but there is a lot of resistance. [26, 27]

One staff member told that he visited all faculty members with a presentation about the global trends (urbanization, disaster management etc) with a call to concentrate research on these topics and these

countries. Some faculty members reacted responsive, but some were also “hostile”. He proposed also this course “where we would not tell the students what is sustainable development, but ask them and let them discuss.” The proposal is already for some time in the queue. The Academic Senate, responsible for changing the curriculum, takes its time. [26]

Other professors acknowledge that sustainable development is important, but do not teach it, because of different reasons. The way how students are taught before, the interest of students and the drive to get high GPA etc do not motivate them to take courses which requires more complex thinking. [23,47 etc] Some students even said, off-record, they took their field of study (in sustainable development), because of the scholarship, not because it was their first choice.

Reflection 22: The line between deciding for and integrating others

One of my reflections, not only during this research journey, but in my Master in general, is about the fact that there is too much information for people to make rational decisions for themselves. How can we expect people to take the best/ most rational decisions for more people, for a community, for the whole world? Also, if you want to include all stakeholders, this could be a never ending story? At some point you have to say it’s enough, now let’s do something.

On the other hand, is it not more “just” to integrate as many insiders as possible? If we want them to participate in the change, and not sabotage it, we also have to give them ownership and we have to value as many ideas of possible.

Education plays a central role. Sustainability is something that should be taught to everyone, not only environmental scientists or high-educated people. In my opinion, an institute-wide course on systems thinking, where students learn about the planetary boundaries and limits etc is the first action that a higher education institute can implement, to take care that all students know and can apply the basics. It has to be also compulsory. In the first two weeks, students can visit different elective classes (AIT students call it “shopping”) and several students told me they would go for easier subjects, unless they has a strong motivation. As systems thinking and industrial ecology principles requires a new way of thinking and leaving the comfort zone, this has the risk to be perceived to be too difficult. Therefore it requires compulsory participation.

When students know about sustainability, can think in systems and acknowledge the boundaries and limits of their environment, including their institution and campus, they can be very valuable partners in improving what has to be improved and identifying and maintaining what is already successful. They would be “free” human resources in making AIT even more a role model of a global village.

Some professors feel they have to to focus often on basic knowledge, because some students come from certain social backgrounds in which they did not learn enough or where the motivation is different. They need to learn first basic concepts. Their background is not good. And often they are trained in previous education to memorize, not really think. *S*ustainable development is important, but the priority for them and for developing countries is economic development. [24]

One of the observations -not only in AIT, but almost everywhere- is that sustainable development is considered as an isolated field, not as a concept that is affected by and affect each field. In AIT, there is one school which is called School of Energy, Resources and Development (SERD), but the School of Technology and Engineering or the School of Management discuss also energy, resources and

development and vica versa. In general, there is still too much sectoral thinking where people do not reflect enough on the impact of their sector on other sectors. Building and growing things for easier repair, reuse, remanufacture should be present in any field, especially in civil engineering. Some students see sustainable development as the mandate of other “fields”. One of the students, whose field has a huge impact on climate change, told the researcher off-record that it is not her job to think on climate change, but how to give her country access to energy. She thinks that the consequences of her work is work for others.

Reflection 23: Reflecting on social dimensions and my own background

In reflection box 4 I talked already about the social dimension. This quote had to be also understood in its context. This quote came from an informal conversation with a student during the career fair. I was asking questions to a petrol company that called itself very environment friendly and then talked with her. It really made me depressed. Even when I told her that hopefully her job will not exist anymore in ten years -because of international laws - she said that people always need energy. She saw petrol as a way of her country to be less dependent from other countries. About renewable energy, she had not an opinion.

This conversation also let me reflect on the social and even geopolitical impact of “environmental projects”, like for example banning petrol, and going for renewable energy. As someone from the middle class in West-Europe I can take things easily for granted. I think I took extra care that I was not going to sound like the westerner who “knows it better”, so they cannot use the “you, westerners, have all resources, so for you it is easy to talk”, or “you, westerners, do not know anything about the east” etc.
I thought a lot about the social (cultural, (geo)political… aspects of circular economy in especially developing countries, which do not have the same means as for example Belgium and Sweden.

On the other hand, due to my travel experience in many countries I noticed that there are more differences within countries than between countries. Suburban middle class people in Thailand behave the same as suburban middle class people in Belgium. The hipsters in Bangkok buy the same products as the hipsters in Antwerp. The shops look even the same. This is a result of the globalisation. Especially the higher classes who can afford traveling, bring and mix ideas from other cultures.

I am aware that most people did not travel so intense as I did, and try to avoid to be a ”wiseacre”, but sometimes I cannot resist to go against what I call “narrow minded ideas”. There was even a debate, organised by the Student Union, about who should take responsibility for climate change? The first or third world. The debate ended that the first world was to blame. I was not there, because I had other obligation, but later on social media I gave my own argument that everyone is responsible, that in the third world there are also “developed people” and that a more useful topic for a debate is how each country can offset climate change or something, but in its own way. Some students felt I was too harsh. My argument is also brought forward in the most recent versions of the Intergovernmental Panel on Climate Change and most important the Paris Accord which states “This Agreement will be implemented to reflect equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances”. (Alänge, 2016, p12)

I was very aware that I thought differently, because of my travel experience. I have not been told by a professor or by a book, but observed it myself. In eastern philosophy, I found a very interesting quote: Tell me and I [will] forget. Show me and I [will] remember. Involve me and I [will] understand.

AIT is not the only higher education institute where students do not look beyond their field.
This thesis has the departure point that sustainable development (and even circular economy and life cycle thinking) should be central in all education, because (but not only) sustainable development is key

to improve the world. This translates into a shift in curriculum design that addresses the global and local challenges and needs. Does AIT prepare global citizens ready to improve their environment?

Reflection 24: Does circular economy require more collaboration between faculty and researchers from different departments and schools?

Environmental and societal issues are transboundary and complex problems which cannot be solved by a certain field, like "environmental scientists" or "social scientists", but by collaboration between people of too different fields.
It is not only the fault of the students and/or their education, but also the AIT educational system seems not to foster to "broaden their mind" regarding looking beyond their field.

AIT is excellent in fostering intercultural dialogue and communication, and other universities can look up to this. By letting people from different cultures do group work together, they bolster this skill. This should also be applied to let people from different fields work in a group work/project together.

I believe that it is fine that students only study ideas, methods, techniques etc from their fields, but instead of trying to teach them "everything", it is better to invest in interdisciplinary communication and collaboration skills, in interdisciplinary team thinking and team working skills, and also systems thinking, because there is just too much information and knowledge to make each individual an "interdisciplinary person". The innovation can happen when people from different fields share a goal (Senge's discipline: shared vision), know how to think and work together (Senge's discipline: team thinking), can communicate with each other (Senge's discipline: mental images) and know their own limits (Senge's discipline: personal mastery) and what the team members of other fields can. (Senge, 1990)

When I attended an information session about thesis topics, the professor remarked that students cannot use methods learned in classes "out of their field" and should stick with methods of their field. The students also stay in small classes with mostly students from their own field, apart from the student who take part in the few "interdisciplinary classes". Cross-fertilization is limited by the discourse, the organizational structures and attitude of AIT. If AIT uses the same method of mixing cultures as disciplines AIT would generate more innovations and successful graduates than they already do.

An interesting structural change is planned for the period after the researcher left AIT. On December 8th 2016, the AIT president announced (via email and Facebook) a new academic infrastructure, which will be embedded in August 2017, which would allow more "integration, multidisciplinary learning and cross-cutting research. There are too many narrow fields (30) without a critical mass of faculty in each field)." Appendix B gives an overview of the Three schools, the (not existing yet) departments and fields, which would start in August 2017:

The researcher found only two current research studies done about circular economy at AIT, namely in Urban Environment Management and Environmental Engineering and Management.

Reflection 25: Do I need numbers to find a conclusion?

I had a couple of informal meetings with this Master and PhD candidate who did respectively their thesis about "circular economy in the mill industry in Myanmar" and the "Packaging waste in Thailand, using a circular economy approach". We were happy to share this interest, and all reflected that most professors in AIT could not support us, because of the "soft side of circular economy" and because the most professors in AIT are more interested in "the hard side". I noticed very quickly that AIT likes numbers. Even the few faculty from social science are "encouraged" to use numbers in their research. Therefore I had struggles in the beginning, because I also felt I needed numbers if I wanted to communicate this to AIT professors. I learned to understand quickly that circular economy is more than the technological systems and measuring the impact with numbers, but also has this intersection with economical, management and social theories, and most professors (not only in AIT) are not trained in understanding and assessing this intersection.

During her search for secondary data about the campus, the researcher found most thesis research about the sustainability of the campus in fields with an environmental focus, like environmental engineering and management; natural resource management and energy engineering. Papers about improving the economical sustainability in AIT could not be found. She contacted one of the heads of the School of Management, but he did not find also any research. [17] In the more social oriented fields, only a thesis about Afghanistan community in AIT was found. The professors of these fields also said that exhaustive studies about the social dimension of sustainability in AIT had not been conducted. [10]

Table 6 gives an overview of thesis research which were read - or at least where the researcher attended their Master thesis presentation. She decided to focus only on research done since 2012, because that was the year of organisational change as well the year after the big flooding.

Table 6: Research done by Students about the AIT campus, since 2012

Subject	Authors (+ year, field of study)
Sustainable Campus	Dharmawansa (May 2016, EEM) Anand (May 2017, Energy)
Plastic Footprint	Reddy (May 2016, EEM)
Water footprint	Nizar (May 2015, EEM)
Waste Management	Khaing (May, 2015, EEM)
Green walls and roofs	Reddy (July 2016, EEM) Sairam (December 2016, EEM)
Energy	Sivapraphagorn (May 2016, Energy), Chayakul (2014, Energy)
Ecosystem Services of forestry	Chan (May 2017, NRM) Szukuang (May 2017, NRM) Venkatappa (May 2017, NRM)
Gender Analysis	Lodin (2016, GDS)
Other social research	No papers
Spending behaviour of students	On-line shopping, (Chueamuangphan, May 1017, EEM)
Economical research	No papers

EEM: Environmental engineering & management, NRM: Natural Resource Management, FE: Food Engineering, GDS: Gender & Development Studies, WEM: water engineering and management, UG: Undergraduate program
No papers from School of Management or School of Engineering & Technology

During the period of this research, one Master student assessed how sustainable the AIT campus is, with a focus on energy, food, water and education. Apart from reading his proposal and attending his progress presentation in April, the researcher also had continuous talks with him.

The three papers on ecosystem services were presented during a workshop organised by Natural Resource Management on May 16th 2017 as an introduction to an interactive workshop with students, staff and faculty to come up with ideas to make the campus more sustainable. The focus was mostly on ecosystem services of forestry and carbon offsetting schemes that could bring money on long term.

Reflection 26: Why are there not more student action researchers in AIT?

In 2015, 748 students entered the AIT ecosystem and, in 2016, 704 new students joined. (AIT, 2017), but from the 748 students who entered, only two students are doing a sort of action research in AIT for their Master/pHd thesis. (Anand and Chalamalasetty) Their supervisor is also one of the professors behind the Sustainable Laboratory Initiative. I am external and do not even count. I observed some surveys on internet, on consumption etc. spread through social media where students are invited to participate, mostly part of a group work, but I have no idea what happened with the results, if they were shared with top management, and if they had an impact on AIT.

I talked with one student who was interested to conduct a research on AIT students (regarding mental health). She participated in Student 2 Student Sessions which were often about mental health. That is why she approached me with her idea. She could not do this as her Master thesis research because her scholarship required her to do research in her own country in a certain subfield. I encouraged her to do the study and to contact one of the vice presidents, who is responsible for campus and academic issues. The vice president was happy with this idea and there will be research. She is part of a team of few faculty and herself. She will do this as an extra research besides her thesis research. I think there are a lot of opportunities where students could be utilized to do action research and co- or redesign parts of campus (life), and I sense that a more pro-active attitude from faculty can create space. Faculty have not a lot of time, because of all their responsibilities, but by encouraging or proposing students to do projects in the campus itself they could also indirectly contribute to the improvement of the campus (and their working/living environment). I think it is not a coincidence that the supervisors of student action researchers were the initiators of the Sustainability Laboratory, or other faculty members who were committee members of the Steering Committee.

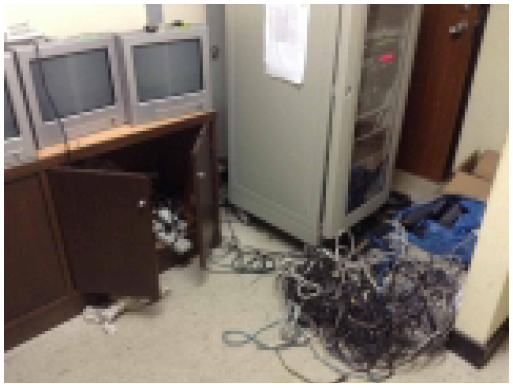
4.2.6. Takeback management

As indicated, there are some “loop practices”, which are all organised isolated from each other, like the Paper Ranger Project, the AIT J-J Terminal facebook group or the practices of the Purchase and Procurement Office. This last office tries to look for more green products and less waste, but they stressed that they need an institutional environmental policy that “would push unit heads to go for more “green”, durable, easier to recycle etc products”, because this office cannot influence the quality of the purchase and procurement at the moment. [43] Also, there should be more clarity who is responsible for which assets.

Reflection 27: Who is responsible for which material/waste/asset?

When I organised a documentary evening ("Before the flood") for students and other AIT residents on a Sunday evening in October, I decided to do this in one of the main auditorium where many externals come. I was already aware that some equipment is so outdated that the Student Union and AIT management always use their own material if they use this auditorium, but was still surprised when I saw the control room. Normally I did not have to arrange the technical part in the control room, but it was a Sunday and there was no supporting staff, only a security guard who opened the auditorium. The other students and I were surprised to find a control room with old computers and a lot of "e-waste" (see photograph 16). Some months later I discussed this with a vice president to design a sort of material passport, a database which records where which equipment and material are "stored", but I did not go deeper into that idea, because other issues came up. Again, some weeks later, when I interviewed staff of the office of Purchase and Procurement, I asked them if they had an account of the assets (and waste) of the Milton Bender auditorium, and who was responsible of taking care of "these assets", but this office could not give a clear answer. They said that was a good question and even thanked me to raise this issue.

