



Stakeholder's requirements and perspectives for future collaboration in solar projects

-Applied on Chalmers university campus using Backcasting methodology and stakeholder management

Challenge Lab 2015: Sustainable Urban Development

Master thesis in Supply chain management programme SARAVANA KUMAR THANGAVEL

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Chalmers Reproservice Göteborg, Sweden 2015 We are made wise not by the recollection of our past, but by the responsibility for our future.

-George Bernard Shaw

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ABSTRACT

The current conventional energy production and forecast for fulfilling the demand of future energy need with conventional energy production pose a serious threat to the humanity. With abundant energy source and huge technology advancement, solar energy is one of many magic pills that could drive the world towards sustainable energy use. This thesis explores the possibilities of new collaboration and strengthening the existing collaboration between stakeholders involved in Chalmers University, especially stakeholders involved in solar energy projects. The thesis uses Backcasting as a methodology to find the problems in the current system (Chalmers university campus) and also uses some of the stakeholder management concepts to map and analyse the requirements of stakeholders involved in the Chalmers university campus solar projects. The thesis is divided into two parts. Part1 describes Challenge lab process and Part2 describes the collaboration of stakeholders for solar energy on Chalmers university campus. In Part2 mapping of stakeholders' involved in Chalmers campus is done and also the perspectives of different stakeholders are pointed out. Finally, dialogue between various stakeholders conducted as part of trust building activity and also to share the perspectives and ideas between stakeholders so as to lay a foundation for future collaborative sustainable solar projects is discussed. The outcome of dialogue and information gained from the dialogue by the stakeholders set a base for results of this thesis and also suggestions to the stakeholders for future collaborative projects.

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Saravana Kumar Thangavel

Acronyms Used

C-Lab – Challenge Lab AH- Akademiska hus AB CFAB- Chalmersfastigheter AB EPOC- Energi på campus aka Energy on campus IFC- International Finance Corporation CSS- Chalmers students for sustainability JSP- Johanneberg Science Park

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1 Introduction

1.1 BACKGROUND

Urbanization is taking place globally at a rapid pace. Global Urban population for first time reached over half of the world's population at 2007 i:e 3.3 billion people were living in cities during 2007. The current trend of urbanization indicates that over 60 % of world population will be urbanized by 2030(The FIG Commission, 2010). In terms of Europe, 72 % of population lives in urban areas and the percentage of population in urban areas is expected to increase by 84% within 2050(UN, 2008). Population growth is one of the reasons behind many challenges that are taking place in the world such as climate change, poverty and resource scarcity. The rate of current environmental change clubbed with other societal problems is outpacing our response to these challenges and thus the current path looks unsustainable (ICSU, 2010). The population increase in urban areas is expected to increase the consumption rate and also increase production rate that meets the consumption rate thus increasing the demand for scarce resources (Decker et. al., 2000). Modern European lifestyles are unsustainable because of overproduction and over consumption which in turn causes negative impacts on environment, economy, society and health. The consumption levels have increased six times since 1960s. The Intergovernmental Panel on Climate change (IPCC) estimates many health related problems and extreme weather events will increase due to climate change (IPCC, 2001).

When it comes to energy use, non- renewable energy use will result in resource depletion and cause many environmental problems affecting the future generations. Renewable energy such as wind energy, hydro energy, and solar energy are some of the alternatives to overcome the challenges posed by existing non-renewable energy (Björn Sandén et al 2014). The international Energy outlook 2013 predicted the world energy consumption will increase by 56% from 2010 to 2040. Renewable energy and nuclear power are predicted to increase 2.5% in coming years yet 80% of the world energy use at 2040 will be still supplied by fossil fuels. When it comes to electricity generation the international Energy outlook 2013 predicts that there will be 93% increase in the total output by 2040. The electricity generation by renewable sources are predicted to increase by 2.8% per year till 2040. Out of the 2.8% almost 80% electricity generation will be from hydro power and wind power which gives an insight of very less percentage of electricity produced from solar. As of 2012, 5% of area of EU was covered by buildings and roads and 1/3 of the global land area is covered in deserts. With 5% of global land area of any place including less sunny areas has a potential of producing more than 1 Million TWh/year of solar energy (Björn Sandén et al 2014).

Sweden's share in using fossil fuels for energy is lowest among IEA members (International energy agency) with average usage of fossil fuel among IEA members was 81% as of 2011. With the aim to increase the renewable energy share, Sweden planned to increase renewable energy supply by more than 50% by 2020 (Official website of Sweden). Sweden focus to increase solar energy production goes along with the policies laid by the Swedish government in recent years.

In order to overcome many challenges posed by current conventional energy production and move towards sustainable future, different actors in the society such as Government, industry and academy need to work together and this is where challenge lab comes in (Holmberg, 2014).

1.2 PURPOSE AND RESEARCH QUESTION

The main purpose of this thesis is to use Backcasting method as a tool to find the requirements for collaboration between stakeholders involving in solar projects at Chalmers campus. The focus would be on the stakeholders of energy field particularly solar energy on the campus. By doing so this thesis would serve as a case study for collaboration projects especially solar projects on different educational institution where many different stakeholders are involved.

<u>RQ- How Backcasting can be used as a method to facilitate collaboration between different</u> <u>stakeholders involved in solar projects on the Chalmers campus.</u>

To find answer to the primary research question, some of the secondary questions have to be answered first.

Firstly, to find the different stakeholders involved in energy on campus and map them based on the involvement on campus. To achieve this some of the tools from standard stakeholder management are used.

Who are the stakeholders affecting energy on campus and what does the stakeholder map look like?

Secondly, as the main focus of this thesis revolve around sustainability the requirements specific to sustainability based on different criteria are explored

How sustainability is viewed in terms of energy on campus by different stakeholders, and what are the requirements, vision and criteria of stakeholders when it comes to solar energy?

Thirdly a dialogue between different stakeholders is conducted to unlock the possibilities for future collaboration and also to build trust among stakeholders

What are the prerequisites need to be fulfilled for successful stakeholders' collaboration involved in solar projects?

1.3 OUTLINE OF THE THESIS

The thesis is divided into two parts Phase1 and Phase2. Phase1 describes the challenge lab process, tools and methods used in the challenge lab process followed by the results of Phase1. The results of Phase1 set the base for Phase2. In Phase2 various theories are introduced to analyse the empirical data collected during the phase so as to find the answer for research question set in Phase1. Followed by data collection and analysis, results of the thesis and also reflection of the challenge lab process methodology are discussed

1.4 SCOPE, LIMITATIONS AND DELIMITATIONS

The scope and delimitations are result of area of interest and topic narrowed down during the Phase1 of this thesis. Unlike most conventional master thesis, where problem is stated earlier in the process, Challenge Lab thesis promotes students to analyse the system and find the problems by themselves. With Solar energy as the general topic, scope of this thesis was narrowed down to solar projects on Chalmers University campus. Please refer Chapter2 for description on how the topic was narrowed.

The thesis is based on interviews conducted on selected stakeholders; perspectives and inputs from stakeholders about the solar energy on Chalmers university campus. The analysis of the thesis is solely based on the stakeholders' views and perspectives backed by theoretical frameworks. The result of the thesis is based on the inputs gathered from interviews and dialogue conducted during Phase2.

The main Delimitation of the thesis is it focuses on stakeholders involved at Chalmers University campus, mainly the ones involved in energy sector. Some of the stakeholders outside Chalmers University were also interviewed to get the perspective about solar energy connected with academia and possibility to connect with Chalmers university but even those stakeholders are limited by boundaries, in this case Gothenburg and Boras.

The main limitation of this thesis is time constraint. This thesis is limited by analysing the possibility of collaboration and not directly involved in any collaboration activities real time.

2 Phase1: Challenge Lab

2.1 INTRODUCTION

The Challenge Lab is a Chalmers entity formed to solve the sustainable challenges around the world. This chapter will describe the purpose and methods of Challenge lab followed by results of the Phase1.

2.2 BACKGROUND

The Challenge lab was initiated by John Holmberg vice president of Chalmers inspired by the vision of Chalmers 'Chalmers for sustainable future'. The Challenge lab also called as C-Lab main aim is to facilitate students to bring different actors such as Academy, Government and Industry together to solve the sustainable problems and to act as a hub for connecting different actors across the society. C-Lab 2015 consists of 13 master programme students of different departments and different nationalities. One of the principles behind C-Lab is to gather students of different departments to pursue master thesis in their area of interest with a common theme which is *Sustainable urban development* this year (2015). C-lab team focuses on finding and unlocking the leverage point in the current system to work towards the solution of solving the challenges in the current system. The aims of the students doing their thesis in challenge lab are 1.To combine different knowledge capabilities gained through their master programmes for finding innovative solutions to the sustainable problems in the world and also 2. To act as a neutral facilitator in connecting different stakeholders and also

to work together to find a common solution that benefits everyone in the society. The master students in the Challenge lab are called "Change agents". They are taught to become challenging and courageous facilitators of change in complex systems to address global challenges (Challenge Lab website). The Change agent acts a facilitator who connects the three different actors of society in the triple helix model based on Etzkowitz, H. (1995).