Figure 15. "e-waste" in the control room of one of the main auditorium (October 2016)
Photograph taken by author



4.2.7. Channels for insiders

During a transition, communication, translation and mediation are key (Nadler and Tushman, 1997, Cash et al, 2013). During the analysis of papers as well as interviews, it was clear that the information about environmental performance, sustainable development, even circular economy, was available in AIT, and to some extent even accessible to everyone, but most people did not know about how to access it or were not interested. The next subsection is the overview of the channels the knowledge management, separated in communication, translation and mediation, based on ideas of Cash et al (2013),

4.2.7.1. Communication

Here is an overview of the communication channels that the researcher identified and also used for data collection:

a) AIT websites, facebook page and newsletter

The website is the main source of information. Unfortunately it is not updated and -according to insiders and outsiders- old-fashioned. The perception of the researcher was that it was not user-friendly enough. She needed the AIT facebook page and monthly newsletter to identify the news. Each department, school

and unit has also their own websites, not always in the same house style. Most news were mostly only updates about alumni, partnership agreements, or references to the glorious past. The news was mostly about results and promotions, not really about processes.

b) AIT login

When you use the wifi of AIT, you see first the event calendar and news. It has benefits, but mostly people skip this page. Some insiders were annoyed that they have to login always. The researcher did not see the news under the calendar in the first 7 months of the year she stayed in AIT (including the first months of her formal action research).

c) Emails to the community

The inbox was mostly filled with news about rules, guest lectures and news about water shutdowns, pest controls, reservation sport grounds, pizza promotions and buffet menu from one of the vendors etc. Insiders complained there were too many emails about small things which did not feel relevant and important.

d) Student Handbook

This book is given during the orientation. It contains a lot of text with rules and regulations. Most people, even staff, did not know there is an environmental policy in this handbook. This environmental policy is still very general.

e) AIT president's facebook profile

The AIT president accepts everyone and shares updates about his work (mostly about what he does externally). Others can also comment there and access him. He also commented on three posts of the researcher. He shared a post about LED lights after he visited an alumni, former classmate and nowadays a LED manufacturer in Thailand.

Reflection 28: Is (social) media driving change?

Social media is a phenomenon of the last ten years. It changes the way how we communicate. More and more leaders also have facebook profiles or pages, or twitter accounts. Also the current AIT president accepts everyone as his facebook friend. I noticed that students and alumni comment and like the posts of the president. Mostly the posts are very praising and positive, but some people also write questions or remarks in the comments. A student told me that another student contacted the president through facebook to address a problem among students. It was more easier to reach him than through "traditional communication channels". Mostly the AIT president does not comment on facebook messages, but he commented on two posts, one about Philips Circular Lighting in December. When he wrote about the visit to the LED manufacturer and mentioned the costs, I commented that there are business models which would bypass the high initial costs, and referred back to Philips Circular LIghting. He tagged than the CEO of this LED company, who explained they have a model where they invest by installing LED and get a certain percentage of the savings. Later, when I met by coincidence the president in the library, he told me that this LED company is doing a survey in AIT. It would have been interesting to also dive how social media can bypass traditional communication channels and the hierarchy in an organisation to trigger change.

f) Informal channels (including social media channels)

The most information was collected through informal communication. Some people send the researcher -via facebook or email- documented notes, reports etc. of proposals, projects, programmes etc.

There is a lot of information available, but most people do not know where or how to find it. In the end of the January semester, two different students asked the researcher what they had to do with their paper waste, because they knew that the researcher was “the circular economy expert in AIT”. She told them to connect with the office of Procurement and Purchase, stressed that they were really nice people who are doing some recycling , and also referred to the Paper Ranger Project. [55] These two events indicate that a certain percentage of students are not aware about all the different activities done by the organisation and by other students and faculty.

Reflection 29: When the external researcher becomes an expert, is it time to leave the system?

As above mentioned, in the end of the January Semester (in April/May), some students and staff saw me as “circular economy expert in AIT.” Also other students started to call me “an AIT expert” and wanted to learn from me, or hear my opinion about certain matters, also not related to circular economy. When people start to see you as an expert, it becomes more tricky to get information or knowledge, because they can assume you know already something. It was a sign for me to leave also the system.

Also most “news” is not considered to be relevant or important. There are too many emails about sport grounds and pest controls. A dozen of students told the researcher that they do not read most emails from the staff. The researcher heard that reading emails is “too boring for the youth who is used to more modern communication techniques and apps such as Line and Whatsapp”.

Also communication is not often two-way and inclusive. The case story of the new 711 is an example. 711 is a convenience store which is open for 24 hours. Students go shopping there in the middle of night and often make noise. When AIT management chose a location, they did not ask for the feedback from the students, “because that could be a never ending story”. [36] They placed it next to the dorms. Months later, students are complaining about the noise at night and that they could not sleep properly, especially during exams.

In the focus groups with students, the researcher asked about the trash-for-cash initiative described in some Master thesis research. The fact that AIT management stopped sending emails about the trash-for-cash project explains why only people who are here for long term still participates and knows about it. [3,9,12,22] Continuity is an issue.

Reflection 30: Linking the empirical findings with theory

Although I had before already a feeling that communication was an issue, based on my own experience in the field of media, art and television, reading the theory of Cash et al (2013) helped me to understand and assess the communication in AIT better as well link it with change management and sustainable development. In my opinion, boundary management is not really strong in AIT, and is also an important factor for sustainable development, also in HEIs. It was a good learning experience to also look back to the theories that I read in the beginning, and dive into some theories deeper.

4.2.6.2. Translation and mediation

In May 2017, the first “Sustainable Campus workshop” was organised, which was open for everyone. In total there were around 30 participants and most of them were students. It was one of the few platforms. There is also a residential committee, which holds meetings, but not many people came. [11] If people talk about the campus, education etc, is it mostly non-constructive complaining. Constructive feedback is not really present.

Several faculty members, people in staff management and students point to the fragmentation. People work and live in silo’s, according to nationality, field of study, belief and role. It does not really foster transparency. There are policies and rules, but no strong controlling system to see if these rules are followed. [9, 22,33,36 etc]

4.3. Enablers and Barriers for circular HEI

To analyze what hindered or facilitated the implementation of new circular economy practices in AIT, this section dives into the history and root causes of the current state of plastic waste and energy. The lessons about the history will help to identify the adoption factors and describe how these enable or hinder the transformation.

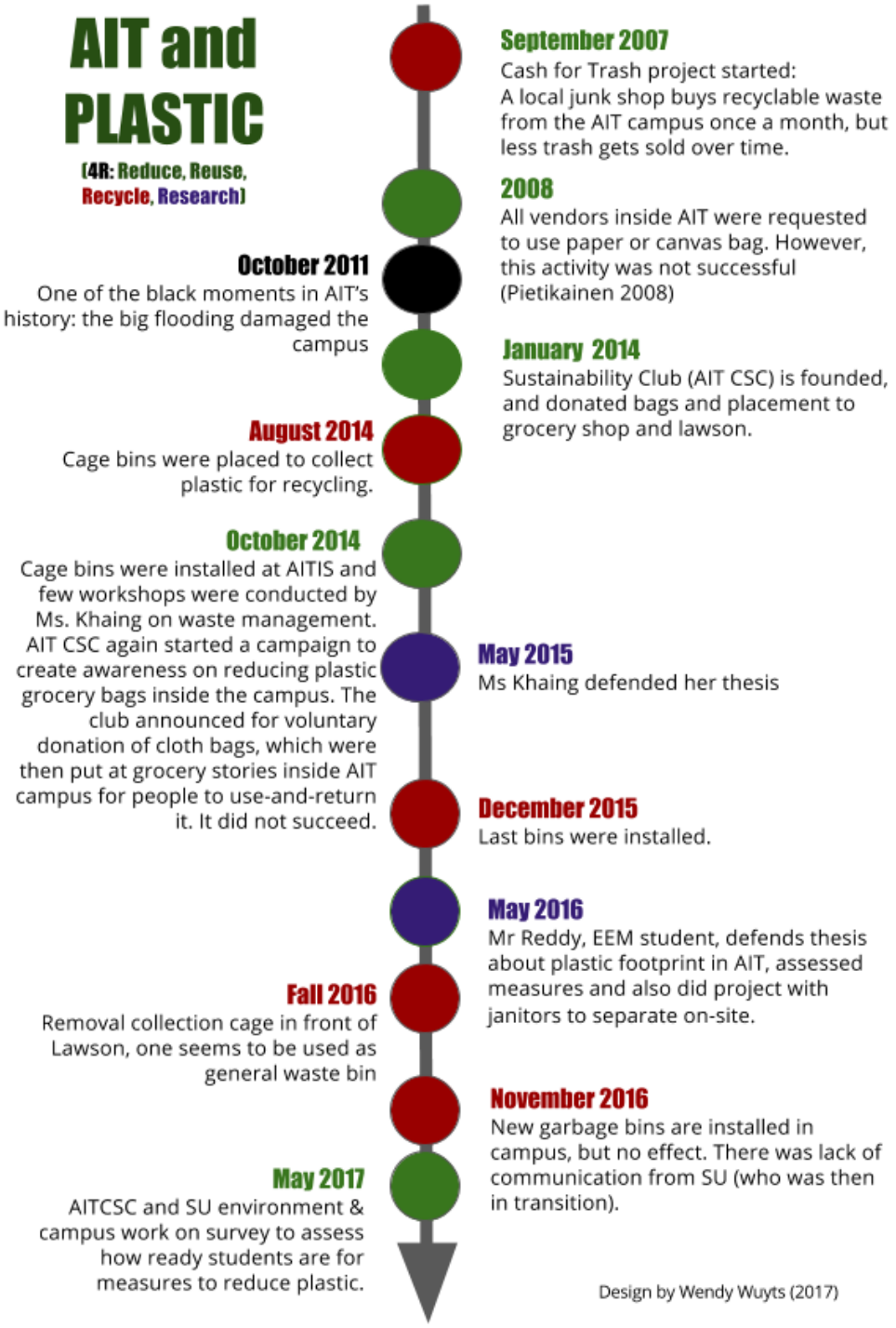
4.3.1. History and root causes of current state

The structure of this section exists of the analysis of the history of the current state of plastic waste and energy in AIT, because the most projects initiated as part of the Sustainable Laboratory Initiative were done in these fields. As most information about the different projects were spread, it was important to synthesize the information in a time line and let this be validated by insiders. Comments from interviews and talks were then included in each conclusion to point out already what was good and what was not so successful.

4.3.1.1. The history behind the current state of plastic waste in AIT

There are different types of plastic waste generated in AIT campus. There are recyclable and not-recyclable waste. Mostly they are plastic bottles, styrofoam, plastic bags, plastic cups and other plastic packaging. Based on inputs from thesis researches, interviews with (old) members of AIT Campus Sustainability Club and Student Union, the researcher made a timeline of measures (in the last 10 years) for handling plastic waste based on 4R policy of Thailand: Reduce, Reuse, Recycle, Research. This timeline is validated by the aforementioned people who gave input in earlier stage.

Figure 16. Timeline of activities to reduce, reuse, recycle and research plastic in AIT



In the past, AIT did waste management procedures. One of the still existing (but not visible and therefore has a very small impact) is the Cash-To-Trash Project: a junk shop visits the campus to collect recyclables (Interview Director A; Reddy 2016, Khaing, 2015). In the beginning there was a lot of advertisement through emails, but now there are almost no emails about this project. Also cages were installed in "strategic points" such as in front of the convenient store, where people could put plastic bottles. When the researcher entered AIT, this project seems to be dead to her, because she observed

people even put not-plastic in the cages (see photograph 8). According to Reddy, there were complains about the cleanliness and the aesthetic view. Some of this cages were removed. Only in the residential area where mostly staff lives, are still some cages.

As aforementioned, in 2014, the AIT Sustainable Campus Club was born. Driving this vision of AIT as “a Sustainable Living Laboratory”, “campus-wide solid waste programs were launched and initiatives were carried out by groups of student-volunteers, with the support from faculty and the Office of Facilities and Asset Management (OFAM).” (Tangwanichagapong et al, 2017). They aimed to increase awareness on the environmental impact of behaviour and to promote 3R. The Club exists mainly of volunteers who installed packaging-waste segregation bins to sort recyclable packaging (plastic bottles, glass bottles and metal cans in particular). During the trash-to-cash project, also another issue arise. In developing countries, informal recycling exists and puts materials back in the loop. Many poor people see cash into trash and go to landfills to collect recyclables (often not protected against the hazardous waste) and sell this. Twice a week, the garbage collectors come and bring the waste to the landfill, but first they pick out the recyclables to sell it. When AIT installed a trash-to-cash-project where they asked to separate recyclable plastic from rest, and reduced the volume of recycles, OFAM got in trouble with the garbage collects who saw a loss of their income (Interview with Director OFAM, 2017; Tangwanichagapong et al, 2017). Also an EEM student, Ms Khaing, was involved in these club activities and did her thesis research on waste management in the campus in 2014-15.

When the AIT Campus Sustainability Club approached OFAM and the vice presidents in the end of April 2017 with a question to ban plastic bags, OFAM remarked that “plastic bags are not bad, because they can be recycled.” After some arguments, OFAM said that they cannot force stores such as 711, Lawson etc to implement this rule, “because then they have to apply this to all universities”. OFAM suggested to try again to do some awareness campaign, with help of SU this time.

In November 2016, the Residential Committee decided to put new bins: a yellow (with label biodegradable), a blue (municipal) and a green (recyclable). The SU president promised that SU would help to promote and educate the students on waste separation, with a video etc. - but that did not happen, because SU changed then from term and this was not followed up.

This history -and interviews with insiders who validated this- points out some **positive elements**: The activities had a certain impact and are successful in some extent. The fact that staff, who stays longer than the average student, still participate in some activities, means that there were successful campaigns. A very good idea of this initiative was to engage students in doing the research and test out some solutions, especially in the case of Ms Khaing. By letting the students first find out themselves about the issues at campus, they motivate students to take some action in the system. Different insiders stressed out that Ms Khaing was a catalyst for some activities. On the other hand, it is important to continuously involve students as action researchers. It also seems that action research is also not conducted a lot (in the campus), only in the fields of Environmental Engineering and Management, and Energy.

Also some **problems** are visible. First, there is a **lack of long term coordination**. This is also visible in the description of the Take Back Management. The projects in the plastic story were part of this bigger initiative of the “Sustainability Laboratory” and were dependent on student volunteers, who are only there for limited time. Often the Student Union is seen as a catalyst, but the Student Union works only for a semester, which is a too short time for catalysing long term change. The AIT Campus Sustainability Club would be a better body to bring change, because there is no time limit, but often this club was missing guidance and leadership. There were several professors initiating and supporting the activities and this club, but they also had academic responsibilities. It would be better if there was a team from management, with a clear vision, coordinating and cooperating with the residents (not only students) .