Challenge lab in general is a new way of work in academia where students of different cultural and educational background get together to find the global challenges in the system and intervene in the system with right approach.



Figure 1 Challenge Lab change agents in Triple Helix model



Figure 2 Challenge Lab Organization

2.3 THE CHALLENGE LAB PROCESS

This section will explain the different tools and theories used in challenge lab process .The Challenge Lab process is divided into two phases (Phase1 and Phase2). Phase1 a process where all 13 challenge lab students take part collectively to work on various methods and tools related to sustainable development and in Phase2 students focus and analyse further on the results gained from Phase1. Firstly the methodology used in challenge lab process will be explained and then the process and tools used in Challenge lab process will be explained, followed by the result of the Phase1 of the challenge lab process.

2.3.1 METHODOLOGY

The first phase of challenge Lab process also called as 'preparatory phase', where students worked on literature studies in their field of interest and also were introduced to methods, tools and frameworks related to sustainable development. During the preparatory phase stakeholders from different fields were brought to challenge lab to understand the current system and also to understand the different sustainable projects that were taking place during the time of Phase1. The stakeholders' meeting were arranged also to the challenges in the current system. The whole challenge lab process was based on two-way approach 1. Outside-in approach and 2. Inside-out approach (Holmberg, 2014). Change agents were taught different tools to understand both approach and also thought the way to use both approaches in a collective manner.

2.3.2 OUTSIDE-IN APPROACH

Outside-in approach enables students to understand the global sustainable challenges and helps to look at the challenges in terms of sustainable development with a wider perspective. Outside – in approach helps to link the global challenges and vision for sustainability with the global, national and local level.

Backcasting is a method that acts as a central feature behind the challenge lab process from start to end. Backcasting is used when the challenges studied in the system are complex and when the system needs a sustainable transition (Holmberg, 2014). Both outside-in and inside-out perspectives are used in all the steps of backcasting to understand the complexity of the challenges much better.

Methods and tools used in outside-in perspective to understand the global perspective are

1. The Funnel – a tool used to understand the current trends and also future challenges that are predicted to happen because of the current unsustainable trends.

2. Sustainability compass- a tool that helps to set goals, vision and criteria for future sustainable world.

Methods and tools used in Inside-out perspective to understand oneself, one's values and strength of own

Inside- out approach is to help students understand one's own values, strengths and vision for sustainability. This approach helps students to channel their strengths towards the field of expertise and interest to find the challenges in the current system relevant to the field.

Methods and tools used in inside-out perspective are

1. Self- leadership for sustainability is to understand and motivate one's awareness, motivation, goal setting and act to receive and give feedback. Self-Values- a tool used to understand one's own values, strengths and the priorities of those values and strengths.

2. Dialogue is art of thinking collectively; it is a tool for setting a base for collaboration between different stakeholders.

Before explaining both outside-in and inside-out perspective a brief understanding about system perspective is needed. System perspective explains how both outside-in and inside out approaches go hand in hand in the process of viewing the challenges in the system on a whole.

2.3.3 SYSTEM PERSPECTIVE

System perspective is a way of analysing and solving complex problems in the system by looking at the system on a holistic level. Unlike traditional scientific thinking where problems are broken down into parts and analysed individually, system perspective analyses the problems in the system on a whole as the challenges are global and complex which are connected to one another (Bagheri, A. and Hjorth, P. ,2005)

Leverage points in a system are where the hope for major shift or big changes is buried in. While analysing system on a whole, leverage points as the name suggests gives a leverage to push towards the major change in the system in terms of sustainability (Donella Meadows, 2008). System perspective provides room to analyse the components of a system on a holistic level which in turn gives a clear understanding about the complex connection between the components and also the problems attached to those components (Winz, I. ,2005)

2.3.4 BACKCASTING

"Backcasting is a method in which the future desired conditions are envisioned and steps are then defined to attain those conditions, rather than to take steps that are merely a continuum of present methods extrapolated into the future" (Holmberg & Robert, 2000). Backasting is used when the future problems are complex and not clear, though the future problems are sometimes clear, the results are not desirable which asks for alternate future. Backcasting helps to analyse the alternative future for the perceived complex problems (Robinson 2003, p842). According to Holmberg(1998) backcasting is a systemic step by step approach and defining criteria for sustainable future gives a guide for today's measures, which in turn distinct backcasting from forecasting. As per Dreborg(1996) backcasting is useful when 1. The problem to be studied is complex, 2. There is a need for major change, 3. Dominant trends are part of the problem, 4. The problem to a great extent is a matter of externalities,

5. The scope is wide enough and the time horizon long enough to leave considerable room for deliberate choice.

Robinson (1990) explained backcasting method with six steps starting from determining objectives to undertaking impact analysis, whereas Holmberg (1998) simplifies the method into four steps such as

- 1. Define a Framework or criteria for sustainability
- 2. Describe the current situation in relation to the set criteria or framework
- 3. Envision a future situation or solution
- 4. Find strategies for sustainability



Figure 3: Steps in strategic planning for sustainability by Holmberg(1998)

Robinson (1990) states that the main characteristics of backcasting are to analyse the challenges in the system and provide a pathway to attain a desirable future but not to explain what will happen in the future unlike forecasting. Further Robinson sees backcasting as a complimentary method for forecasting rather than a replacement.

The four steps of backcasting methodology introduced by Holmberg(1998) are

1. Define a framework or criteria for Sustainability

The first step in backcasting methodology is to set criteria for sustainable future. The criteria give a proper background for planning process in terms of sustainable future. The criteria also avoid the common mistake of an organization or group to consider only current trends in the planning process Holmberg(1998). Though there are multiple tools available to set up criteria for sustainable future, the tool used to set criteria in Challenge Lab 2015 was called 'Sustainable Compass' defined by AtKisson and Hatcher (2001).

The four points of the compass are

- 1. N for nature comprising all natural ecosystems,
- 2. E for economy comprising all nature's resources including goods and services,
- 3. S for society comprising institutions, organizations, and social conditions,
- 4. W for wellbeing that covers our individual wellbeing including health, happiness, and quality of life.

These different focus areas of sustainable compass cover all aspects which is similar to conventional compass which focuses on all directions.





2. Describe the current situation in relation to the set criteria or framework

The second step of backcasting methodology is to analyse the current situation. Competences, activities, process and services of the present system are analysed so as to have an inventory of information which could be used in step3 and step4 of backcasting methodology. The information inventory of the current situation helps to find the right and reasonable strategy for envisioned sustainable future Holmberg(1998). The information gained also helps to understand the future trends and set a base to envision the future needs and strategies.

The Funnel, a tool proposed by Holmberg(1998) used in the challenge lab to visualize the global trends, characterising six different areas such as population, economy, material or energy intensity ,Land area, assimilation capacity and resources. Figure 5 shows the damping effect of the funnel that represents the trends on the different areas.



Figure 5 The resource funnel (based on Holmberg, 1998)

The top line represents the diminishing trend on resources, assimilation capacity and land area, whereas the bottom line represents the increasing trend of population, economy and material or energy intensity. The areas on both top and bottom line influence each other in such a way equilibrium needs to be attained to make a sustainable future.

3. Envision a future situation or solution

In this step future situation is envisioned. Principles and framework from step1 and also the information inventory from step 2 helps to envision a future situation that is sustainable and also serves as source for the strategies to attain the future situation Holmberg(1998). A broad picture of future situation could be helpful to try different strategies for a sustainable future. Söderberg's design thinking is one way of envisioning future solutions. Söderberg explains, with the complex problems in the current system, how important a pre study acts in the future envisioned state and lays a platform for design process. The pre study also helps to identify the requirement of analysing at different levels such as socio-technical, product-service, product-technology and societal level (Söderberg, 2014).



Figure 6 The design thinking based on (Söderberg, 2014)

4. Find strategies for sustainability

In this step strategies for the envisioned sustainable future are identified based on the sustainability principles which could link the current situation with the future envisioned situation. This step tries to analyse different strategies that could potentially fill the gap between the current system and future envisioned system. Holmberg(1998) suggests some of important points to consider while setting up strategies for future situation, they are

- Will the measures taken during the process bring us close to sustainability?
- Will the each measure be a flexible platform to next measure or will it be a dead end?
- Will each measure will pay off soon enough?

• Will the measures taken together help society to make changes at a sufficient speed and scale to achieve sustainability without too many losses for humans and other species during the transition?

2.3.5 INSIDE- OUT PERSPECTIVE

Unlike conventional master thesis, Challenge lab master thesis focuses on students' inner values and desire to focus on the sustainable challenges. Inside-out perspective on challenge lab focuses on topics such as self-leadership and dialogue. By focusing on these areas Change agents are allowed to focus one's own areas of interest and also co-operate with the other change agents. The tools help students to work towards solving the sustainable challenges in the system and drive towards sustainable development.

2.3.6 SELF-LEADERSHIP

"The first and best victory is to conquer self." - Plato

Self-leadership is practice of influencing one's own thinking, feeling and behaviour to achieve the objectives (Bryant, A. & Kazan, A.L., 2012). According to Bryant & Kazan specific qualities a person must have to become more successful and effective leader from inside-out. They are 1. Self-esteem, 2.knowing what you need 3.Confidence and communication 4.Personality, strengths and motivation. Ryan and Deci(2000) explains four levels of motivation that go with the level of self-determination, which are

External regulation- This motivation is mainly derived by the external rewards and has very less self-determination.

Introjected regulation- This motivation is driven by the factor of avoiding guilt and to improve one's own self-esteem

Identified regulation- This motivation comes with sense of meaning to the action that one does, be it good for environment or society

Integrated regulation- This motivation is possibly the result of highest level selfdetermination, where the motivation is based on one's own values and beliefs.



Figure 6.1 Self-determination and motivation levels by Dominic von Martens (based on Ryan and Deci, 2000)

2.3.7 DIALOGUE

Dialogue is an important part of challenge lab process which helps students to interact with stakeholders on a strategic level used both in Phase1 and Phase2. Dialogue is also a way to express oneself and make use of ones' self-leadership skills by facilitating a multi stakeholder's dialogue. Dialogue is a tool for collaboration by listening to each other (Sandow and Allen, 2005).

The important aspect of dialogue is active listening. Active listening to the participants of dialogue without any argument gives more space for exploring different views of understanding of the participants. Dialogue is a way to understand the different aspects of the challenge or problem from different perspectives. As Sandow and Allen puts, learning comes from active listening. Active listening creates an environment where the members of a team could understand each other which in turn develop trust. Trust among the team members lead to better collaboration. Listening further develops mutual understanding reducing conflicts (Sandow and Allen 2005).



Figure 7 Reinforcing circle towards resilient organization (Sandow and allen 2005)

Argyris(1977) describes that learning is process of finding the error and correcting them. Upon detection of error, most of the organizations try to find a new operational strategy to solve the error but they are bound by the same goals and rule structure. This method is called "single-loop learning". Argyris argues that single-loop learning is a simple feedback loop wherein learning involves connecting a strategy for action with results. For example, if an action that we take yields result that we dint expect, then through single loop learning we try to examine the result and try to take a different action for expected result. The cyclic process of changing action or strategy for same expected result may occur multiple times and we may never succeed. Failure to attain the expected result after trying multiple strategies may push an organization to evaluate their governing variables such as goals, values, beliefs and conceptual frameworks. The process of evaluating goals, values and beliefs is called double loop learning Argyris(1977).



Figure 8 Double loop learning based on (Argyris, 1977)

Argyris believes that in the current rapidly changing environment organization should able to critically analyse their goals, values and beliefs for better consequences.

2.4 PROCESS AND RESULTS

This section explains the steps implemented in Phase 1 based on the theory and different tools of challenge lab introduced during phase1. This section will also explain the results of Phase1 which laid the base for Phase2.

2.4.1 DEFINING THE CRITERIA FOR SUSTAINABILITY

The first step of backcasting is to set criteria and vision for sustainable future. Challenge lab team 2015 focused on topics from the sustainability compass such as nature, society, economy and well-being. Literature studies were done in groups of 3-4 students with each group focusing on specific topic. The criteria were setup after discussing with each group about their criteria findings and also other groups reflections.

The main challenge during the criteria formulation was whether to focus on sustainability in general or to focus on urban sustainability. Further discussion on this challenge made the challenge lab team clear, that setting up criteria in general would be the ideal fit that would match with the vision for sustainable future.

Holmberg's four sustainability principles were used as a basis to set criteria,

1) The systematic increase of concentrations of substances extracted from the Earth's crust

2) The systematic increase of concentrations of substances produced by society

3) The systematic physical degradation of nature and natural processes, and

4) Conditions that systematically undermine people's capacity to meet their basic human needs.

The following criteria were set after discussion during the Phase1, only a handful of criteria were selected to avoid confusion and repetition.

Nature

References used to set these criteria (Holmberg et al., 1996; Holmberg & Robèrt, 2000)

- Not to increase the concentration of substances from the lithosphere in the ecosphere.
- Not to increase concentration of human made substances in the ecosphere.
- Not to systematically deteriorate the resource base; such as fresh water, fertile land, and biodiversity through manipulation, mismanagement, or over-exploitation.

Economy

References used to set these criteria (Anand and Sen, 2000); (Martin and Simmie, 2010); (Pisano, 2012)

- The economic system enables us to meet the other criteria efficiently and effectively. The economic system should be influenced by the other dimensions (society, well-being, nature) and not the other way around.
- The economic system is resilient in a way that it functions as a buffer against destructive disturbances, such as environmental catastrophes or economic mismanagement.
- The economic system should enable further use of resources and avoid dissipative use of materials.
- The economic system has an inherent mechanism of maintaining and serving societal infrastructure and institutions that permits human well-being to be met over time.

Societal criteria

References used to set these criteria (UN General Assembly, 1948); (Raworth, 2012); (UN, 2012); (Open Working Group on Sustainable Development Goals, 2014); (OECD, 2015)

- Societal institutions are built on transparency, accountability, and mutual trust. They enable the well-being of the individuals in society.
- The societal system is an instrument for individuals to live together within the other criteria.

Well-being criteria

References used to set these criteria (UN, 1948); (Rawls, 1972); (Max-Neef, 1993); (Oxfam briefing paper, 2008); (International Wellbeing Group 2013); (OECD, 2013)

- Everyone has basic needs fulfilled such as food, water, health, energy, shelter, and safety.
- Human life includes affection, understanding, morality, participation, leisure, empowerment, creation, identity, and knowledge.

- Each person has an equal right to the most extensive basic freedom compatible with a similar freedom for others. This includes freedom of opinion and assembly, expression, conscience, and choice without deliberately harming others.
- Social and economic inequalities are not justified unless they are to the greatest benefit to the least-advantaged members of society.

Vision

After several discussions, the challenge Lab team 2015 decided to have the same vision as the previous year's vision as the earlier vision had enough weightage in terms of reflecting a strong sustainable message. In addition to this the Vision of Challenge team 2014 focused on both planetary boundaries and the human wellbeing which went hand in hand with the focus of the 2015 Challenge lab team.

"A sustainable future where we (~10 billion people) are able to meet our own needs within the planetary boundaries without compromising the ability of our future generations to meet theirs"

2.4.2 CURRENT TRENDS AND PROJECTS

Mapping current sustainable and unsustainable trends locally and globally was part of challenge lab team's parallel assignment during the criteria formation. Each member of team was asked to present a trend locally or globally that interests them. Apart from the trends that each member presented, general trends based on funnel were also discussed. Sustainable projects that took place during the Phase1 were also explored and mapped.

The trends that were discussed during the Phase1 by Challenge Lab students were 1. Crowdfunding 2.Economic inequality 3.Population trends 4.Third party solar agreements

2.4.3 ONGOING PROJECTS

Challenge lab team started to map all the sustainable projects that are taking place locally (Gothenburg). Stakeholders were invited to challenge lab to describe the ongoing projects on the city of Gothenburg. These projects were considered to be the starting point of the motivation of the every student's thesis. Challenge lab students started to analyse their inner drive I:e their area of interest connecting with the projects. Some of the projects that were mapped during the Phase 1 after getting all the information about projects are

JOHANNABERG DISTRICT FACTOR 10

A Climate-KIC initiative towards sustainable cities, initiated the project Johannaberg district factor 10. The project's main goal is to attain factor 10, an idea where the reduction of resource usage by 90% without compromising human well-being. Some of the stakeholders involved in this project are Castellum AB, Tyrens AB, Mistra Urban Futures, Johanneberg Science Park and Chalmers University of technology.

There are many sub-projects that are part of Johannaberg district factor 10 such as HSB Living lab, Energy innovation campus program and ElectriCity

HSB LIVING LAB

HSB Living lab is a user-centred facility for sustainable living which is an ongoing project with construction started on March 2015. HSB Living Lab is planned as a built infrastructure for advanced research on the flows of energy, materials and water through living space and their relationship to state-of-the-art design and technology. Situated in the Johanneberg district the facility will be a showcase for how individuals can lead a sustainable lifestyle in their home (Factor 10 manual on Chalmers website). This project has an important role in factor 10 showing how design and user based facilities can reduce the resource consumption.

ENERGY INNOVATION CAMPUS PROGRAM

This Project's main role is to identify and support education, research, and innovation projects using existing and new infrastructure, buildings and properties in terms of energy. The project tries to bring academia, public sector, real estate owners, business and industry together and conduct energy related projects in Johanneberg. The projects handled by this program will benefit the local sustainable development as well as contribute to long term solutions on how to meet the global challenges especially related to urban development (Factor 10 manual on Chalmers website).