Second, there is **a lack of continuous communication**. When you want to change behaviour, but have a continuous inflow of new students, and even staff and faculty, behaviour campaigns have to be done in a systematic and continuous way. Especially some behavioural studies point out to especially do campaigns in transition periods (like change of working, living … environment) as the best times.

Third, there is a **low understanding of circular economy:** the focus seems too much on monetary benefits of (informal) recycling, without acknowledging that informal recyclers are exposed to hazards, that recycling is the least favoured strategy to close the loop and has still environmental externalities.

Fourth, only a few insiders (faculty, students and staff) take leadership over the issue or just one project, but this is **not enough leadership**. There is also **not so much collaboration** across “boundaries”, like field of study boundaries, or the boundaries between the different roles.

Fifth, other problems are externally, so AIT cannot change that, but has to work with that. AIT is not an isolated system. It has to **deal and negotiate with people and systems outside its own system**, as for example the garbage collectors, the 711, even the whole waste management facilities of the municipality.

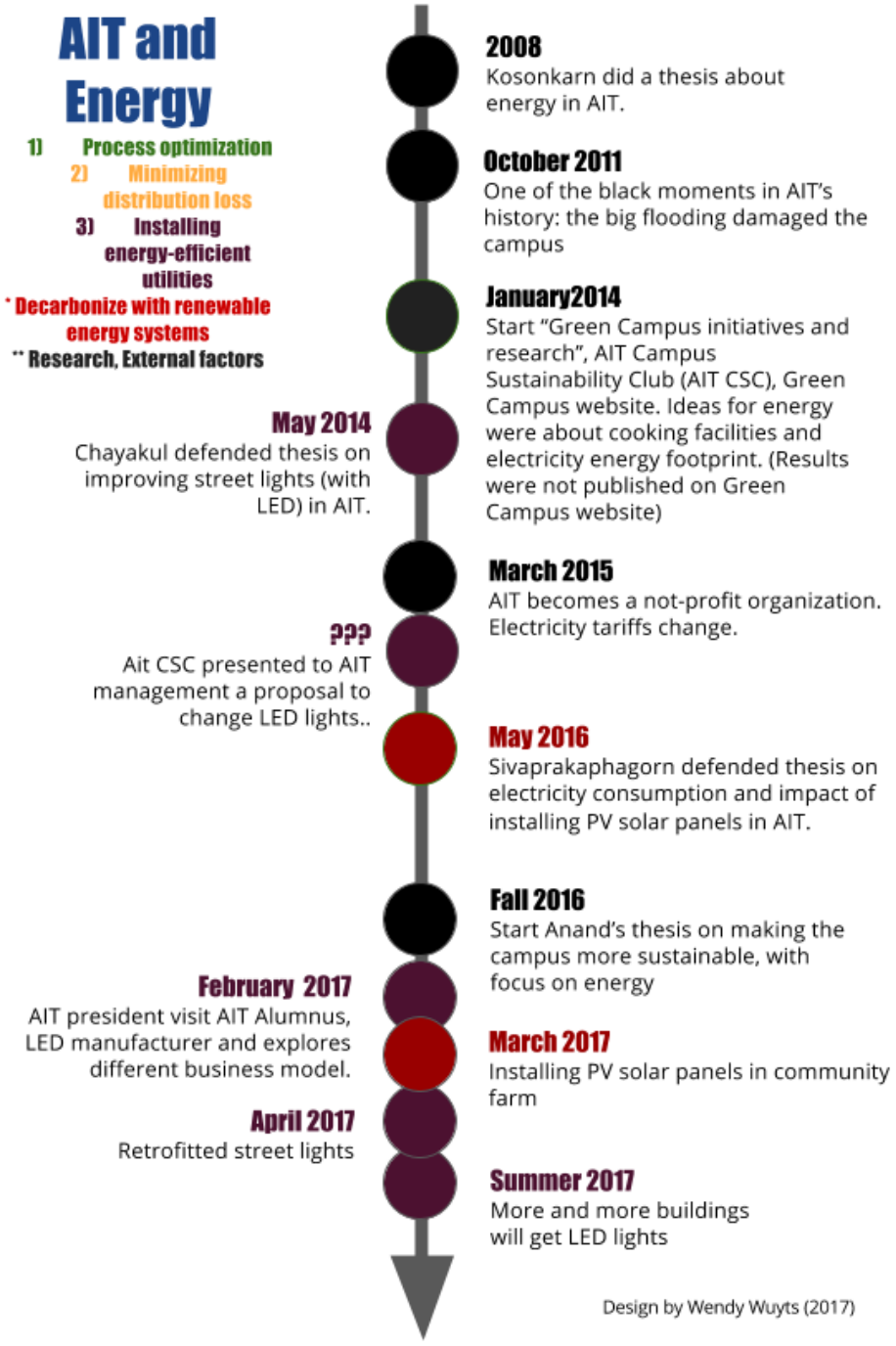
The social dimension of sustainable development also matters. It is important to **integrate the social/informal economy** in (new) projects and programs, especially in developing countries as Thailand.

After describing and identifying positive elements and problems in the focus area of energy (in the subsection below), we will select problems that occur in both “focus areas” and dive deeper into these problems.

4.3.1.2. The history behind the current state of energy in AIT

During the course of “rational use of energy in industries” (2016), Dr Mohanty taught about an integrated sequence of actions in the field of energy within certain system boundaries. He calls to reduce the energy demand by 1) optimizing the process, 2) minimizing distribution loss and then 3) installment of energy-efficient utilities. When the energy demand is as low as possible but still satisfies the people, 4) the fossil dependence can be reduced by investing in renewable energies. A look to the actions in the last years (see figure), makes clear that the focus was on the two latter actions.

Figure 17. Timeline of AIT and the history of Energy



Chalamalasetty, one of the energy students, was conducting a thesis research called "Improving the Performance of Air Conditioning System at AIT" and investigated the chiller plant itself (see reflection box 23), but this research was not concluded before the researcher left AIT (in May). He wrote there are four chillers, which are all located in a central place. The first chiller is from 1979, the second chiller does not work, the third is from 1996 and the fourth is from 2014. He stated four problems:

i. The Specific Energy Consumption (SEC) in the chillers is very high (1kW/RT to sometimes even 1.41kW/RT, while the average is 0.6 KW/RT).

ii. The pumping system used to pump chilled water to different buildings from chiller plant is inefficient, i.e. all chilled water pumps used to distribute the chilled water to end use buildings at AIT are constant speed pumps. The chilled water is pumped at a constant speed throughout the day irrespective of the cooling load variation. Due to this, the electricity consumption share of pumping system is very high even when the cooling load is low.

iii. The distribution is not insulated and the new buildings are far from the chiller plant, which leads to a loss of 30% of energy just because of the the chilled water distribution network itself.

iv. Some Fan Coil Units (FCU) are also not energy-efficient (FCU is the device which controls the temperature in a space).

Chalamalasetty wrote the researcher he would suggest to switch to decentralized systems and to use a variable speed pumps, which will control the flow of chilled water based on the supply and return temperatures of the chilled water.

Also, different insiders mentioned that some faculty members and students advocated for example for LED lights in the last years, but the payback time was still too high then. [23,36, 51] Currently, the payback time is low enough to implement LED lights, according to the president , [18], but that would not push down the energy demand a lot. This year the AIT president visited an alumni who is also a LED manufacturer and this opened a dialogue for LED lights. The AIT president wrote also a public social media post about his visit, all the advantages of LED lights and the possibility of installing (more) LED lights in AIT. He mentioned that there would be costs. [13] This is another indicator that initial costs is a big barrier, often for an organisation, like this HEI, with small margins.

Reflection 31: Difference between western and eastern business approaches

During the discussion after the thesis presentation in Sweden (15 June 2017), we talked about corruption in Thailand. I explained that in a closely-knit society or group helping someone from your family, friends and acquaintances with a job, or a project, is not seen as something bad, because social relations and helping each other are highly valued. In the eastern society, it is more likely that you are valued for the people that surround you. In the western society, it is more likely that you are valued for your productivity. Besides, in a small group, the pool of talents is also very small and it becomes more difficult to avoid -what westerners call- corruption or nepotism. When someone asked if there was a public call to any company to install more energy efficient (street) lights, I did not know the answer. I did not study enough what corruption means in Thailand, but I know -due to news articles and conversations- that corruption is everywhere, in probably every organisation, so it could be assumed that it is also in AIT.

Reflecting upon the fact that -if actions were undertaken- mostly “affordable” actions in the third or fourth area were undertaken. This points out to some “**problems**” (as in the story of plastic):

- lack of understanding
- expertise is not translated into practice
- the payback time
- The fact that especially the new buildings are constructed “too far” from the chiller plant indicates a lack of systems thinking, and long term coordination

- Only a few (some faculty, some students, president) take leadership over the issue or just one project, but it is not enough

This story also shows positive elements from which AIT can build:

- Engagement of students in the research and solutions is effective: Two students who did research were also active members of the AIT Campus Sustainability Club
- Expertise and knowledge is present: there is done research by students and faculty about energy issues in AIT

4.3.2. Root causes of selected problems

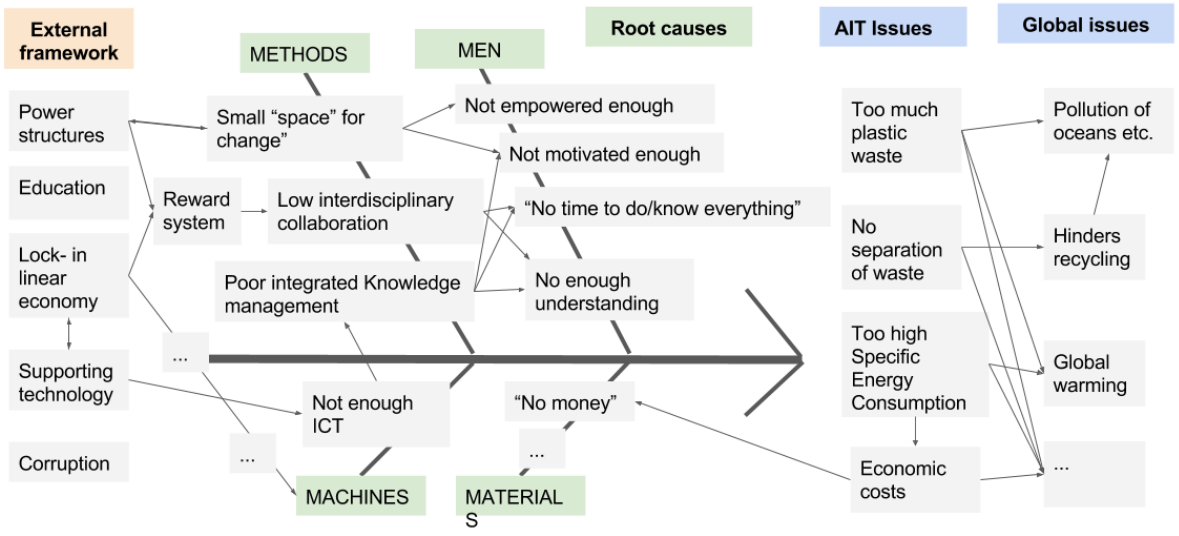
In both two focus areas of plastic waste and energy, the following recurring problems can be identified:

i. Lack of understanding of Circular Economy,
ii. Lack of knowing the local and global problems, lack of understanding social dimension (social/informal economies), lack of understanding need for Circular Economy
iii. Lack of Systems thinking (life cycle thinking, long term thinking, design thinking etc)
iv. Not effective integrated knowledge management, where knowledge and expertise are translated into practice (for example, not continuous, not two-way)
v. Not enough transboundary collaboration
vi. Not enough leadership[41]

During the research journey different fishbone diagrams were drawn to dive deeper into the roots. The following figure is a digital summary of some fishbone diagrams where different problems in areas of energy and plastic waste are written down and categorized according to men, materials, methods and machines. A discussion about the external framework, or external context of the organisation, is also necessary, because AIT is not an isolated system. It does not imply that AIT has no control about the current issues, but that these external factors have a certain influence, especially on the speed and (societal) impact of change.

[41] Leadership can be interpreted in many ways. It could mean authority and power. In this context, leadership means driving change or creating space (for other) to drive change. (inspired by the keynote of Dr Peter Senge during the International Sustainability Transition Congress, June 2017 in Gothenburg

Figure 18. Fishbone diagram for different problems regarding plastic waste and energy



This figure is not complete. There are many more factors and causes, but the reality is too complex to capture in a graphical abstract design.

The following sections will first explain the factors under medium, i.e. the external factors, and then the internal factors. There are more factors and causes than described in the subsection below, but the researcher decide to focus on these ones, because of time limitations.

4.3.3. External factors

The system of AIT cannot be described and analysing without looking to the surrounding systems. Political, economical, societal and technological mechanisms in Thailand, or Greater Bangkok, also hinder or enable circular economy thinking.

An interesting fact is that AIT used to be the only place in Thailand where postgraduate education is offered, but has now big competition of other Thai universities which emerged in the last decade(s). Thailand is seen as one of the 7 TACTICS-countries, identified by Times Higher Education, in collaboration with the Centre for Global Higher Education at the UCL Institute of Education, in early 2017 to become the next high education powers. "In all these countries, GDP is below $15,000 per head, at least half the youth population is enrolled in higher education and participation grew by at least 5 per cent between 2010 and 2014. " (Times Higher Education, 2017). The small size of AIT cannot be compete with the large scale of these Thai universities. Most Thai students go now to the other universities. Even food vendors go to the nearby campus of Thammasat University, because "they can sell to more students". [36] AIT has also competition in attracting funds. It used to rely on scholarships and funds of developing world, especially from European countries. At some point, in the beginning of AIT's history, AIT had computers which were only present in USA, not even in Europe, because they collected so much funds. [37] Due to change of different foreign aid policies and more competitors, especially in surrounding and

less developed countries as Myanmar, Cambodia, Laos, there is a decline in funds for AIT in the last decade(s). [37]

Nevertheless, AIT has unique features that the other Thai universities do not have. Besides the international aspect, AIT can also benefit from its small scale. There are a lot of opportunities in managing a smaller higher education and residential campus, if you do not see other universities, industries etc. as competitors, but as partners. In the spring 2017 semester, AIT seems to sign MoUs with foreign universities, not so much with Thai students. These partnerships, though, are good, especially in bringing new ideas and faculty. Four students told the researcher off-record how much they like the "visiting scholars" with their new ideas.

Reflection 32: Intercultural collaborations create space for inflow of new ideas and approaches

This action research is also the product of a partnership with international Higher Education Institutes. One professor who is involved in the AIT Sustainability Laboratory Initiatives was also the coordinator of this Erasmus Mundus partnership. He can visit and teach in European universities and get some ideas. One assistant European professor came to AIT to teach. He also gave advice to students. I heard from other students that they really liked his educational methods and new views. He was only in his early thirties, so it was different from them to get a class from him. He was also an instructor in my first course and I know his educational methods are differently than the one I observed in AIT.