2.5 DIALOGUE AND VALUES

After mapping different projects that were happening in Gothenburg and also globally, Challenge Lab team had the opportunity to have two workshops which helped them to contact the stakeholders of the different projects more effectively. One such workshop was dialogue workshop with Martin Sande and other was self-leadership workshop with Dominic von Martens

2.5.1 DIALOGUE

Martin Sande from Preera conducted a workshop called "enabling dialogue frameworks and tools". By this dialogue he shared the importance of dialogue in a sustainable transition and also his experience with many organizations that participated in dialogue process. Martin Sande discussed about the 5R model used in a dialogue process were each R represents different aspects that are important in a dialogue which were The Room, Relations, Roles, Routines and Results.

Some of the conditions of the 5R are the *room* should have an equal weightage to all participants, which could be achieved by having circular seating position. The *relationship* between the participants of dialogue should be based on respect between each other views and perspectives. The routines of the dialogue should start with a check-in and end with a check-out. The *roles* of different participants of the dialogue are mover, pusher, opponent and bystander.

2.5.2 SELF-LEADERSHIP WORKSHOP

Self-leadership workshop by Dominic von Martens focused on analysing one's own values as seen in Figure9. Though this process of value mapping happened before Phase1 of challenge lab process, the process of discussing one's own value with other challenge lab student took place during Phase1. The process of exchanging values and strengths with a life example

helped Challenge Lab students to understand each other much personally and also improved the collaboration later in the many decision making activities.



Figure 9 Value map example by ValuesOnline Nordic AB, 2014

2.6 FOCUS ENERGY OF CHALLENGE LAB TEAM

Focus energy of challenge lab team was an activity conducted by John Holmberg during Phase1. The purpose of this activity was to find the interest area of Challenge lab students and where their energy lies in when it comes to sustainability. The activity started with listing out different fields such as energy, build environment, water, participation, circular economy and open innovation. The activity was held after introducing the different ongoing sustainability projects so as to give a clear understanding about different sustainability fields and also to narrow down the path that led to Phase2 of Challenge lab students theses.

One such interest area and project behind this thesis was Johanneberg district factor 10 project.

2.7 NARROWING DOWN RESEARCH TOPIC

From very early stage of Challenge Lab process my interest area was around solar energy. I started with exploring topics in business model innovation on solar energy field. Among the projects we as a team explored during our initial stages Phase1, 'Johanneberg district factor 10' project in particular caught my attention as the project was in initial phase. Following that, I started to find stakeholders connected with Johanneberg district factor 10' project mainly involved in energy.

2.8 PRELIMINARY INTERVIEWS WITH STAKEHOLDERS

After mapping different sustainable projects to understand the current system, and also mapping different energy areas, Challenge Lab students started to contact different stakeholders who were part of projects that were of students' interest. This process of contacting stakeholders to understand the current system and also the projects they are part of was conducted by pairs and individually.

Energy was one of the interest areas behind this thesis, particularly solar energy. So to understand the current system as part of Phase1, system being here Chalmers campus, different stakeholders connected with energy on campus were interviewed. Firstly the process started with contacting stakeholders who were part of Johanneberg district factor 10 project and then narrowed down to Chalmers campus.

The interviews were semi-structured and mostly one-way communication to understand how the system looks like and to get information about solar projects. The different stakeholders interviewed were

1.Ulf Ostermark - Director of Open arena energy

2.Jenny Forshufvud- Project Co-ordinator External Collaborations (Energy on campus)

3.Georgios Georgiadis - Post doc in the Networks and Systems division at the Department of Computer Science and Engineering.

4. Bengt Bergsten – Energy strategist, Chalmersfastigheter

5. Per Löveryd- Energy strategist, Akademiska Hus

6. Magnus Wennergren- Environmental coordinator, Chalmers University

7. Maria Abrahamsson- Assistant Professor; Chemistry and Chemical Engineering, Physical Chemistry, Chalmers

2.9 DESCRIPTION OF THE PROBLEM

After the preliminary interviews various stakeholders on Chalmers campus to understand the ongoing projects and also challenges in the system, the problems identified with the current system (Chalmers campus) were the lack of collaboration between different stakeholders and also lack of awareness about the different solar projects taking place in the campus.

3 Phase2: Theoretical framework

3.1 INTRODUCTION

This chapter describes different theoretical topics such as stakeholder theory, stakeholder analysis and stakeholder engagement that are used to solve the research question formulated at the end of Phase1.

3.2 STAKEHOLDER THEORY

R. Edward Freeman (1984) in his book of Strategic Management: A Stakeholder Approach defines stakeholder as 'any group or individual who can affect or is affected by the achievement of the organization's objectives'. Eden and Ackermann(1998) defines stakeholders as people or groups who have power to influence the organization's future. People or groups with lack of power don't make them stakeholders. One other definition of stakeholder is, stakeholders are any group or individual who can affect or who can be affected by, a corporation or its activities (AccountAbility, 2005).



Figure10 Value for stakeholders (Freeman, Harrison and Wicks, 2007)

Freeman (2010) discusses that the view of stakeholders has changed over time and nowadays the natural environment is considered to be part of stakeholders. The different groups of stakeholders such as customers, employees and suppliers all strive towards common purpose, which is sustainability and raise concerns regarding the challenges in the environment. This makes an organization to move towards seeking opportunities towards generating value by practising sustainable practices. Sustainable business also provides companies with an additional business opportunities and competitive advantage over their competitors.

The stakeholders connected with an organization or issue forms a wide range of spectrum. Organization usually selects key stakeholders for the purpose of the activity or process to make it viable to analyse the effectiveness of stakeholders' engagement. Stakeholder groups are commonly neither static nor dynamic with the relationship towards organization or issue. The map of stakeholders varies time to time based on the issue or the activity an organization handles during the time of mapping. So to maintain a fruitful relationship with stakeholders at a specific point of time organization nowadays focus more on trust building activities rather than the usual priority based connection. The process of trust building starts with conventional methods used earlier but finally leads to engagement activities. For better understanding of the relationship and more easy way of engagement organization still segregate stakeholders as primary and secondary as the scope of issue or activity lies more on the primary stakeholders' side (AccountAbility, 2005).



Figure 11 Typical primary and secondary stakeholders (Stakeholder Research Associates Canada Inc., United Nations Environment Programme & AccountAbility, 2005).

3.3 STAKEHOLDER ANALYSIS

Stakeholder analysis is more important nowadays given the interconnected nature of the world and the problems that are prevailing in the world such as global warming, terrorism, resource scarcity. These problems are affected by and affect numerous people, groups and organizations in the world. In this connected world no individual, group or organization own any specific problem and the problem affect, involve and hold responsible most that are connected with the problem (Bryson, J.M,2002).

There are different types of stakeholders analysis techniques explained in many literature and two of the basic techniques are discussed below

The basic stakeholders analysis technique by Bryson(1995), which offers a simple and easy way of analysing different stakeholders connected with the main core of the analysis. The steps that involved in the technique explained by Bryson are identifying stakeholders and their interests, clarifying stakeholders' views of a focal organization or issue, identifying some key strategic issues and beginning the process of identifying support and opposition.

Eden and Ackerman(1998) discuss about analysing stakeholders by power and interest that each individual or group hold related to the issue on hand or the organization's future.



Figure 12 Power versus interest by Eden and Ackermann(1998)

Eden and Ackermann(1998) use the two by two matrix to explain the position of different stakeholders' interest towards the organization or issue on hand and also the power of the stakeholders to affect the organization's or issue's future. The four categories of the stakeholder's position in the matrix are '*players*' who have both significant interest and power; '*subjects*' who have considerable interest but little power; '*context setters*' who have power but little interest towards the issue or organization and the '*crowd*' who have very little power and interest towards an issue or organization.

The power vs interest grid helps to determine which stakeholder's power or interest must be taken in account to address the problem. A problem or organization is linked with numerous stakeholders and is complex to map all the stakeholders that are involved, so using power vs interest matrix it's easy to analyse the stakeholders position related to an organization or problem(Eden and Ackermann,1998).

3.4 FRAMEWORK FOR STAKEHOLDER'S ANALYSIS

Eskerod,P.,Lund Jepsen,A. (2013) describes a framework for stakeholders analysis. The framework involves steps such as, stakeholders' identification, stakeholders' assessment and stakeholders' prioritization. To create solid stakeholders activities Eskerod,P.,Lund Jepsen,A. (2013) points out that one need to establish and organize insights about stakeholders in order to improve the stakeholder management activities. The results of the stakeholders analysis will help to plan activities in connection with each stakeholder giving insights about the requirements, perspectives and concerns of each stakeholder.

1. Stakeholder identification

The first step of stakeholder analysis is to identify people or groups which can affect or can be affected by the project process or the project outcomes. Among the different ways of finding stakeholders, common used method is asking project team members to list stakeholders in their specific areas of expertise or the stakeholders list from similar projects (Eskerod, Lund Jepsen, 2013, p.29). The outcome of stakeholder identification has both internal and external stakeholders connected with the organization or issue.

2. Stakeholder assessment

The purpose of this step is to identify each stakeholder's harm and help potentials (Eskerod, Lund Jepsen, 2013, p.29). Stakeholder with a high help potential have many resources that can be used to support the organization progress whereas harm potential threatens the organization's success (Eskerod, Lund Jepsen, 2013, p.32). Stakeholders who control important contributions to the project have a high harm and a high help potential since the project progress is dependent on the stakeholder.

Stakeholders can be categorised by their help and harm potentials in four different classes for each stakeholder and for each issue. As per Eskerod and Lund Jepsen (2013) the different categories of stakeholders are *Resourceful, Key Player, Show Stopper and Marginal* (Eskerod, Lund Jepsen, 2013, p.32). Resourceful stakeholders have help potentials and control resources with importance for the organization or issue. *Show Stopper* has no helpful resources for the organization or issue but have the potential to stop the project. *The Key Players* are very important for the success of an organization because they have high harm and help potential. Marginal stakeholders have neither high harm potential nor high help potential and can be considered least important for the project. In addition to that, it is important to mention that stakeholder's help and harm potential can change during different phases (e.g. planning, execution) of the project.



Harm Potential Figure 13 Stakeholders potential matrix by Eskerod and Lund Jepsen (2013)

3. Stakeholder prioritization

The stakeholder prioritization identifies the most crucial stakeholders. One structured way to prioritize the stakeholders is to add an extra dimension to the project stakeholder potential graph - the stakeholder's attitude (Eskerod, Lund Jepsen, 2013, p.44). Stakeholders with a positive attitude will use their help potential more than their harm potential whereas stakeholders with a negative attitude will not want to help but may be want to harm the project or organization.

After arranging the stakeholders in the different categories of the cube, a well-arranged way to monitor the stakeholders is to arrange the stakeholders in a table and add a traffic light system. Red colour represents a high need for management attention; yellow colour represents considerable need for attention and green colour represents not much attention in the moment (Eskerod, Lund Jepsen, 2013).

4. Management Strategy formulation

Based After prioritising stakeholders, an organization should formulate appropriate strategies to deal with the issues raised by stakeholders, mainly for the most important stakeholders. Yang and Geoffrey (2014) describes that the organization has to decide the methods of stakeholder engagement and formulate appropriate strategies to solve the concerns raised by the stakeholders. The levels of engagement are based on the project objectives, help and harm potential of stakeholders and stakeholders' attitude. The different levels of engagement are *inform* -to provide the stakeholders with objective information to assist them in understanding the problems, consult -to get stakeholders' feedback on analysis, alternatives and/or decisions, involve -to work directly with the stakeholders during the project in order to ensure that stakeholders in each aspect of the decision and *empower* – to place final decision making in the hands of stakeholders(Yang and Geoffrey, 2014).

5. Implementation and Evaluation

The final step of stakeholder analysis is to implement the strategies and evaluating the stakeholder satisfaction based on the engagement activities (Yang and Geoffrey, 2014). The evaluation of the strategies is part of the feedback system where the organization objectives are achieved. The results of the evaluation should be used to improve the objectives in the succeeding process. In order to evaluate stakeholder's satisfaction with the engagement activities surveys and meetings can be conducted (Yang and Geoffrey, 2014).

3.5 STAKEHOLDERS ENGAGEMENT

Stakeholder engagement is not a new concept. Dialogue and communication with key stakeholders such as investors, employees and customers were part of a company's practice for many years. Methods used for stakeholder's engagement by companies include meetings, satisfactory surveys, consultation based on projects and regulatory filings (AccountAbility, 2005,). Engagement is a broad term used to cover an organization effort to understand and involve stakeholders in its activities and decisions. Engagement is critical aspect of an organization to improve trust among its stakeholders and also to bring transparency in the process that involves all stakeholders.



Figure 14 Spectrum of stakeholder engagement (IFC,2007)

The spectrum stakeholder engagement describes the various activities throughout the life of a project along with the number of people engaged with the intensity of engagement.

There are different ways to engage stakeholders and some of the common approaches are

1. Communication 2. Consultation 3. Dialogue 4. Partnership

Communication with stakeholders is part of every organization's day to day activity. Organization communicates to transfer the information about its products, plans, perspectives to stakeholders who are interested in the project or organization. Internal communication in an organization involves explaining the policies and principles to the internal stakeholders mainly employees. External communication involves transferring the required information to external stakeholders, outside the organization (AccountAbility, 2005).

Consultation is the process of gathering information or advice from stakeholders both internal and external. Consultation lays base for changes in the organization's decisions but may not directly influence the decisions.

Dialogue is similar to consultation where it involves exchange of information, opinions and ideas. Consultation is one-way process where organizations try to gather stakeholders advice and inputs whereas dialogue act as a two way process where organizations try to meet the expectations of stakeholders by exploring different possibilities that are gained from the advice and information gathered from the stakeholders (AccountAbility, 2005). Dialogue's effectiveness depends on the unbiased attitude of the participants of the dialogue and willingness to suspend judgement towards other participants. Dialogue is considered to be a key tool in an engagement activity. For an effective dialogue right mixture of stakeholders with different perspectives sets a base for fruitful outcome.

COMMUNICATION	CONSULTATION	DIALOGUE	PARTNERSHIPS
Information sharing	Questionnaire surveys	 Multi-stakeholder forums 	Joint ventures
Employee training	 Focus groups 	• Advisory panels	 Local sustainable development projects
 Project bulletins and letters to targeted audiences 	Workplace assessments	Leadership summits	 Multi-stakeholder initiatives
 Company brochures and reports Internal and exter- nal newsletters Web sites Technical briefings Speeches, confer- ence presentations, displays, handouts and videos 	 Ad hoc stakeholder advisory meetings (e.g., community con- sultations) Standing stakehold- er advisory forums Online feedback and discussion forums 	• Virtual engagement on intranets and the Internet	• Alliances
Open houses and town hall meetings			
• Tours			
• Press releases, press conferences, media advertising			

Figure15 Approaches to Engagement Relationships (AccountAbility, 2005)

Partnership is defined as "people and organisations from some combination of public, business and civil constituencies who engage in common societal aims through combining their resources and competencies" (AccountAbility, 2005). Partnership is mostly the ideal step followed by a successful dialogue. As we know dialogue focus on building trust and exploring different ideas and possibilities, partnership aims for synergies among stakeholders and resources in an organization or issue (AccountAbility, 2005).

3.6 KEY COMPONENTS OF STAKEHOLDER ENGAGEMENT

Stakeholder engagement is broad term compromising many activities involved in the whole engagement process. Some of the key components in a stakeholder engagement as per IFC (2007) are

- Stakeholder identification and analysis
- Information disclosure
- Negotiation and partnership
- Grievance management
- Stakeholder involvement in project monitoring
- Reporting to stakeholders
- Management functions

Though all these components are part of stakeholder engagement as discussed by IFC only selective activities will be discussed that are more relevant to this thesis.

Stakeholder identification and analysis

Much has been already discussed about stakeholder analysis earlier in this chapter. Stakeholder engagement process starts with finding the right number and right mixture of stakeholders. The following steps are performed during the mapping and analysis of stakeholders. 1. Identifying the stakeholders directly and indirectly involved in the project or issue, 2. Be strategic and prioritise the stakeholders that are identified, 3. Review the past engagement process with the stakeholders if any and 4. Engage stakeholders in their place and time of interest (IFC, 2007).

Information Disclosure

Information disclosure is one of many main parts of engagement process. Transparencies among stakeholders place a vital role and the first step towards earning the trust of stakeholders. All other activities, from consultation and informed participation to negotiation and resolution of grievances, will be more constructive if stakeholders have timely information about project or issue. Some of the key aspects that needs to be followed for a good information disclosure are

1. be transparent, 2. Follow and apply good practice and principles during engagement activities, 3. Manage information on sensitive and controversial issues (IFC, 2007).

Negotiations and Partnership

Consultation and dialogue sets a base for proper negotiations and partnership. Any organization or group involving stakeholders seek engagement with value or benefit in return. With proper dialogue and consultation beforehand, a fruitful negotiations and partnership can be achieved without any challenges. Dialogue before negotiations and partnership sets the scene for mutual trust during the negotiations and partnership which in turn results in a successful outcome. Following aspects needs to considered before negotiation is needed, 2. Negotiate in good faith without any hidden agenda, 3.choose a style of negotiation that benefits all participants and thus improving the relationship further (IFC, 2007).