Partnerships with other universities could also lower the risk of "incestuous corruption" that small systems can face. Most faculty and employees are harvested within AIT itself, and it does not mean necessarily these are the best and especially most motivated human resources. This has to be seen from the cultural context: in a closely-knit society, where collaboration and helping family and friends are valued highly, this is not considered to be "*bad corruption*", but from a very western perspective, where "productivity" is in general valued more than the family well being, this "nepotism" could be evaluated as something bad, especially in terms of change management.

Reflection 33: Does strong social cohesion hinder or enable change management?

During the writing of this thesis in Sweden I was also reading about Northern countries, because I am very interested in cultural differences. I read about the root causes of Iceland's bankruptcy in 2008. The fact that in this small country, people give jobs to people they know, and have to work with only the humans in this small country, was called "incestuous corruption". This kind of corruption was not seen as a bad thing, because helping your family and friends is valued in this closely-knit culture. It reminded me to AIT, because it is also very small scale. In AIT, students and staff said that AIT seems to recruit from within their circles. Even if they have a HR policy which states that each job vacancy has a public post, often the job goes to someone within the closely-knit AIT network.

There are many opportunities in the partnerships, if they are more than "just Memorandums of Understandings" as well the internationalisation. It is important that AIT does not put itself in a victim of external factors, like the rise of other universities and does take control to see the other universities as partners. As Thailand is an economic growth oriented transition country, the supporting technological systems for circular economy are also development. The waste management and reverse logistics are

not very mature, but this should not be a problem, as circular economy in narrow meaning calls for leapfrogging recycling and more for reduction of waste.

On the other hand, there are many actors in the social/informal economy in Thailand which are creating value with waste through circular economy practices, mostly through upcycling and recycling. AIT has strong connections with different social enterprises through the Yunus Center in AIT (YCA) and AIT Solutions. Representatives of both centers participate in networking events. In the end of February representatives were invited on a co-creation workshop for facilitation of social innovation in Thailand from the UNDP in Bangkok. The researcher helped the YCA to organise and facilitated the panel on “reaching zero waste through social business”, with social entrepreneurs, consultants and activists in Bangkok. She arranged also a van for interested AIT students and staff. [29] The president of AIT also organised CSR campaigns, which highlighted the work of local social enterprises and cooperatives. The Trash-for-cash-initiative was also a project between the social/informal economy and AIT. AIT can identify more projects if they invest more and highlight more the work of centers as YCA and AIT Solutions, to the outside world, and also to students, staff and faculty.

A cultural factor is the role of spirituality and buddhism in supporting sustainable development. There is research about this. Even in AIT, some professors and students study how the belief of spirits in trees and other nature element could foster natural resource management, because belief, faith and spirituality is still strong in this country.

Reflection 34: When we talk about sustainable development, we have to talk about religion

Only in North and West-Europe people separate science, politics etc. from religion, but when you want to change things in other parts of the world, you have to talk about religion. I observed myself and also heard from others who have been to Sub-Sahara-Africa, that the Church is one of the strongest influences in all domains of life, and even . In Middle East, sharia law is marrying religion and politics. In Thailand, rich buddhist people like to donate money to temples, to improve their karma. The AIT president also shared a nice example of a temple in Thailand with me, where the monk is doing and promoting circular economy (repairing, reusing materials…) but the monk does not call it circular economy. It is part of sufficiency philosophy of the late King Bhumibol (who died in October 2016), and also part of buddhism to be able to detach of materials and be happy with simplicity. When I was processing my thesis in Sweden, my host of India explained the difference between spirituality in east and west. In West-Europe it's separated, seen as something apart from the "daily life practices", while in East it's interwoven in daily practice. He explained this with coffee. He says it is fine to enjoy your cup of coffee today, and that is what he calls materialism, but a spiritual person would be still fine if he does not have that cup of coffee tomorrow. He is not attached to coffee, and that detachment is spirituality. He stressed out that materialism is not seen as something unfavorable or opposite.

I was reflecting on the notion of detachment and how it would help people to live with less (smaller houses, less materials), to go for minimalist lifestyle. An interesting research for the future is how training students to be mindful, by having "practical spirituality classes" (meditation, mindful exercises etc) changes their consumption behaviour and get more interested for sharing economy, collaborative consumption models and dematerialisation and detachment in practice. I have to note that in Thailand, it's normal that a majority of the buddhist guys become a monk for several months, and I know two Thai students, bot in energy, who have opposite consumption behaviour. The one talks about second-hand clothes, sustainability, minimalism and also practices it partly, but the other goes shopping in all corners of the world and puts the pictures of his purchases on social media.

Still, I think education can have a high impact on youth by having compulsory classes on spirituality, mindfulness, detachment, and knowing yourself. Senge (1990) also called personal mastery as one of the five disciplines. For a better world, we need to open minds, and the precondition for that is to know first your mind. The reason why many young people are returning to religion -or binge drinking (the opposite)- which I see in Belgium (Brussels) and United Kingdom, is because they are lost and don't look for themselves.

AIT has many religious associations. Students organise also meditation and yoga classes. So there is already a base. Religion is unfortunately a sensitive topic. In West-Europe, engineering and religion would be two different world, but I noticed that a majority of AITians are engineers and also religious (in different grades., The religious associations could be a great medium to work with to foster sustainable development in the campus. I realised this too late, when I was already back in Europe, that I should have talked with the leaders of the religion associations in AIT how their activities can contribute to a transition to make the campus (life) more sustainable.

Further research should be a collaboration between environmental scientist, political scientist, economists and religious scholars or cultural anthropologists how religion can foster circular economy. The influence of religion itself is too complex for a single researcher and a master thesis, and also it is a sensitive topic that requires some expertise, but I think it is important to acknowledge the role of religion in sustainable development. I learned, by being in the east, that you cannot ignore religion, or work against it, but have to work with religious groups.

Lastly, another "societal" factor, which has a big influence on change management, is the seniority in Thailand. From a students' perspective, one of the most hindering factors is the seniority and hierarchy in Thailand. Seniority is more than being older. It is a combination of social identities, such as (especially) age, educational background (Phd degree) and role in the organisation. It means also that hindsight experience is very valued.

Reflection 35: Is my West-European background helping me to bypass seniority?

My young age had benefits and disadvantages. As I have the same age as PhD students, students saw me as one of them. It helped me to design a workshop and environment where the students felt comfortable to come up with their own ideas. I have to remark that my background in European student organisations also helped me to create space for other students. I even felt that as long as I show enough respect I could ask questions to the older insiders, but I am not sure how much they listen to me. I asked mostly questions, because I saw this as my way to plant ideas and reflections in the heads of older people .

As aforementioned, as an outsider "from another culture", I did not get a place in this hierarchy, which made it easier for me to access people of different layers of this hierarchy in AIT. It was still an exercise of balance for me. I wanted to show respect to the older people and their hindsight experience, but I wanted to be also true to myself, my values and learn by doing. Someone told me I can bypass this seniority, because they assume that I cannot know this norm, or have double standards for Asian youth and European youth, but at some point I was aware of this seniority, but I still neglected that. In Belgium, if you are productive and successful, you can talk with your seniors, especially because we have this double sort of communication, which gives the feeling that everyone is equal, but in reality there is still some hierarchy. I do not think it's my "culture" that helped me. It made things easier, but it would not explain why I took the opportunity to talk with top management, and other's don't. My own father treated me as equal, already from a young age, and brought me 1-3 times a week to environments with mostly only old people, with whom I had to compete in language games. (I was 10 years old, the other participants were 50-70, even my father was still one of the youngest participants). I was mostly in the lower ranks, so in some ways I am used to compete, but also be willing to "lose" because I acknowledge they had many years of experience. In breaks I talked with them, so I also learned how to talk with older people. Until my late teenage time I spent also a lot of time with my grandfather, who created also a lot of space to explore, grow etc. and who, I witnessed often, also talked with many strangers.

This reflection is to highlight that a background of a researcher matters, and not just a single social identity as nationality, but the intersectionality of different social identities. Subsection 4.4. and the Discussion will dive deeper into that.

Observing the Asian Institute of Technology was an interesting exercise to reflect about the role of higher education in building capacity in innovation. AIT is an interesting case, because the age gap between students and faculty is high[42]. The researcher participated in classes prior to her research and observed that she was one of the few students asking questions, asking for more information and acknowledging she did not understand everything and even challenging what the professor tells. Most students also study only the syllabus and do not do more, as the reward system of education is promoting more memorisation rather than critical and creative thinking. Even, a student remarked off-record that an older student is often "more right" than a younger student and chooses for him or her -for example- upon who to vote during the elections of the Student Union.

Seniority limits innovation coming from the youth. "Parents know what is best for their children" belief, as one faculty member called it off-record, translates in a lack of trust among the older people and in a less criticising attitude among the young people. Some interviewed faculty members and staff are aware of this, and are experimenting with their educational methods to foster creativity and critical thinking, and other skills which are more useful than memorising.

[42] The average age of staff is 48 years old and that 20 faculty members (more than 20%) are above 60 years, which is the age of retirement according to Thai law. [45]

4.3.4. Internal factors

Based on the frustrated messages on social media and informally, there is clearly frustration about the current state in AIT, which is a “favorable indicator and factor for change”, but despite this, change happens slowly. Most people (students, staff, faculty etc) with who the researcher communicated through interviews, workshops and off-record, seem to understand the problems, like the environmental impact, health issues, but they do say that they do not have enough resources and/or that they are only responsible for their unit. Some people referred to the president, when the researcher had ideas for the campus, so she had the feeling that he was the sole responsible person for change, or as if all decisions, even minor, should be made by him. It seems that people wait for instructions from him.
The staff and faculty seem also very internal driven; they know what is best for students, and do not integrate them in projects. Some students remarked off-record that AIT staff and faculty are very good in protecting the status quo, and that change happens very, or even too, slowly.

AIT has permanent and temporary staff. They work with a lot of short-term contracts (one month, three months, one year). The HR director noticed that these people work harder than permanent team members who become more bored, which he sees as a problem. He encourages staff to also participate in the short courses in professional management organised by AIT Extension. But the short term contracts also causes stress to people who like to stay longer and often have to wait or work for free when they wait to go again through the same procedure of applying for the job, getting shortlisted and doing interview. [45] The permanent members have more benefits, like vans to and from Bangkok at the beginning and end of office hours, as well discount on the school fee for students in AIT International School. Also temporary staff can enjoy this.

The researcher also reflected on change management in AIT, but did not collect enough data to provide a result for the third research question.

Reflection 36: Do we have to change something if it is good enough?

I helped the SU August '16 with the design of a project. When we discussed how students could make teams, they wanted to adopt the requirement of the last years which stated that different fields should be presented. I discussed for almost one hour to change that in different nationalities. This let me reflect on how difficult it is for them to change "good enough" practices and not take risks, as well the importance of nationality.

Also the president remarked that I have high ideals and that some things are already good for the context in which AIT operates, as a reaction on my call for changing things in AIT. [39]

These two events had some mental effect on me. I asked myself why they said that, if I do/said something wrong. It slowed me and, in the second case, my research down.

Later, I heard from a Belgian (and a philosopher) that driving change is also a "typical christian thing" that I perceive change, experimenting and trying new things, as something "necessary". West-Europeans/christians like to have some sort of final solution, a paradise on earth, and are open for change, but also go for high ideals. In other religions and cultures it is less about finding a solution, but about finding balance and harmony, which often means protecting the statu quo and avoiding conflict. In reflection box 30 I also noted that religion plays a role in sustainable development (and transition management), and that you have to be aware of that, and how it influences you. Even West-Europeans who call themselves atheist, are still influenced by the christian heritage in the west.

For a West-European researcher, it can seem, I realised, that AIT is not changing quickly enough, while in the eyes of an Asian researcher a lot of things are happening in change management.

During the research process it was understood quickly that most insiders of AIT did not hear about circular economy. Interviews had more specific questions on some principles or activities of circular economy that resonated with their background. When a definition was shared, they recognize the principles, but under other concepts.

In March, the researcher conducted some sort of workshop of 4 focus groups of students. At the beginning of the workshop, the students were asked to write on small papers the associations that came up in their mind when they hear circular economy. After the Q&A, they were asked to write again associations to assess the impact of this one hour introduction into circular economy.

The next figure is a visualization of which associations the students made apriori and aposteriori the theory and Q&A. How bigger the word, how more people made this association.

Figure 19. Visualisation of the impact of the theory part of the workshop on "the understanding of circular economy", design by author

Associations made before the workshops

Associations made after the workshop

There is a clear shift from "economy", "business" and "recycle" to "waste", resources", "reducing" and "management". Before the workshop, some students did not know anything about circular economy, and just thought it was going to be very economical, even about international cooperation and assumed things on base of the name. Also, often people who have some basic knowledge, told that they thought it is about waste management and recycling, but -as one student remarked on her paper after the Q&A: "Is recycling a circular economy activity?- recycling, certainly when it is downcycling and when the entropy law in thermodynamics is considered, should be one of the last activities. In a narrow meaning it is not seen as circular economy.

The following table is a result of decoding the associations made a posteriori in categories.

Table 7. Associations CE made by AIT student focus groups

	Category	**Amount**
1	Design, Systems & long term thinking (life cycle thinking?)	10
1	Shift from ownership to use, product to service	10
1	Resource & Waste Management	10
4	Resource efficiency and reduction demand resources	9
4	Sharing, reusing, commons	9
6	Human, societal and environmental health	8
7	Change values, mindset, transition...	7
8	Consumer/purchasing behaviour	5
8	Green technologies (removing pollutants)	5

8	Economical/financial sustainability	5
11	Zero Waste	3
12	Recycling	3
13	Longer lifespan, more durability	2
13	Future generations	2
15	Renewable Energy	1

The discussions and questions and remarks during the workshop were mostly about the shift of owning things to using things, and the Philips circular lighting case study (mostly all groups), the social component of sustainable development (focus group 1) and if circular economy is a pathway for transitioning countries to leapfrog the mistakes of the advanced economies.
Especially the systems thinking and life cycle thinking felt “new” for most of them. [3,9,12,22]

As a professor remarked, mostly focus in the curriculum is on the first half of the life cycle and not so much on the second half of the life cycle. Some students said that they were really overwhelmed by all the theory, the new concepts and ideas in the two hour workshop. Although no economical models and figures were used, some students of SET remarked that this was too economical, or “too new” for them. They were not taught about this sort of “systems and life cycle thinking” before. After the workshop, some participants asked for a follow-up to learn more about circular economy.