Reporting to stakeholders

Stakeholder engagement doesn't stop with partnerships and actual engagement in a project or specific issue of an organization. In any relationship follow-through is important. After any engagement activity such as dialogue or consultation stakeholders usually seeks to know if their suggestions and time spend during the engagement activity was useful. Some of the key aspect needs to be considered while reporting back to stakeholders are 1. Information that need to reported back which doesn't affect the existing relationship, 2. Publicly disclosing changes that are made from the ideas or suggestion given by stakeholders during dialogue improves the trust and relationship further, 3. Translate the report in language and format each stakeholder can understand in a more efficient manner (IFC, 2007).



Figure 16: Key components of stakeholder engagement (IFC, 2007).

3.7 METHODOLOGY

During Phase1 and Phase2 of the challenge lab process qualitative data were collected to set a base for analysis of the thesis. The qualitative data were collected in form semi-structured interviews with stakeholders from all three sectors that represent the triple helix model such as academia, public and private sector. The qualitative data collection was part of both Phase1 and Phase2. Phase1 data collection was about understanding the system on a whole and finding the challenges in the system and data collection during Phase2 was about finding a viable strategy to intervene in the system so as to solve the challenges.



Figure 17 Phase2 Process

The literature review was the base behind the analysis of the qualitative data obtained during the interviews. The theories help to understand how the research questions should be approached and help make use of the interview data for further analysis. The main theories looked into during literature review including the theories discussed Phase1 were stakeholders analysis and stakeholders engagement.

3.7.1 SEMI-STRUCTURED INTERVIEW

Semi-structured interview is used when the opportunities to interview stakeholders are limited. The semi structured interview gives interviewers set of instructions and provide reliable, comparable qualitative data (Bernard, 1988). Semi-structured interviews often take place after an unstructured interview such that the interviewees get a clear understanding about the topic and requirements of interviewers during semi-structured interviews. Semistructured differs from structured interview by the type of question asked during the interview. Semi-structured interview often deals with open ended questions allowing the interviewee to explore the topic of discussion benefiting both the parties involving in the interview. Usually semi-structured interviews with questions are paper-based interview but the nature of questions used are open ended and the interviews might diverge from the questions framed earlier thus it is advisable for an interviewer to tape-record the interviews and later transcript the interviews for analysis. The main advantage of semi-structured interview is, it allows the interviewers to explore different questions based on their literature research and also it allows interviewees to express their views in their own terms (Dicicco, B. & Crabtree, B., 2006).

3.7.2 SNOWBALL SAMPLING

Snowball sampling is a way to expand the primary contacts from a minimal group of stakeholders who are relevant to the research to more relevant contacts by stakeholder's guidance or referral (Bryman and Bell, 2011). The primary stakeholders first introduced to challenge lab during the Phase1 to students were guests who visited challenge lab and gave lectures about their work and relevant projects they were part of. Students contacted the stakeholder whose work was more relevant to student's interest area and then further contacts were gained from the primary contacted stakeholders.

4

Empirical data

4.1 BACKGROUND

This chapter describes the various data collected during the Phase2. First the different stakeholders who were part of this study are listed out and secondly the interviews with various stakeholders are discussed with their views about the topics asked during the interview. The interviews are added to the empirical data rather than appendix so as to give a clear understanding about the whole process and proper understanding about the data used in the analysis. Only selected interviews are added to empirical data that involves the key stakeholders rest of the interviews are added in the appendix.

4.2 ENERGY ON CHALMERS CAMPUS

Chalmers University is a large energy user when it comes to Chalmers campus, Chalmers university works with property owners Chalmersfastigheter and Akademiska hus collectively in various activities that are taking place around campus. Total size of premises of Chalmers University campus surfaces around 226,860 sqm. The total premise is owned by both Chalmersfastigheter and Akademiska hus where the split is around 98,690sqm and 128170sqm. The whole energy use by all stakeholders in Chalmers campus including heating, electricity and cooling amounts for 70000MWh on an average every year since 2005.

With increase in number of students every year the consumption of energy also increases. For example, the energy consumption from 2013 to 2014 has increased by 16% in total.

Chalmers has very minimal solar energy production, 110W output worth of solar cells installed in energy technology building as part of research and also minimal amount of solar cells installed on Kuggen house at campus Lindholmen.



Figure 18 Energy consumption in total on Chalmers campus (source: Chalmers sustainability report, 2014)



Figure19 Energy consumption per employee and student (source: Chalmers sustainability report, 2014)

4.3 DIFFERENT STAKEHOLDERS CONCERNING ENERGY ON CHALMERS CAMPUS

Though from outside Chalmers University campus might look like a huge campus owned by solely Chalmers University, there are many stakeholders involved in various processes. When it comes to energy on Chalmers campus three stakeholders stand out they are

Akademiska Hus (AH):

Akademiska Hus is a state owned Property Company with mission to own, rent, develop and manage properties with focus on educational institutions such as universities, college and research institution. AH have properties all over Sweden ranging from Luleå in the north to Malmö in the south. The strategy of AH is increased cooperation with customers and continuous development towards sustainability (AH official website).

Mission: "The mission of Akademiska Hus is to own, develop and manage properties for universities and colleges, with a primary focus on education and research activities. The company's operations shall be carried out in a businesslike manner and yield competitive profits by adapting our rents to the company's business risk. Akademiska Hus shall work to promote a sustainable long-term development of university and college campuses."

Key aspects to achieve Sustainability goals: Trust and transparency, dialogue with suppliers and climate change adaptation

Achievement: One of the main achievement by AH related to energy on Chalmers campus is reduction of energy consumption in AH buildings on Chalmers campus by 40% in last 10 years.

Solar projects handled currently: Solar panels installation is in planning stage on Kraftcentralen (Bio mass power centre building) and also solar panel installation is in planning stage on Architecture building (information collected from interview from AH energy strategist).

Chalmersfastigheter AB

Chalmersfastigheter AB redevelops, expands, leases, and manages premises and buildings for Chalmers University in Sweden. It also focuses on letting premises to tenants outside the Chalmers campus. The company was founded in 1999 and is based in Göteborg, Sweden. Chalmersfastigheter AB operates as a subsidiary of Chalmers University.

Vision: "Chalmersfastigheter will support Chalmers aims to be an outward technical university with global appeal which conducts internationally recognized research and training, linked to a professional process of innovation. This will be done in harmony with sustainable development and in interaction with industry"

Achievement: MIPIM Sustainability award 2009 for Kuggen building and also various projects improving energy efficiency.

Solar projects handled currently: Solar panels installation is in planning stage on Johanneberg science park building.

Johanneberg Science Park

Johanneberg Science Park was formed by Chalmers University of technology foundation and city of Gothenburg with the aim to develop an environment which stimulates collaboration between academia, industry and other players in society at Chalmers Campus Johanneberg. JSP brings industry closer to educational vicinity for mutual benefit. JSP is owned by many stakeholders such as Chalmers University of Technology Foundation, The City of Göteborg AB Volvo, Beng Dahlgren, Göteborg Energi, Peab Sverige AB, Riksbyggen Skanska AB Tyréns AB and White arkitekter AB.

Persons responsible for different fields Ulf Östermark - Open Arena Energy Maria Ådahl -Open Arena Urban Development Mats Bergh - Open Arena Material



Figure20 Open arena connecting different actors (JSP official website)

4.4 SOLAR PROJECTS ON CHALMERS CAMPUS

Contacting different stakeholders on Chalmers campus gave an understanding of different solar projects that were taking place during the time of interviews. Here are some of the solar projects details gained from different stakeholders. These project details are collected by connecting web of stakeholders and it is not necessarily that all stakeholders involved in solar projects are aware all the solar projects happening on the campus.

Project	Description	Stakeholders	Scope
Photon Fission and	The aim of the	Maria Abrahamsson	Research
Fusion: Beyond the	project is to increase	Bo Albinsson	
Limits of	the efficiency of solar	Kasper Moth-Poulsen	
Conventional Solar	panels by increasing		
Energy Technologies	the photon absorbing		
	rate.		
Kraftcentralen	AH bought PV	Per Löveryd	Installation
PV installation	modlues from	Akademiska hus	
	different suppliers and		
	the installation is		
	plnned on		

	Kraftcentralen		
Student Union	Chalmers	Magnus Wennergren	Pre-study
building PV	environmental unit		
installation	invited consultancy to		
	do pre-study on PV		
	installation on Student		
	union building		
Solar panel installation	Plan to install solar	CFAB	Planning phase
on science park	panels on		
building	Johanneberg science		
	park buildings		
Solar test bed	Connecting different	Many stakeholders	Collaborative
	actors together for	involved organized by	project
	solar research,	VINNOVA	
	innovation and market		
	penetration		

Table 1 Solar projects on campus

4.5 DIFFERENT GROUPS INVOLVED IN ENERGY ON CHALMERS CAMPUS:

There are different actors and groups that handle different aspects of energy on campus some of them are building owners such as Chalmersfastigheter and Akademiska hus and some them are groups that are formed to improve the energy consumption and efficiency. The groups stated below are not the right representation of number of groups around Chalmers campus. These are groups that were identified during the interviews.