Also, circular economy is a long term vision and implies a change in norms and behaviour. As AIT is a system with new insiders entering and old insiders leaving, this requires continuity in re-initiating and re-involving especially new insiders, like the new students. Over-communication and continuous communication are required. This implies a long term strategy and a long term body taking care of this. In interviews with members of AITCSC, top managers and students of the focus groups, a vision on sustainability for AIT, with clear targets, milestones and indicators, was often stated as be one of the first essential steps. The director of OFAM also noted that also instruments, like penalties, and controlling systems, are necessary to take care that the vision and rules are followed. He observed that in the past changes are implemented in regulations and rules, but that they are not followed because they are not controlled enough. [36]

Regarding a supporting body that can drive and maintain sustainability, the students are not suitable, because they are supposed to stay only a limited time in AIT. The researcher noted that the most initiatives she identified as circular economy, like the ones done by AITCSC and SU (campus and environment), the Sustainability Laboratory, the community garden etc. were implemented and maintained on voluntary base.
Khaing (2015) did a composting project with students and staff who reside at the campus. Different persons were asked to do composting. Khaing saw that the students were better in learning how to compost individually, but after her project ended, the staff members continued with the practice and

performed in the end as good as the average student involved in the project. The students who helped in the project were gone. Khaing opted for “group composting projects”.

Another observation is that AIT advocates for interdisciplinarity, which is also a precondition for circular economy thinking. The researcher reflected that due to the lack of (enough) collaboration between the different fields, there are only “interdisciplinary individuals”, but not many “interdisciplinary teams”. An individual cannot know everything. Some students told the researcher were asked to take a more holistic approach, which implies they have to go “beyond their field”, but without support of students or faculty of other fields. This means that students have to invest time in learning new theories from other studies. Especially Master students do not have this luxury. Off record, five students complained to the researcher that they missed help from people of other fields in their PhD/Master research.

One of the working points for AIT is breaking the barriers between fields of studies and to let students and faculty from different fields (and nationalities) collaborate in research projects. Funding goes mostly also to transboundary and transdisciplinary projects. Opportunities are missed, when faculty members applied individually for the same funding and were not successful. This lack of coordination is also not a good external image to donors. [2]
One reason behind this is the reward system, not only in AIT, but in many other HEIs. Faculty for example are rewarded for the number of papers and impact factors, so to obtain that goal, they go mostly for publications in their field, because they know more about this and can use resources within their field. According to one of the staff members, this reward system looking to quantity does not encourage them to publish in multidisciplinary research journals. [37]

Another working point is to optimize the benefits of this international culture, one of the strongest points of AIT. How more open the culture is, how more new people and ideas can enter the ecosystem and integrate, and bring change. Therefore, Joustra et al, also advocated for celebrating diversity. AIT is very proud to be the most international institute according to several rankings, but the researcher observed also indicators of nationalism, between the faculty and the staff, like hate speech, targeting certain nationalities, on social media. In the student community it is interesting to notice how nationality, even more than fields of study, fragment the student community. SU activities, such as the cultural show and sport competitions, divide people into nationalities. Even the political campaigns for the next SU president is very influenced by “the seniors of major nationalities”. The influence of the students on AIT management is dependent on the character of the Student union president. Only the SU president is invited in meetings like Board of Trustees and is the main voice of the students. Also, the SU president makes her team. The only members which are also elected by the AIT students, are the treasurer, secretary general and General Assembly speaker. As the power of the AIT management, this power is very centralized. Intersectionality matters when we analyse participation and decision making. Students do not vote for the most capable candidate, but for “the most political candidate”, meaning that during the campaign the candidates negotiate votes for positions within their SU in exchange of support. For the Student Union president election of August 2016 campaign there was a female muslim candidate against a male candidate. One student who is here for long time, told the researcher off-record that Muslim guys

said publicly that they cannot vote for muslim women, because according to their culture women should not have positions. “But it is fine if she is not Muslim.”
Power structures are very visible, when political campaigns, like the SU election, happen.

All this internal politics demand a lot of energy from the SU (President), which can then not focus on other interactions and projects. There are also recurring activities which have to be presented and the SU President has only one semester to “bring change”, which results in not much time for “new ideas”. The SU President of January 2017 students was perceived, by dozen students who have experienced many different SU president, to be an exceptional leader, with a strong team. They initiated new projects, created more social space and improved existing activities.
An interesting suggestion, opted by students, is to have less change processes (elections), which trigger power struggles, that slow downs change, and give SU longer terms, or to restructure the governance in a way that there are influential long-term student bodies which can drive long term change and establish strong relationships with AIT staff and faculty, which can help them to negotiate. According to some students, this internal fragmentation among students weakens their position to negotiate with AIT. Three students told off-record the story of a student union president, some decades ago, who knew how to mobilize all the students to negotiate for changes with the Board of Trustees and the current AIT president himself. This lead that the Board of Trustees gave a seat to the SU president since then. Also other changes were implemented. This story was validated by this alumni himself, who is now in the top management (and invited by the Board of Trustees, and also thinks that the students do not use their power (enough) to bring change. [27]
A faculty member wrote also that “I think the largest reason why there is no environmentally related activities in AIT is because AIT prohibits political gatherings. They do not encourage or rather prohibit students to express any political statement in public on campus. Not having such culture of expressing opinions in public does deter other types movement-type activities.” [10]

Another working point is (a higher level of) activation of the insiders. AIT is a local oriented organisation. Insiders (staff, students, faculty etc) did not take a lot of responsibility themselves and referred to the president as if he is the only person who can implement change. People recommended the researcher to share with him ideas, or to ask him for permission, like the use of a space. Governance is very centralised, which has advantages to bring quick change, but also risks to let feel other insiders (staff, faculty, students etc) excluded. A dozen of students who have been for a long time in AIT, really applaud off-record the student oriented approach of the previous AIT president, who went regularly to the cafeteria (and also invested in food quality there), organised fora and talked personally with students in the cafeteria and campus.
But even when some leaders create space, it does not mean that others take it. As one student wrote: *“My earlier impression was that maybe AIT does not encourage its students to move in this way (like action research), but I realize now that students do not know that they can be activist or maybe they simply need to be taught about being self-responsible. We talk about entrepreneurship, innovation, and leadership. But do we really practice it?”* [55]

Lastly, circular economy is a long term vision and often presidents (and CEOs in generals) are not long enough to take responsibility for a vision. There is a Board of Trustees, which is responsible for this, but they exist of very high-ranked personalities who do not communicate with most AIT insiders.

Reflection 37: How can leaders create more space for others to become leaders and change agents?

Leadership skills are not only for people with power and authority. In my opinion, every person could be a leader. In a keynote of the International Sustainable Transition Congress 2017 in Gothenburg, Senge also described a leader as someone who crosses the threshold. In change management, this translates into driving change or creating space for others.

To become a leader you have to improve your soft skills (public speaking, communication, networking…) but also be conscious about yourself. Leaders invest their time and attention in relations with themselves (personal mastery), with others (understanding other individuals) and in bigger groups (understanding cultures, gender struggles etc.).

Informal education are therefore important. Mostly knowledge, relationships and personal mastery are build in informal contexts. The European Youth Foundation (of the Council of Europe) invest mostly in non-formal education for these reasons. My own background in an European student organisation let me witness how experiential learning gives students the tools to become more ready for life after graduation than academic learning itself.

As I witnessed a lack of collaboration and training in skills, I initiated informal learning opportunities in AIT, such as the Student-2-Student Sessions, in AIT but also these workshops for the focus groups, comes from this conviction that information learning helps people to master themselves, by becoming more aware of themselves. Senge (1990) would call this discipline “personal mastery”. One progressive AIT insider, who recruited many leader figures in his career, called “personal mastery” also as one of the three prerequisites he looked for in job interviewees. The feedback of the Student-2-Student Sessions which I collected when I left, was all about personal improvement and intercultural understanding. The feedback from the last circular economy workshop gave the students more ideas how to design a product from “waste”.

This brings me to the last research question, how (external) action researchers can facilitate the implementation of (new) circular economy activities.

4.4. Support by Action research

The previous subchapter about leadership brings us to action research and how this can support implementation of new practices, in this case new circular economy practices. In this chapter the researcher will describe what happened to her and her research (by referring to the reflection boxes[43]), and what happened to other insiders. A list of reflection boxes can be found in the beginning of the research. Table 8 categorizes the reflection boxes in different themes. The recurring themes are the impact of the research background on the research and system itself, internal factors like competence management and leadership, behaviour, motivation, culture and communication and space. Business models and social space are also recurring topics of reflections. The categorization helped to understand what the action researcher especially learned during her research journey.

Table 8 : Categorization of the reflection boxes

#	Category	Reflection Boxes
11	Impact of researcher's background on research and system	1, 7, 8, 12, 13, 23, 28, 29, 33, 35, 38
8	Internal factors: Competence management and leadership	16, 22, 24, 26, 27, 28, 33, 37
8	Behaviour, motivation, culture and communication	12, 13, 14, 28, 31, 35, 36, 37
8	Shared space, creating space, social space, collaboration	15, 18, 22, 24, 26, 32, 37, 38
6	Business Models	3, 4, 11, 17, 19, 38
6	Inclusion of poor, social impact, social economy	4, 22, 23, 33, 37, 38
5	Impact of research and system on researcher	10, 20, 25, 29, 35
5	Data collection, processing and validation	2, 6, 9, 10, 25
5	External Factors: Technology, Politics and Religion	13, 18, 21, 34, 36
4	Celebrating diversity, internationalisation and nationalism	5, 24, 32, 35
3	Learning from theory, the past and other universities	2, 13, 30
2	Sharing economy	11, 17
1	Semantics, terminology	4

4.4.1 Mutual learning

Action research is an iterative learning process for the action researcher as well for all the other insiders who come in contact with the action researcher. Her learning process was fuelled with frustration about certain issues, in the campus, like differences in waste management in AIT and her home [R12][44], as well her curiosity to learn more why suggestions of previous were not implemented [R16]. As she realised to involve also other stakeholders, to learn from them, but also help to identify other key agents, root problems and improvements, she created space, and made from them also co-researchers [R06, R08, R18, R22 etc], but she could only do that, as student, because other insiders created space for her. [R37]

[43] The researcher refers to the reflection boxes with square brackets, the letter R and the number. For example [R01].
[44] R refers to the reflection boxes.

There was never one-way traffic or impact. Different reflections were on how the research and system impacted her [R10, R20, R25, R29 etc] and how she influenced AIT in some ways. [R01, R07, R08, R12 etc]. In June 2017, the same external advisor who connected me with the president asked in an email a student about her interaction with me. She replied this (with the researcher in cc):

"I met Wendy in one of her workshop where she talked about circular economy and Green Campus Initiative at AIT. I knew about this initiative through AIT Campus Sustainability Club as a volunteer. Arranging independent informal workshops is not part of the AIT culture and students do not really talk about or share things openly. Either they are scared or they do not just care about the things. By things here it means activities, outputs, outcomes, or process for example, how to make campus better. Many initiatives or activities just stay limited to the group of certain people and not marketed properly (although communicated). In the workshop, we were supposed to discuss about why this initiative failed or in other words is not successful so far. I had many questions for the same since club has not performed any well either. It was when we started looking for answers together. Not that we found answers, we also learned about few positive things on the way to make the campus better. Wendy's thesis also answers some of the questions. Meeting Wendy and understanding her work helped me to get some answers I was looking for but it also brought more questions at the same time. For example, why students are not aware of their rights?
The usefulness of interaction with Wendy as a student at AIT is that I came to know my institute and its management a bit more than I already knew. "

During the period of this research journey, the AIT president made time to listen and answer the researcher's questions. He clearly showed interest in circular economy and shared afterwards ideas. He also accepted the invitation of the researcher to join lunch with student leaders (from the Student Union, the next SU president and the Sustainable Campus Club) [47].

The researcher also learned from this research and the people she met due to this research. During her time in AIT she wrote blogs for a Flemish magazine about circular economy in Thailand. Appendix D gives a list of the eight published blogs. The first blogs were about her frustration about the lack of waste separation [R12] and how separation can improve recycling, industrial symbiosis etc. It was more about technology. The later blogs were about social innovation, the importance of choosing the right education methods to foster sustainable development and other social factors and the difference between recycling and circular economy, and even avoiding praising recycling and smart technologies. The research had also impact on her.

Mutual learning helps if both person create "space" for others [R08, R22, R37] and accept it. The action researcher organised many initiatives, not only around circular economy, but only a small percentage of the students and faculty participated. One faculty mentioned another initiative to connect faculty by providing a space for lunch or coffee, but not all faculty members participated. One reason was that some faculty members preferred to have lunch in their office or at home at the campus.[28] In the January'17

Semester a Facebook group was started for only AIT faculty and staff. Further research is required to understand why students and faculty did not participate in this new spaces.

4.4.2. Learn by doing

During her period as student assistant for the Yunus Center in AIT, the researcher got space from the director to do her thesis and projects, (time, he also provided rooms for her focus groups, and let her facilitate and organise the next networking cocktail on zero waste and design a workshop for Thai undergraduate students where she could also use circular economy principles) as long as she combined it with the mission of YCA. That was not difficult, because its mission is sustainable development and alleviation of poverty. Waste is a societal issue. This work also brought her in contact with the social economy in especially Thailand and with people with actually create value with reducing, reusing and recycling by-products.

Another result was the establishment of a sustainability shop and lifestyle hub in AIT. She discovered that the director had a dream to have a place in AIT, which sells the tools for a more healthy and sustainable lifestyle, and would also a place where people can collect. That also matched with her ideas. She catalysed his dream. A Thai friend of him invested in the idea and also registered the shop[45]. The researcher shared ideas on circular economy and zero waste, and her insights and learning outcomes of her own research. When OFAM offered spaces for rental, she helped with the business proposal for AIT. When she left AIT in May, she heard that the proposal was accepted. During the process of writing in Europe, she was in contact with them and also learned more how circular economy practices are not that inclusive, and that more creative ideas or other business models had to be tested. [R03, R11, R38]

[45] In Thailand, at least one Thai partner is necessary to register officially a business.

Reflection 38: Learn by doing

During the period of writing the report, the shop came into existence. The Thai friend registered also the shop officially. They sell mostly items, like food, drinks, clothes etc from Thai social enterprises and I heard from the others how they tried some circular economy ideas, like selling yoghurt in glass jars (instead of single-use plastic) and told customers they could bring back the glass. They told me they lose money, because they also have to keep the price low for students, and the glass jars are expensive, but not brought back. We discussed about a takeback management, working with deposit, and evaluated later also why that would not work (They tried, and remarked students have no money to pay a deposit of even 1 euro to pay this, so they eat the yoghurt in the place itself). After a month operation, their biggest audience were staff members, who were happy to have healthy alternatives at the campus. To also make it affordable for students, they switched back to plastic package.

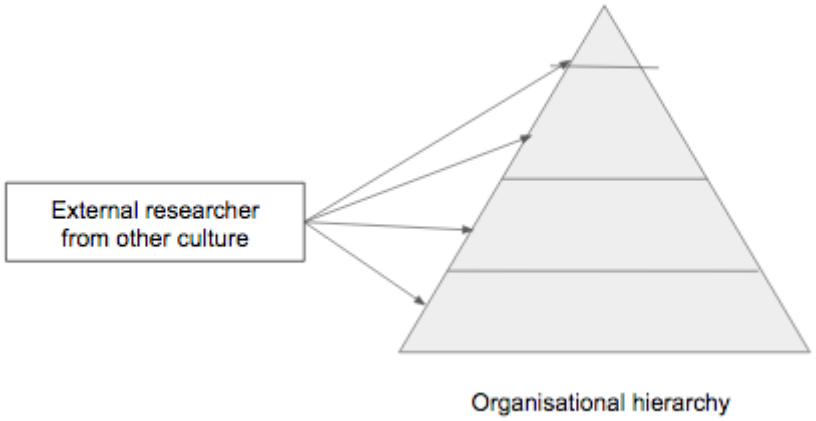
Even if I did not operate the shop, I learned a lot about for example that the audience matters. Working with reusable cups (and letting people pay for the deposit) only work for clients with a certain budget. We could also let them consume the stuff at the place and go for “slow food”, but then the shop needs more space. The shopkeepers are also now working with the relationship with Scraplab/Scrapshop in Kasetsart University that I helped to establish, to sell their upcycled furniture, but also use it for clients to sit and consume at the location. Also, the shop is not making any inventory costs, because it rents spots in the shop for a monthly fee to social entrepreneurs and students to showcase and sell their items. It does not generate extra revenue when it sells these stuff, but it helps to pay the rental of space. This was also only possible due to the rich network of the Yunus Center in AIT.

I helped to set-up a facebook page and some designs:
The facebook page: https://www.facebook.com/ChillChillAIT/

4.4.3. Intersectionality of social identities of the researcher

During a social research process it is also important to be conscious about how others perceive “the researcher”. On base of her initiatives and her social identities they will make constructions of who she is, which could hinder or foster the research journey. Some disagreements happened due to cultural differences, like the events described in [R23, R31], and demotivated her. Age is also a social identity which she knew to bypass, because of her background (not only culture, but also her upbringing [R35]). As the researcher was from another culture, she felt she could move across cultural boundaries. [R14] In Asia there is a strong organisational hierarchy. As an outsider, who could not be placed in the hierarchy in their culture as easy she could break some norms.

Figure 20. Moving across cultures in an organisational hierarchy
Design by author



One student told the researcher that she could probably do this journey, because she was not considered as a threat, because she was only temporary in the system, and a student. An outsider, who also finished her action research, suggested that also her gender could play a role. Especially in a society or organisation -such as AIT- where women are seen as “caring humans who would not harm easily others”, interviewees often open up more to female researchers than male researchers. This all means that this research journey could not be constructed easily, because the intersectionality of all the different social identities has an effect on the data accessibility and the results.

4.4.4. How to involve other students as action researchers

Action research can transform other insiders into co-researchers. Especially the workshops were a good transformation and activation tool. During the four workshops with the focus groups she created time for feedback and also changed her workshop. During the 2 hour workshops, she gave the participating students first a small theory part about circular economy in general and in practice (in other HEIs) with a possibility to let them ask questions (to build some mutual understanding and shared vision) before she let them identify the stakeholders and needs in AIT. She asked them questions and let them reflect and even disengage from the current state, before she let them brainstorm about possible circular economy activities.

She could only do this, because other students were interested, “ready” enough to participate, or they were her friends [R10], or a combination of the factors. She could also only do this, because older people with a higher position gave me space and opportunities. [R26, R37]

One unit director gave the researcher carte blanche to design a 3 day workshop for 20 Thai bachelor students in industrial design, as long as it was about social business. The researcher designed a workshop where the students would follow the same journey as her, but condensed in 3 days. She would let them learn by doing. [R38] The reactions of students was that they got some more insights, started to

see “waste” differently, started to reflect more about problems and needs. As they also had to test out the prototypes between day 2 and 3, they also taught the testing persons some insights. Some students who designed pillows with plastic bags for elder people, told about the positively surprised reactions of old people about the upcycling of plastic waste and also started to reflect about waste. Both workshops (2 hour workshops and 3 day workshops) facilitated learning and inspiration. Appendix A gives a list of ideas generated during workshops and interviews. The workshops provided space for ideas. [R08] The researcher also reflected upon the role of space (social and physical) as an enabler to generate ideas [R18], but the implementation of these ideas was not visible. A reason could be that change requires time. Also, the researcher reflected upon the idea that finding solutions and driving change is more a Western ideal, because she experienced hinder when she tried to interfere in the harmony, the status quo and challenged some existing practices and norms. [R23] She experienced that she could learn a lot by actually interfering and participating in the socio-technological system. [R35]

Action research can have a multiplier effect, if there is space for an effect. In a strong hierarchy as AIT, it was very crucial that some “older” and higher positioned people were supporting this research journey and the workshops. Therefore it is not only about teaching the youth, but also about involving and reflecting with the elders. [R37]

4.4.5. Balancing the insider-outsider role

This was also a continuous reflection on the balance between different roles and relationships. An external action researcher is partly an outsider and can bring new perspectives and can take a step back from the situation, which an insider cannot. An external researcher from another culture, as in this case, can also move across cultural norms as he/she is assumed not to know these cultural norms, but it is not only the cultural identity that guarantees the researcher will also use these access. The intersectionality of the social identities of the action research matter. [R01, R07, R08, R35, etc]

An action researcher is also an insider and can be easily “adopted” by the community. She was even considered as a different sort of stakeholders by one of the focus groups. [R08] As an Insider she could also access easier the already existing knowledge and build from that, but at some point the researcher felt that they saw me as a full insider. The other interviewees will assume that the action researcher “knows already the answers” and start to see her as an expert in circular economy in AIT. [R29] This was also a “signal” for the researcher to leave.

Also, AIT is not a place, for her, that is just about research. It is also her personal space. She made also friends there, lived there, and even worked as student assistant there. The relationships that she developed, not only as “researcher”, but also as a “person” made this whole research more complex. A lot of information, ideas, new questions arose because of informal talks, which were off record. [R10] There was a chance for conflict of interests. She had to separate what is personal from what is for her research.

She tried to be conscious of the complex roles and relationships and also reflected with outsiders, especially her examiners and supervisors in Sweden -over Skype. Summarized, in this research journey she had to navigate complex insider and outsider issues.

5. Discussion

This chapter aims to connect empirical data with practices in other studies and to more general theories and ends with recommendations for AIT, other HEIs and further research. This chapter is also written in the first person, because it includes my opinions, reflections and suggestions.

5.1. Discussion of the results

5.1.1. Can the research be applied to other universities?

My theoretical framework consists mostly of American and European theories about sustainable development, change and learning. A discussion point is if we can assume that these theories can be equally applied to an international organisation in Thailand. In 1980 already, Hofstede published a paper called "Motivation, leadership, and organization: do American theories apply abroad?." and researched the influence of values and norms in cultures on organisational outcomes. (Hofstede et al, 2010). The influence of culture on AIT was difficult, because it is an international organisation in a Thai context, not a Thai organisation in a Thai context. There was a majority of people from other countries in South-East, South-Asia etc.

During this research journey, I touched topics like beliefs, cultural norms, behavior, which are different for each context. I learned more about the Thai context and how it has an influence on an organisation, even if it is international, by living and doing research in Thailand, but also because I could compare with HEIs in other countries like Chile, Argentina, Sweden and my own home country Belgium.

The results for research question 1 (other HEIs) and research questions 2 and 3 (AIT) had many similarities. Some themes recurred in both subsections, like leadership, competence, social impact, collaborations and partnerships etc.

Regarding external factors, the key persons in the other universities talked about saving costs. Ghisellini et al (2015), pointed out that transitioning countries, like Thailand, are not motivated to look into saving costs, because of their orientation towards economic growth. The key persons in National University of Quilmes also noted that the factors against circular economy are the drive to reduce costs (especially labor costs) and not optimize processes. The key person in the University of Chile also told that Chile started to look into renewable energy and waste programs after the market was ready i.e. the costs of installing renewable energy technologies was low enough.

Regarding internal factors, a vision from top down is not always necessary. The University of Chile did not start from top-down like Chalmers University of Technology and Kasetsart University, but was started from bottom-up and ended in an office for sustainability, reports and institute-wide actions. AIT could follow the same path. AIT has also bottom-up activities, but they did not blossom (yet) to the top. The political context of both universities are also different. In the last years, citizens and students in Chile are activated to come up for rights and change in Chile. That culture is not present in Thailand. Also the integration of the social/informal recycling sector was a recurring factor in especially the universities in “global south”

that could enable or hinder recycling programs and projects. External factors matter, in influencing the internal factors, but it is not a matter of having enough resources or the right technologies in the country. University of Chile is using creativity and their connections (social collateral) as resources to do projects and programs, even without money.

5.1.2. Intersectionality and other limitations in action research

Power structures at different levels, in different groups of stakeholders, became visible in times of change, like for example the election period for the next Student Union president. Also Nadler and Tushman (1997) noted power as one of the three problems in transition. As I was also trying to bring change, I also felt some power struggles. I reflected also on the factors that enabled me or hindered access to data and am very aware that the intersectionality of different social identities, such as my nationality, my age, gender, and also my experience influenced the action research in such a way that it is difficult to reconstruct my research by researchers who have even only “one different social identity”. [R01, R23]

Also time is an important factor. Change and seeing the impact takes a lot of time. Also the key person of the University of Chile pointed this out that change takes time, but time is a scarce resource. For me it was also really difficult to assess the change and impact. I could measure some small impact in short-term, but in circular economy short-term does not really matter. I felt that especially my research question how action research can facilitate implementation of new circular economy activities was difficult to answer, because of the short time of my stay. Some students said that I was a change maker, or wrote my name separately in the stakeholder map of circular economy in AIT [R09], but the long term impact can disappear when these students also graduate. Some of them graduate now. For me it was therefore also important to involve students who would stick around for one year in AIT, or the Student Union, or employees and faculty. Nadler and Tushman (1997) also recommended to have evaluation tools to assess the change and collect feedback from insiders, but on short term you cannot evaluate change and impact. On the other hand, by diving into history, lessons could be learned about the impact of past and still ongoing projects and programs, such as the importance of integrating the local social phenomenon, like the informal recyclers [R04], and that projects based on voluntary services will stop eventually and do not create much economic value, so the business model has to be designed differently. [R03]
Another note regarding time is that circular economy at micro-level requires a long term body guarding it. Alänge and Steiber (2009) researched the importance of Boards in large scale change processes such as sustainability matters, because boards are long term bodies, while CEOs, presidents etc. have not enough time to implement long term changes. Long term thinking is key.

5.1.3. Selecting co-researchers in this action research

I delimited the research through the selection of stakeholders in my action research and also by not selecting certain stakeholders. (see Subsection 1.5. Limitations and Delimitations). Persons of the main stakeholder groups were involved: staff, top management, faculty and students (and especially SU members). Only the Board of Trustees seemed to be a group. These are also high-level persons

(ambassadors) which felt too far from me, but later I discovered I could have reached them through the network that I built. The network I built during my 10 months in AIT also had an impact on who I selected, and could select, to be my interviewees, participants in focus groups etc, and be my co-researchers. The action research was delimited but also in the same time enriched by my own networking skills, and a bit of luck.

One of the most important stakeholders that I did not include, were the leaders of the religious associations in AIT. Too late in the research process I reflected how important and how interwoven, spirituality and religion is in the life of people in AIT. [R34] Spiritual leaders have a high impact on behaviour, participation and beliefs of many people outside West-Europe. It would have been interesting to have involved them in a workshop, to think together and co-design circular economy projects for AIT, which could be supported by the religion associations.

Another important group stakeholder that I could have included is the social economy (entrepreneurs, cooperatives etc) in Bangkok.

5.1.4. The Integration of the Social/Informal Economy

The key persons in the National University of Quilmes (Argentina), the University of Chile, and Kasetsart University (Thailand) all talked about the social economy, and how especially recycling creates jobs and money for poor people. The first also stated that there was a lack of research about how to integrate the social dimension of sustainable development and design circular economy solutions for the poor. I observed that people in Thailand and insiders in AIT recognize the practices which are given as examples of circular economy, and can give examples in the social economy and how poor people are getting a little bit money of it, so that could imply that research exists, but under a different name. The key persons in the National University of Quilmes also told that they had a framework which was similar to circular economy, before they got to know the concept of circular economy.

My student assistant job for the Yunus Center in AIT helped me to learn more about the social economy in Thailand, and especially Bangkok. I also was the facilitator during the networking event on “reaching zero waste through social business” where I got in contact with social entrepreneurs, consultants and activists in Bangkok. The social economy has expertise in business models around waste which could be interesting for the circular economy.

I also got the space to marry social economy and circular economy in a 3 day workshop for Thai undergraduate students in April, where I had to explain also the social business model canvas. This let me realize how useful this already existing ideas are for circular business models. I read about Lewandowki’s business model for circular economy, and saw many similarities with the social business model canvas I was explaining during this workshop. AIT and other HEIs could find many opportunities in identifying the right business model for “sustainable practices” and get inspiration in the local social economy, and work together with social entrepreneurs. [R04, R22] If I had more time I would focus more on this and integrate social entrepreneurs in AIT. YCA, and also AIT Solutions, would be great platforms

to introduce collaborations between social enterprises and AIT to generate more value and in the meantime design win-win situations for both. The sustainability shop and lifestyle hub established in summer 2017 in AIT, is a result of this idea. The shop has also the vision to co-evolve, adapt to the needs and try new things. Further research would follow this shop, which impact it has on the students and other insiders in AIT, and also on local social enterprises and local society, but also why which business models work and not work, taking into account the social dimension. The key person in Chalmers University of Technology also said that circular economy practices did not work, because of the wrong business model. Planing (2015) also noted the importance of business models, but did not go into social business model canvas. Lewandowski (2017) also recommended to apply the circular business model on other sectors, but did not start from social businesses. Murray et al (2015) mentioned that the social component in circular economy is missing. Some practitioners call for a social circular economy which also designs out poverty and other social problems. I believe this should not only be part of circular economy in developing countries as Thailand, Chile and Argentina, but also in Sweden and Belgium, where there are also social problems. In fact, I also reflected that there are poor people in countries as Belgium who are doing more circular practices than middle class and high class people. It would be interesting to integrate them and their ideas, and even learn from them and co-design solutions that design out poverty, famine and other societal problems. [R04, R22]

An observation about myself is that in the beginning of the research I was more interested in the technologies and engineering applications [R12, R13], but in the end of the research got more interested in the learning opportunities that social economy, less privileged people (and even religion leaders [R04, R22, R34]) can deliver, not only in developing countries, but also in developed countries [R04]. I believe it is important to see what is already there, learn from the past, and see how to co-design better working and living environments for the less privileged. Informal recycling is circular, but it still keeps people in poverty and is not healthy. That means that we also have to be aware of (the intersectionality) of social identities and power structures, that could be threatened (see above).