Chalmers campus development group

The aim of Chalmers campus development group is to create vibrant campus with good conditions for the exchange of knowledge and creativity. Different stakeholders involved with different field of interest some of the key people are

Anna Eckerstig -Head of Department Project & Development at Chalmers Fastigheter AB Alf-Erik Almstedt- Vice President of Chalmers responsible for Chalmers research and research education

Anders Ådahl- Energy, Area of Advance Director

Energy group

Energy group was formed by Ulf Östermark along with people who are involved in energy on Chalmers campus. This group's main purpose is to meet twice or thrice in a month to discuss about ongoing advancement in energy on Chalmers campus and also discuss about future plans related to energy on campus.

Primary persons involved in energy group are

Ulf Östermark, Johanneberg science park

Per Löveryd, Akademiska hus Magnus Wennergren, Chalmers University Jan-olof dalenback, Chalmers University Bengt Bergsten, Chalmers fastigheter

EPOC- Energi på campus

Energy on campus is a newly established initiative at Chalmers whose purpose is to develop the Chalmers campus as a test bed for new smart energy solutions in an urban environment. EPOC handles projects in both existing and new construction infrastructure, and include research, training and demonstration projects. Examples of approved or ongoing projects are the Chalmers Energy Central(Kraftcentrallen), ElectriCity and HSB Living Lab. Initiated and led by Ulf Östermark on Johanneberg Science Park and Jenny Forshufvud. EPOC's role is to identify needs and opportunities within Chalmers Energy-related activities and pair them with the right actors in academia, industry and the public sector.

4.6 INTERVIEWS WITH STAKEHOLDERS

Stakeholders interviewed during the Phase2 include different fields such as Academia, Industry and government. The stakeholders interviewed during Phase2 are as follows. Detailed explanation of the interviews with main stakeholders will be discussed in the empirics and rest in appendix 2

Stakeholder	Organization	Position	Scope
Jenny Forshufvud	Chalmers Area of advance- Energy	Industrial and vice program leader for energy on campus	Academy
Ulf Östermark	Johanneberg science park	Director of open arena energy	Academy/Industry
Per Löveryd	Akademiska hus	Energy strategist	Industry/Government
Magnus Wennergren	Chalmers University	Environmental coordinator	Academy
Maria Abrahamsson	Chalmers University	Assistant Professor, Chemistry and Chemical Engineering	Academy
Kasper Moth- Poulsen	Chalmers University	Associate Professor, Chemistry and Chemical Engineering	Academy
Bengt Bergsten	Chalmersfastigheter	Energy strategist	Industry
Georgios Georgiadis	Chalmers University	Post doc, Computer science and engineering	Academy
Alf-Erik Almstedt	Chalmers University	Vice president	Academy
Jan-Olof Dalenbäck	Chalmers University	Professor, Civil and Environmental Engineering	Academy
Peter Kovacs	SP Technical	Research engineer/	Government

	Research Institute of	Project leader	
	Sweden		
Sven Wolf	Solkompaniet	Business	Industry
		Development	
		Manager/ Board	
		member	

Table2 Stakeholders interviewed in total of different organization

4.6.1 MEETING WITH AREA OF ADVANCE (ENERGY):

Jenny Forshufvud: Industrial co-ordinator and vice program leader for Energy on campus. Handles many projects related to energy

The interview with Jenny was based on the understanding of her role in energy on campus and various connections with different groups that handle projects related to energy. Jenny's role is to facilitate and co-ordinate different research projects that are related to energy and provide guidance to researchers. The idea of this interview is to understand Jenny's perspective of energy on campus and perspective about solar energy in particular. This is second interview with Jenny as the previous interview held during Phase1 was to understand the system and roles of different actors and the challenges that prevail in the system (Chalmers campus). The interview also helped to learn more about different groups such as campus development group and energy group.

Snowball sampling: The interview was helpful to gain more contacts relevant to the study and also stakeholders who were involved in solar projects. The contacts gained from the interview were

Maria Abrahamsson- Assistant Professor; Chemistry and Chemical Engineering, Physical Chemistry

Kasper Moth-Poulsen- Associate Professor; Chemistry and Chemical Engineering, Applied Chemistry

Торіс	Views
Vision for sustainable energy on campus	Solar power on campus, efficient use of energy, efficient energy distribution systems
Key stakeholders for major decisions	Chalmersfastigheter and Chalmers management
Stakeholders required in solar projects	Solar power industries collaboration with university
Support from key stakeholders	Chalmers management- Policy and financial support Energy area of advance- research and technology
Stakeholder without positive influence towards solar	Did not mention any because of sensitivity of the question
Number of stakeholders in collaboration at the moment	Satisfactory and positive
Awareness about solar projects on campus	Limited to projects she was part of

Table 3 Meeting with area of advance (energy)

4.6.2 MEETING WITH JOHANNEBERG SCIENCE PARK

Ulf Östermark – Director of open arena energy, Johanneberg science park

"It is embarrassing to know that Chalmers still don't have any solar panels on the roof when most of the universities in Sweden do"- Ulf Östermark

The interview with Ulf was motivated towards understanding the position of Johanneberg science park role in energy on Chalmers campus. Ulf role as director of open arena energy is to act as a facilitator to bring the three aspects of the triple helix that is academia, public and private sector together to achieve common goal in terms of sustainability. Ulf is member of energy group and also one of the brains behind the group formation. Ulf is also part of project that is trying to reduce the campus building energy consumption and increase the efficiency of energy use. The interview helped to understand the energy prices around Sweden and how the lower energy prices of conventional production hinders the renewable energy growth. Ulf also gave a picture of Johanneberg science park role in connecting the different actors of the society and how his role as a facilitator helps to communicate with different actors and bring them together in solving the current sustainable problems.

Snowball sampling: The interview was helpful to gain more contacts relevant to the study and also stakeholders who are involved in solar projects. The contacts gained from the interview were

Bengt Bergsten- Energy Strategist, Chalmersfastigheter Per Löveryd- Energy Strategist, Akademiska hus Ola Carlson- Professor, Energy and Environment, Chalmers Eva-Karin Gillander- Development manager, Göteborg Energi AB

Торіс	Views
View about sustainable energy on campus	Adhering to KPI in terms of sustainable
	measures.
Vision for sustainable campus	Similar vision to Chalmers vision
Stakeholders required in solar projects	Chalmers top management involvement
Support from key stakeholders	Chalmers management should support
	financially
Stakeholder without positive influence	None as most are interested but bound by
towards solar	different priorities
Current challenges in solar installation on	Lack of financial support from Chalmers
campus	management
Awareness about different solar projects on	Limited as there is no specific forum as of
campus	now to learn more about different projects
Number of stakeholders in collaboration at	Sufficient to identify the leverage points and
the moment	move towards change

Table 4 Meeting with Johanneberg science park

4.6.3 MEETING WITH AKADEMISKA HUS

Per Löveryd- Energy Strategist, Akademiska hus

The interview with Per Löveryd was motivated to understand the role of AH on Chalmers campus when it comes to energy. The interview shed light to understand how AH sees Chalmers as a customer and partner in the activities that are taking place on Chalmers campus. Per discussed about the current solar panel installations on AH buildings and also discussed about the negotiation with Chalmers about selling the solar power post installation. Per also discussed about energy group meetings and the lack of potential researchers that should be included in the energy group to benefit from each other. One other important aspect learned was how energy group gives more leverage to clarity when it comes to energy plans that are discussed during the meetings. The meeting gave a clear view about AH perspective about Chalmers and CFAB when it comes to solar energy on campus. Per also discussed about benefit of knowledge sharing in collaboration and how it can help in terms of economy during solar panel installation.

Snowball sampling: The interview was helpful to gain more contacts relevant to the study and also stakeholders who are involved in solar projects. The contacts gained from the interview were

Торіс	Views
View about sustainable energy on campus	Collaboration in all sustainable projects on campus
Vision for sustainable campus	Similar vision to AH vision
Stakeholders required in solar projects	Chalmers top management involvement and CFAB
Support from key stakeholders	Chalmers management and CFAB
Stakeholder without positive influence towards solar	Chalmers Management as they prioritise financial aspect
Current challenges in solar installation on campus	Lack of financial support from Chalmers management and also lack of support for AH projects from other stakeholders
Awareness about different solar projects on campus	Limited to AH and some Chalmers projects as there is very minimal collaboration taking place
Number of stakeholders in collaboration at the moment	Satisfied with AH projects but expecting more collaboration from Chalmers and CFAB when it comes to projects on Chalmers campus
Benefit of collaboration in solar projects	Better knowledge transfer among stakeholders
Difficulties in collaboration	Most of the time have to contact Chalmers through CFAB

Ola Carlson- Professor, Energy and Environment, Chalmers Jan-Olof Dalenbäck, Professor, Civil and Environmental Engineering

Table 5 Meeting with Akademiska hus

4.6.4 INTERVIEW WITH CHALMERSFASTIGHETER

Bengt Bergsten- Energy Strategist, Chalmersfastigheter

Interview with Bengt was motivated to understand the role CFAB when it comes to energy use on Chalmers campus. Interview with Bengt helped to understand the different measures Chalmers and CFAB handled in terms of reduction in use of energy on Chalmers campus and also different studies conducted to see the feasibility of solar installation on Chalmers campus. Bengt discussed about the importance of efficiency in energy consumption and how it sometimes outweighs the importance of installing new renewable energy source. The interview also gave a clear picture of Chalmers and CFAB priority when it comes to solar panel investment as both prefer financial benefits and prioritize the economic value more than the others.