5.1.5. Creating Space to open minds

A prior the research the researcher had already created informal social space (Student 2 Student Sessions) and the focus groups, the design workshop for Thai student, the lunch meeting with different stakeholders, the validation workshop etc were all spaces connecting people and ideas. She also got do this, because older people with higher positions granted her space. [R37] In the end, she catalysed the beginning of a project that will ais to provide more social and physical space for insiders and visitors in AIT to learn from each other, to learn about sustainability, to learn about circular economy and social impact. [R35] As a geographer, and due to my participation in other platforms aiming to remove boundaries between people I want to acknowledge the importance of creating space that generate solidarity, spaces that lowers social segregation. At Chalmers University of Technology, the Challenge Lab is also such a space that connects researchers and society. At National University of Quilmes, they also talk about the importance of integrating society, about creating space. The key person of the University of Chile expressed how important “internationalisation” is for her, because it brings new ideas

that can challenge and evaluate old systems and help to co-evolve with the global society, even new perspectives that not all resources are infinite. Minds have to be opened. Joustra et al (2013) would refer to the essential skill of celebrating diversity. I also like to connect this with Senge's discipline of personal mastery. A person will only open his mind if he knows his mind. In further research I would like to discuss more how practice of mindfulness in education and a more realistic worldview are connected. Also, I believe that HEIs are great platforms for connecting industry, governments and society to foster change. HEIs are centers that can create space for innovation in sustainable development.

5.1.6. The circular economy needs a new education system

Circular economy is a new economy and asks for new way how education is done. Currently, when I look at AIT and other higher education institutes, I see that education are locked in a linear economy. It is not enough to only provide "the option" to learn sustainable development or circular economy as a Master, a module or a course, but it should be integrated in every study programme. For example, if structural and civil engineers do not understand the importance of circular economy and still believe that all resources are infinite, they will not design out waste. As long as "others" see circular economy and sustainable development as responsibility of the ones who study sustainable development, circular economy, industrial ecology, biomimicry or similar then the change will be slow and incremental. The world is constantly changing. Education should prepare the youth for the common world, for life after graduation, and give them tools to solve the next challenges and renew this common world. Even in 1961, Hannah Arendt already wrote it in her essay "The Crisis of Education" :

"Education is the point at which we decide whether we love the world enough to assume responsibility for it and by the same token save it from that ruin which, except for renewal, except for the coming of the new and young, would be inevitable. And education, too, is where we decide whether we love our children enough not to expel them from our world and leave them to their own devices, nor to strike from their hands their chance of undertaking something new, something unforeseen by us, but to prepare them in advance for the task of renewing a common world."

5.2. Recommendations for AIT (and other HEIs)

AIT has very strong points, like its international aspect, the presence of regional experts, its rich network with international organisations, companies (through its alumni) etc., hosts the Yunus Center, which is seen as a platform for social enterprises in Thailand, etc, has already implemented successful projects in sustainability (education, research, internal environment).

The following recommendations are built on these strong points.

5.2.1. General: for internal environment, education and research

One of the first recommendations for AIT and other HEIs is to invest in the understanding of circular economy as a vision: what is it, why is it needed and especially how can it be applied. Senge (1990) also mentioned "a shared vision" as a discipline of a learning organisation, because it helps to give everyone direction.

Instead of following a single leader, who does not last forever, as Alänge and Steiber (2009) pointed out, a vision, if guarded by a Board or another long term body, can last much longer. In AIT, practices and projects are mostly implemented as a result of short term planning, which implies that seeing circular economy as a long term vision is more difficult to grasp for the insiders than just focusing on single, isolated “circular economy projects”. Also, for change to be strategic (long term and sustainable), it should encompass the whole organisation - not only individuals or small teams, as in AIT. Two main reasons why activities identified as circular economy stopped or failed, because they were considered to be the responsibility of individuals or groups of individuals and because AIT is a promoter of projects and activities rather than long term programmes.

A second working point is the mutual understanding of the concept of circular economy. Murray et al (2015) also pointed out that the semantics are often misunderstood. Cash et al (2003) said that translation is important for boundary management to accelerate transformation.
During the research process, it was observed that most people, even after the explanation, associate circular economy with recycling or waste management, while this is one of the less favored practices in a circular economy. As Ghisellini and her colleagues pointed out: “It is important to mention that the benefits from recycling of materials tend to decrease until a cut-off point is reached where recycling could be environmentally or economically too expensive to provide a net benefit.” (Ghisellini et al, 2015). During the research I had to make a figure (figure 3) that helped to understand the difference between especially a recycling and a circular economy, so communication and especially translation are key. As both Cash et al (2013) and Tushman and Nadler (1997) emphasize, knowledge management is key for sustainable development. As circular economy thinking is based on a new mindset and a view where resources are seen as finite and waste as a resource, and based on changing the way how production processes are done, it is required to over-communicate what circular economy means.
You can only bring change if the other insiders are also motivated to learn and improve the organisation. When I look to the education in AIT, I observed that some students are also not aware of global and local trends and problems, or do not give much value to it, and again, push the responsibility to people in other fields, or even countries, to people disconnected from them.

To motivate them, to let them feel responsible, as Nadler and Tushman (1997) suggest, it is good to have a dialogue with other insiders about the current state. They even advise to not give them the information, but let them research themselves or reflect about the issues. It is also advised by capacity builders, such as Kaplan (2000) to not present them the answers, but ask them the right questions and co-design the solutions. More people start to enter into a genuine thinking together, which Senge (1990) would call “team learning”. To motivate people (even more) to go for circular economy, it could be advised to dig into the needs and problems in their surrounding. Again, if leaders want to identify these needs and problems on which they want to develop circular economy practices, they have to take care there is inclusive, two-way continuous communication, translation and even mediation. Knowledge systems are key to

sustainable development and building circular economy, where communication, translation and mediation can break or make an organization. (after Cash et al, 2013)

Last but not least, AIT aims to integrate sustainable development in each course. Also Chalmers University of Technology has the same goal and is investing in the training of faculty how to integrate sustainable development in their courses. Stimulating especially faculty and providing consultancy or sources how to integrate systems thinking etc in their courses could also be a recommendation for AIT and other HEIs.

5.2.2. Recommendations for improving the internal environment

I observed that most research was already done about different issues in the campus, even multiple times, but the recommendations were not implemented, or the knowledge from this research was not known by other people. Also other insiders pointed out the individualist culture or fragmented study and work environment in AIT, which hinder knowledge transfer. As Senge also pointed out, a learning organisation understands the benefit of seeing interrelationships, rather than things, and seeing wholeness. This system thinking is missing in the campus and often also in the curriculum. Not only integrated knowledge management, but also circular economy requires systems thinking (EMF 2017, Joustra et al, 2013). If there are no relations, there is no knowledge transfer, no collaboration and no circular economy. Also, when we look to other organisations, the UN also acknowledge the importance of partnerships, dialogues and relations in their last Sustainable Development Goal. It is important that everyone feels responsible in this change, but first has to taken care that everyone is connected, so everyone can participate. Creating and providing space (physical and social) and going against social segregation are key to transition and sustainable development.

Circular economy calls also for a certain behaviour, norms and images, from consumers and producers. Senge (1990) defines mental images that employees (producers) can have, as deeply ingrained assumptions that influence how we understand the world and how we take action. Even if we optimize a system, customer irrationality can lead to the rebound effect. Also irrational behaviour in the producer could hinder the implementation of circular economy practices in its organisation. Also power structures, as different people pointed out, can hinder (or enable) the implementation, or certain norms. Senge pointed out that if leaders do not understand the underlying norms and power structures in their organisation than their decisions cannot reach the desired effect. It is therefore recommended that leader “go native” and interact with different kinds of insiders and also try to look at the current state from their perspective.

Apart from understanding behavior by interacting, interaction can also help to change behaviour. Nadler and Tushman (1997) talk about behavioural change in employees, and how leaders can show the example of a desired behaviour or break a norm. As an informal student leader, I also broke some norms, by talking with people higher in the hierarchy. In behavioral economics they talk also about social norm campaigns to change the behaviour of customers. The risk of such campaigns is that responsibility is

often imposed on the customers who have to change their behaviour. AIT did a food waste campaign and conducted social norm campaigns. The results of the impact are not published yet, but it was interesting to see that they focus only on the students and other residents, but these campaigns do not address the real root causes of food waste in AIT, i.e. the perceived lack of quality of food in the student cafeteria, the size of portions and plates, the presence of trays, the fact that AIT residents do not have to pay for the food they waste etc. An idea is to transform the business model of the cafeteria where students, staff, faculty and visitors pay money for a buffet, but pay extra for all the food they waste (f.e. 10 baht for 10 gram waste). This business model has to be evaluated by and co-designed with the food vendors, OFAM and representatives of the clients etc to see how this can work practically, what would be the pricing etc. to increase the chances for success. It is important that the different stakeholders are involved. This brings me to the next working point for AIT.

Another working point is the continuous two-way communication. When you invest in behavioural change for example, this should be a continuous process, because there is always this inflow of new people. The problem of some projects, like the Trash-for-Cash-project illustrates well that you can only sustain practices and behaviour if the communication is continuous. Also inclusive communication is important to increase the participation of other stakeholders. A recommendation is to create more platforms for students, but also agents of local social enterprises, cooperatives … how to design win-win situations for everyone.

5.2.3. Recommendations for education

An institute-wide course on sustainability for everyone is suggested by some insiders in AIT, as well is reality in other higher education institutes as Chalmers University of Technology. It would guarantee that every student has learned about sustainability.

It could go one step further. At Chalmers University of Technology, there is the Challenge Lab, where a number of students do action research. I would recommend to go even further. A suggestion could be to involve fresh students, staff and faculty in a re-designing practice when they enter the AIT system. The idea to install an institute wide course on sustainable development could be a platform for students, and even staff and faculty -as part of their training - to address an issue in AIT, design and test a solution, but also -synchronously- foster dialogues between the newcomers and the ones who are already there for a long time, to reflect on the already existing practices and structures, and how to build from this knowledge.

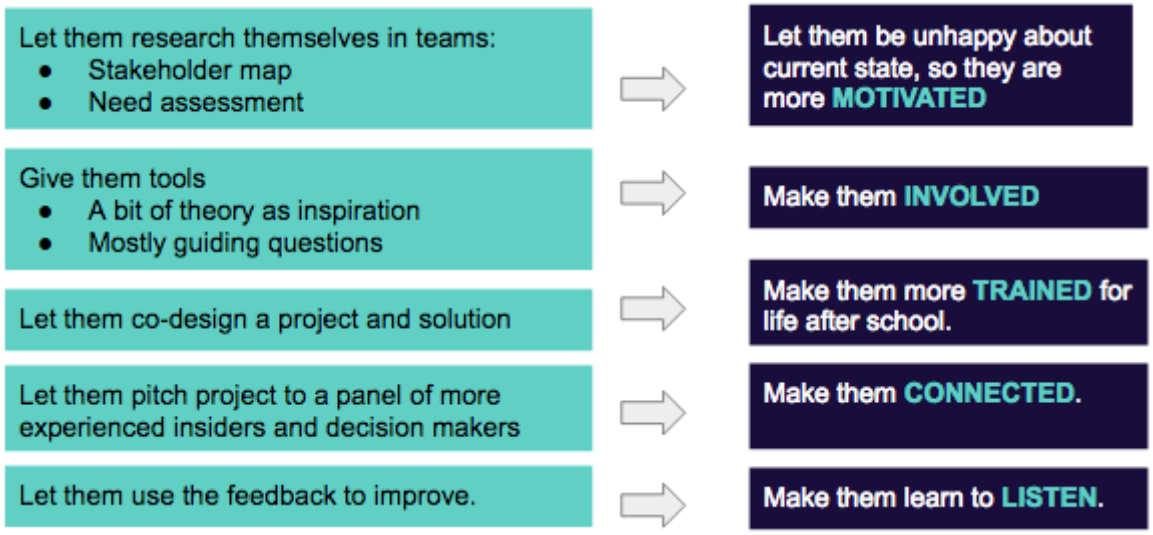
After letting other insiders understand the system, the structures, the history and core problems, and giving them a platform to learn this and co-create solutions, it is also important to give them the tools. Already by letting them research themselves the issues and current state and co-design solutions, you help other insiders to sharpen their skills. You let them learn by doing. Even Joustra et al (2013), who made a whole list of essential skills for circular economy project teams, point out the importance of skills, rather than knowledge. Non-formal education is beneficial, but formal education is also essential. Based

on workshops I gave, I designed a course which exists of different steps, which do not have to happen after each other, but can happen synchronously:

i. Let students research themselves in teams who are the stakeholders and what are the issues. Give some guidance if needed. Let them be unhappy about the current state. This frustration will help them to become more motivated
ii. Give them tools to transform the frustration into creation. A bit of theory as inspiration, guiding questions, skill trainings could help in this phase. Let them feel involved.
iii. Let them co-design a project and solution in a team. This helps them to feel motivated, involved as well trains them for life after graduation.
iv. Let them pitch the project to a panel of more experienced insiders and decision makers. Take care of some cross-fertilization. Let the students learn more about the history, and identify root problems.
v. Give training in receiving (and giving) constructive feedback and let them be critical about the feedback and integrate the selected feedback.

The next figures gives a graphical explanation:

Figure 21. Proposal course design "circular economy and your campus"



This course has to be tested and evaluated, but the 3 day workshop followed the same structure. Appendix B displays also ideas that resulted out from such design thinking workshops.

6. Conclusions

Global and local problems such as material scarcity, climate change, pollution of water, air and land call for change towards sustainability. Different practitioners and scholars mention circular economy as a new vision of the economy to deal with these problems. Circular economy is an economy where waste and pollution are designed out and where materials and products are kept as long as possible in the loop. The different practices can be grouped under Regenerate, Sharing, Optimization, keeping in the Loop, Virtualize and Exchange (after the RESOLVE framework). As dissemination is important for especially diffusion, D of Disseminate is added. The departure point is to see circular economy as a vision, an end goal, a future state, for any organisation, and that a future state should not be designed alone. Implementation of new circular economy practices is described in terms of a transition, where an organisation moves from a current state towards a future state.

Higher Education Institutes (HEIs) play an important role in this development towards a circular economy. They can adopt their curriculum and research, by integrating life cycle and systems thinking, raising awareness about global and local problems and trends etc. They can also educate by demonstrating in the campus and organisation how circular economy principles can be implemented in practice. Examples of circular economy in selected universities were collected and categorised according to the RESOLVE framework of EMF. Key persons of universities in Sweden, Thailand, Argentina and Chile were interviewed about hindering and enabling factors. The recurring themes of the interviews were the importance of integrating the social dimension, the collaboration with social economy, local society, government and industries, in designing solutions, identifying roots of problems and resources, the management of the internal environment etc.

In the second section, the current state of AIT from a circular economy perspective is described: the stakeholders are identified, activities are identified and described according to the RESOLVE frameworks, the history and root problems of effects in the current state were described and analysed. The current state itself is also a result of certain decisions taken in the past, which can be defined as the time before the current state. The main factors were internal: low degree of internal collaboration, lack of continuous communication, motivation, leadership, lack of long term vision etc. Also external factors (political, economical, social, technological) play a role especially in the speed and momentum of the implementation, but the internal factors determine how the insiders work with these external factors.

This whole action research journey was a continuous reflection on the balance between different roles and relationships. An insider/outsider action researcher is partly an outsider and can bring new perspectives and can take a step back from the situation, which an insider cannot. An external researcher from another culture, as in this case, can also move across cultural norms as he/she is assumed not to know these cultural norms, but also other factors played a role in why she took this privilege. Intersectionality of social identities matters.

An action researcher is also an insider and can be easily “adopted” by the community. An insider has already knowledge about the existing structures and can access easier the already existing knowledge and build from that, but when the action researcher is often seen as a full insider, the other interviewees will assume that the action researcher “knows already the answers” and maybe even more. Therefore it was important to also leave the system.

The impact of this action research was that not only that the action researcher learned more about AIT, circular economy, transition and change management, but that she also made from other insiders co-researchers along and after her journey. She created space for others, which also could happen because others created space for her. Long term change and transition needs time and space. Therefore the recommendations are to have a long term body with a long term vision, and platforms, spaces, where transition can foster.
For education specific, a first recommendation is to have compulsory institute-wide courses, integrate this in many courses as possible, by investing also in the competence of the faculty.
More research should be done on the inclusivity in circular economy, what circular economy can learn from the already present social economy (and its successful business models) and how education institutes could play a role in building this platforms.

A final conclusion is that space and the celebration of diversity can facilitate the implementation of new circular economy practices which are even inclusive. This space has not be created by an action researcher, but could be created by any leader in the system.

7. References

The following references refer to papers in journals, or (chapters in) books. During this research, also websites were used. The references to websites can be found in the footnotes (URL + date on which the website is accessed). The list of interviews (primary date) can be found in Appendix C.

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8. Appendices

Appendix A: List of Ideas for Circular Economy in AIT

These ideas are from students, top management, staff and faculty:

Ideas	**Follow Up**
Develop a big roadmap and vision	Top management is already working on this during the thesis.
Install an institute wide course.	Top management is already working on this during the thesis.
Organise student-for-student workshops about sustainability.	In June, Student Union said to organize biweekly sessions about sustainability, inspired by student 2 student sessions
Improve internet.	Student Union started a survey in June ‘17.
Have shared facilities for cooking.	OFAM told that the new student accommodation will have a first shared kitchen.
Re-use grey water for sanitation	N.A.
Ban Plastic Bag.	Student Union and AITSCS were working on a new survey.
Expand Community Farm.	N.A.
Open a Sustainable Lifestyle Shop and Cafe.	In July they are renovating one of the empty shops in a community space which would sell tools for zero waste etc.
Make the pedestrian roads more comfortable, work with shadows, so people will use less cars in the campus	N.A.
Car-free campus	N.A.
Reuse shipping containers as accommodation	N.A.
Put all food vendors in on space, and make the space as resource efficient	N.A.
Have a space where people can donate stuff they do not need anymore	N.A.
A design lab where students can experiment with plastic waste	In end of May, the iLab opened. There are 3D printers etc. which students can use

The 4 teams of the last workshop designed pillows for elder people from plastic bags, water filters from ice cups, toys for poor children from and accessories from plastic bottles.

Appendix B. Schools, departments and fields in AIT

The departments would start in the August 2017 Semester.

School of Engineering & Technology (SET)

Civil & Infrastructure Engineering

- CEIM: Construction, Engineering and Infrastructure Management
- GTE: Geotechnical and Earth Resource Engineering
- OTM: Offshore technology and management
- STE: Structural Engineering
- TRE: Transport Engineering
- WEM: Water engineering & management
- DPMM: Disaster Preparedness, Mitigation and Management
- UWEM : Urban Water engineering and management

Information & Communication Technologies

- CS: Computer Science
- IM: Information Management
- ICT: Information & Communication Technology
- TC: Telecommunication
- RSGIS: Remote Sensing and GIS

Industrial Systems Engineering

- ME: Mechanotronics
- MES: Micro-electronics and embedded systems
- IME: Industrial and Manufacturing Engineering
- Nanotechnology

School of Environment, Resources and Development (SERD)

Food, Agriculture & Bioresources

- ABM: Agri-Business Management
- ASE: Agricultural systems & engineering
- AARM: Aquaculture and Aquatic Resources Management
- FEBT: Food Engineering and Bioprocessing Technology
- UG: Undergraduate (will be annulled)

Energy, Environment & Climate Change

- Energy
- EEM: Environmental Engineering and Management
- CCSD: Climate Change & Sustainable Development
- EB: Energy Business

Development & Sustainability

- GDS: Gender & Development Studies
- NRM: Natural Resource Management
- RRDP: Regional and Rural Development Planning

UEM: Urban Environment Management

School of Management

New Dean arrived in August 2016 and there is ongoing transformation process

Appendix C: List of Interviews, Focus Groups and other Events

C.1. Other HEIs (Research question 1)

R: audio recorded

	Name	HEI	Role	Date	Length	R
A	Dr Ulrika Lundqvist	Chalmers University Technology, Sweden	Education of Sustainability	25.08.17	1h20	Y
B	Roongtip Luilao	Kasetsart University, Thailand	Director business & designer, Scrap Lab, Architecture Faculty	31.08.17	2h	Y
C	Claudia Mac-lean	University of Chile, Chile	Director Office Sustainability	05.09.17	45min	Y
D	Sebastian Carenzo & Lukas Becerro	National Universit of Quilmes, Argentina	Senior Researchers	05.09.17	1h20	N

C.2. AIT (Research question 2-3)

R= Recorded audio, PO= paper outputs, S: secondary data outputs

	Date	**Event**	**Persons**	**Length**	**R**	**PO**	**S**
1	24.01	Informal talk	1st vice president	1h	N	N	N
2	25.01	Informal talk with request for quantitative data	1st Research staff member	45min	N	N	Y
3	01.02	Focus Group 1	8 (male) students	2h	N	Y	N
4	02.02	Informal talk	1st Faculty member, former dean, AITCSC founder	30min	N	N	N
5	04.02	Interview	Manager of one of assets	45min	N	N	N
6	05.02	Informal talk	SU member	20 min	N	N	N
7	09.02	Received email	President	x	N	Y	Y
8	09.02	Focus Group 2	8 (female) students	2 h	N	Y	Y
9	10.02	Informal talk	AIT PhD student (Circular Economy in Thailand)	1h30	N	N	Y
10	13.02	Email communication	2nd and 3rd faculty members		N	Y	Y

11	16.02	Informal talk	SU member	20 min	N	N	Y
12	16.02	Focus Group 3	6 (Thai) students	2hours	N	Y	Y
13	18.02	Facebook communication	President	x	N	Y	Y
14	19.02	Informal talk	2nd Staff member, also doing research about AIT	1hour	N	N	Y
15	20.02	Informal talk	PhD student, part of focus group 1	1hour	N	N	Y
16	21.02	Received Email	Staff, Same as (2)	x	N	Y	Y
17	21.02	Received Email	A Vice Dean	x	N	Y	N
18	23.02	Informal talk	President	10 min	N	N	Y
19	23.02	Informal talk	Student (also Master thesis Sustainability in AIT)	45min	N	N	Y
20	23.02	Received email	Vice-Dean School	x	N	Y	N
21	01.03	Received email	President	x	N	Y	Y
22	02.03	Focus Group 4	12 students	2hours	N	Y	Y
23	03.03	Informal meeting	2nd vice president	15 min	N	N	Y
24	08.03	Semi-structured interview	4th Faculty	54min	Y	N	N
25	08.03	Open forum	Students	2hours	N	N	Y
26	09.03	Informal talk	Student, same as (18)	30 min	N	N	Y
27	09.03	Informal talk	Vice president, Same as (1)	1hour	N	N	Y
28	14.03	Semi-structured Interview	5th Faculty	1h10min	Y	N	N
29	15.03	Networking platform	AIT students, staff and outsiders	3hours	N	N	Y
30	17.03	Lecture & questions	President	45 min	N	N	N
31	17.03	Visit	AIT'S Community farmers	1h30	N	N	Y
32	21.03	Received email	3rd Staff (focus entrepreneurship)	x	N	Y	N
33	29.03	Received email	6th Faculty	x	x	Y	Y
34	01.04	Informal chat	Master student (research CE in Myanmar)	1h30	N	N	N
35	03.04	Visit	students	2h	N	N	Y
36	19.04	Semi-Structured Interview	Director OFAM	1h40	Y	N	Y
37	20.04	Not Structured Interview	Vice president, same as (1)	1h	Y	N	N
38	20.04	Informal talk	Student, same as (18)	20min	N	N	N
39	20.04	Received email	President	x	N	Y	N
40	21.04	Meeting	AIT CSC	1h30	N	N	Y

41	21.04	Received Email	4th staff (higher position)	x	N	Y	Y
42	24.04	Facebook messages and email (Water Issue)	Students, staff	x	N	Y	N
43	24.04	Semi-Structured Interview	2nd Director Service Center	1h30	Y	N	Y
44	24.04	Meeting	AIT CSC	45 min	N	N	Y
45	28.04	Semi-structured Interview	3rd Director Service Center	1h30	Y	N	N
46	28.04	Received email	Staff, Research, former AIT CSC member	x	N	Y	Y
47	28.04	Informal meeting	President, 2 directors, (next) SU and AIT CSC members	1h30	N	N	N
48	29.04	Semi-structured Interview	7th Faculty	1h30	Y	N	N
49	30.04	Received email	8th Faculty	x	N	Y	N
50	01.05	Informal meeting	Students: current AITCSC (including staff) and SU members, and 1 staff member	1h30	N	N	Y

Appendix D: Titles of my published blogs at Mo*

Mo* is a Flemish magazine on globalization. I wrote blogs which got published online, during my time in AIT and Chalmers. These blogs are accessible at http://www.mo.be/auteur/wendy-wuyts

	Date	Original Title	Translated title
1	29.08.16	Slalommen tussen de stereotypes van Thailand	Slaloming between the stereotypes of Thailand
2	26.09.16	Oh moeder, waarom sorteren wij?	O mother, why do we separate (waste)?
3	21.10.16	Gelukkig Bhutan en de circulaire economy	Happy Bhutan and the circular economy
4	25.10.16	De Thaise koning is dood, wat nu?	The Thai king is dead, what now?
5	19.12.16	Hoe maak je jonge, verantwoordelijke wereldburgers?	How do you prepare young, responsible global citizens?
6	26.01.17	Van een Thaise vuilnisbelt naar Japanse vuilnisbakken	From a Thai landfill to Japanese bins
7	07.03.17	50 Shades of Smile in Thailand	50 Shades of Smile in Thailand
8	25.06.17	Meester, hoe breng je verandering in onderwijs (over circulaire economie)?	Professor, how do you bring change in education (about circular economy)?

Appendix E: Questions for interviews

1. Can you please provide some information about your background?
2. What does “circular economy” mean to you?
3. Going on from what you answered above, do you think Circular Economy can be/should be integrated into teaching/research/operations in your university?
4. What are the strengths and weaknesses of your university to accelerate circular economy in your city, country and/or region?
5. What are external factors (political, economical, socio-cultural and technological) factors enabling or hindering the transition towards a more circular university?
6. Can you identify other stakeholders (within university and in local contect) which takes an important role in the sustainability transition of your university?
7. How would you evaluate the current activities your university do, in terms of eliminating waste, and recovering value from materials and regenerating products (this can be in regards to research, operations, or teaching)
8. Can you give one example of a practice in your university for each category? (after EMF’s RESOLVE framework)
    1. Regenerate: signifies the shift to renewable energy and materials?
    2. Share: actions aim at maximizing utilization of products by sharing them among users
    3. Optimize: actions are focused on increasing the performance/efficiency of a product and removing waste in the production process and in the supply chain.
    4. Loop: actions aim at keeping components and materials in closed loops?
    5. Virtualize: actions assume to deliver particular utility virtually instead of materially
    6. Exchange: actions are focused on replacing old materials with advanced non-renewable materials and/or with applying new technologies (e.g., 3D printing)?
9. How would you evaluate the current communication and knowledge management your university do, to accelerate circular economy in the university?
10. What are strategic and operational plans for the university regarding circular economy?
11. What is implemented of these visions aforementioned, and why?
12. What is not implemented (yet) and why not?
13. Are you aware of any similar initiatives being carried out in the past in your university? And so yes, why did they not continue in the presence?
14. Is there something else you would like to share about the topic?

Appendix F: Pioneering and Networking Universities in EMF Network

Region	Pioneering Universities	Networking & Partner Universities
Continental Europe	The Technical University of Delft	* Johannes Kepler University (JKU) Linz * Universiteit Gent * Rotterdam Erasmus University * Skema Business School * TU Berlin * MIP (Milano)
UK	* Cranfield University * University of Bradford * University College London (UCL)	* Bangor University * Loughborough University * Northumbria University * University of Sheffield * University of Strathclyde * Worcester Processing Institute * University of Edinburgh
Latin-America	University of Sao Paulo (USP)	* Universidad de Chile * Universidad Nacional de Quilmes * Tecnologico de Monterrey
Australia		* University of Queensland * University of Technology, Sydney
USA	* Rochester Institute of Technology * Arizona State University	* Yale * MIT * UC Berkeley * Stanford University * Georgia Institute of Technology University * UC Davis
Asia		* National Institute of Design (India) * Tongji University (China)