Snowball sampling: The interview was helpful to gain more contacts relevant to the study and also stakeholders who are involved in solar projects. The contact gained from the interview was

Торіс	Views
View about sustainable energy on campus	High efficiency in energy consumption and well-being of end user
Vision for sustainable campus	Similar vision to CFAB vision
Stakeholders required in solar projects	Chalmers top management involvement and CFAB
Support from key stakeholders	Chalmers management and CFAB
Stakeholder without positive influence towards solar	None, most are interested but the progress is halted by time constraint and priority for other projects
Current challenges in solar installation on campus	To decide whether to invest in solar energy or improve the current energy efficiency
Awareness about different solar projects on campus	Limited to CFAB projects and projects discussed during energy group meeting
Number of stakeholders in collaboration at the moment	Satisfied with the current collaboration but very limited time for further collaboration activities.
Benefit of collaboration in solar projects	Better knowledge transfer among stakeholders but different priorities hinders collaboration.

Jan-Olof Dalenbäck, Professor, Civil and Environmental Engineering

 Table 6 Interview with Chalmersfastigheter

4.6.5 INTERVIEW WITH RESEARCHER AT CHALMERS

Kasper Moth-Poulsen- Associate Professor; Chemistry and Chemical Engineering, Applied Chemistry

After gaining information from Jenny about Kasper and the project he was part. I met Kasper in his department premise. Interview with Kasper was based on the understanding about the solar project he worked on, which is to improve the efficiency of solar energy systems. Interview with Kasper shed light on previous attempt to create common forum for solar energy (chalmerssolar.org) and the demise of the forum due to lack of support. The interview also helped to understand the perspectives of researchers' and how the lack of transparency in the system hinders the awareness about different solar projects happening on the campus.

Торіс	Views
View about sustainable energy on campus	Not relying on fossil fuels
Vision for sustainable campus	Similar vision to Chalmers
Stakeholders required in solar projects	Funding agencies and researchers
Support from key stakeholders	Innovation office helping with patent for researchers
Stakeholder without positive influence towards solar	Chalmers Management as they prioritise financial aspect
Current challenges in solar as a researcher	Lack of solar panels on campus for data collection and have to rely on source outside campus
Awareness about different solar projects on campus	Limited to projects handled as no common forum to know more about other projects
Number of stakeholders in collaboration at the moment	Satisfied with current collaboration and willing to collaborate with more stakeholders to understand more about different solar projects
Idea for better collaboration and raising awareness	Separate section for solar projects in Chalmers Journal

Table 7 Interview with researcher at Chalmers University

5 Analysis

5.1 BACKGROUND

This Chapter will discuss and evaluate the qualitative data gained through the interviews and dialogue. The chapter begins with mapping the stakeholders by organization or group and then mapping by individuals. Following to the stakeholders mapping the chapter will discuss the different potential of the stakeholders based on organization and then by individuals. Continuing with that the chapter will discuss the stakeholders' dialogue process and its outcomes followed by the reflection of the dialogue process. Stakeholders analysis in general helps when the stakeholders involved in a study is huge but in this study the stakeholders analysis is used to understand the position of different stakeholders and their potential that could influence sustainable transition on Chalmers campus.

5.2 STAKEHOLDER IDENTIFICATION AND MAPPING

Stakeholder identification started as early in the project during the Phase1. During Phase1 of the project challenges in the system were explored then by having those challenges as reference stakeholders connected with the challenges were explored. Snowball sampling method was used to connect the web of stakeholders connected with the challenges. The challenge found earlier in the process was lack of solar energy usage in Chalmers campus, and then stakeholders connected with energy on campus were identified and contacted. Though there are many stakeholders connected with energy on Chalmers campus only selective stakeholders were contacted based on the importance and also their role towards sustainability. As part of challenge lab process its effective to connect with stakeholders who are seen as a change agent, thus by pressing that leverage point the probability of sustainable transition increases.



Figure 21: Stakeholder connection on Chalmers campus based on group or organization (line between stakeholders indicate 2 way communication)

Chalmers University is connected with AH by CFAB. Decisions and various management suggestions to Chalmers go through CFAB. Though there are some direct connection between AH and Chalmers most of the key decisions are passed through CFAB. In general

there are many industries connected to Chalmers on various fields directly but when it comes to energy, especially new changes in the energy system or research and innovation in energy field, Johanneberg Science park plays an important role in connecting Chalmers with the industry. Some of the key examples of Johanneberg Science Park's role in connecting industry and chalmers are projects such as HSB living lab, ElectriCity and Frihamnen project. Johanneberg Science Park plays a role of facilitating the initial relationship with industries and Chalmers.



Figure22 Stakeholder connection on Chalmers campus based on Individual related to energy; Blue- Academy, Green-mixed, Red- Industry and Grey- Government

Names vs Roles: Individual stakeholder map was formulated based on names rather than stakeholders' roles. The reason behind this mapping was to understand the exact connection between the stakeholders. The interviews with stakeholders made clear that the roles are not the right representation of the influence each individual have when it comes to energy on campus. For example, Prof.Jan-Olof influence inside Chalmers campus is not the right representation of his influence in solar industry in general.

As mentioned earlier only selected member of stakeholders were interviewed and used in this thesis to understand the common perspective about the existing challenges. Ulf represents the Johanneberg Science park energy sector. Ulf connects the researchers, faculties and students who are part of Chalmers with different stakeholders in industry sector and also other stakeholders inside Chalmers campus such as AH and CFAB. Ulf plays a key role in connecting different players related to energy. In addition to this, Per, Ulf, Magnus, Jan-Olof and Bengt are connected by a common interest and group.

5.3 STAKEHOLDER ASSESSMENT

After finding different stakeholders and mapping them based on the connection with different stakeholders, stakeholder assessment was done based on the information gained from the interviews. Harm and help potentials are based on the influence a stakeholder can make as an individual and group in the organization decisions and activities. Harm potential does not necessarily mean the stakeholder is harmful, it represents the potential harm that stakeholder a can inflict in an organization.

High	Researchers Johanneberg science park Solar Industry	Akademiska Chalmers fas	Hus stigheter
potential	Chalmers Students		
Low		Government Institution	and public
	Low H	arm otential	High

Figure23 : Stakeholder assessment based on Organization or group

Firstly the potential of stakeholders as an organization or groups was analysed then prioritized based on individual level. When it comes to energy particularly solar energy AH and CFAB plays a major role, as AH and CFAB holds the potential to invest in new solar technologies and also installation on Chalmers campus. AH installed solar panels on many universities all over Sweden which gives them experience when it comes to installation. CFAB has help potential to connect researchers with AH, currently they act as a middle man between Chalmers and AH. Both AH and CFAB has huge potential to help each other and also other stakeholders on Chalmers campus. Though AH and CFAB attitude towards solar energy is generally positive they still have the potential to harm any major decisions that can take place on Chalmers campus. JSP has high help potential but not so high Harm potential. JSP can connect public and private sectors to Chalmers campus but when it comes to influence, major decisions on Chalmers campus are taken by AH or CFAB. Chalmers students are placed in the 3rd quadrant because students in general who are not part of energy or who are not connected to research work have very little influence towards major decisions; the reason could be priorities and lack of awareness about changes happening around campus. Government and public sector has very moderate influence over the decisions that are taking place inside Chalmers campus but they have the potential to hinder those decisions that are already taken by legislation or laws.

Stakeholder	Help Potential	Harm Potential	Attitude	Stakeholder Category
Maria Abrahamsson	High	Low	+	Positive Marginal
Magnus Wennergren	High	High	+	Positive Key Player
Sven Wolf	Low	Low	+	Positive Marginal
Per Löveryd	High	High	+	Positive Key Player
Bengt Bergsten	High	High	+	Positive Key Player
Ulf Östermark	High	Low	-	Positive Key Player
Jan-Olof Dalenbäck	High	Low	+	Positive Key Player
Georgios Georgiadis	High	Low	+	Positive Marginal
Kasper Moth- Poulsen	High	Low	+	Positive Marginal
Jenny Forshufvud	High	Low	+	Positive Key Player
Peter Kovacs	Low	Low	+	Positive Marginal
Alf-Erik Almstedt	High	High	+	Positive Key Player

Table8 Stakeholders prioritization individually based on their influence on Chalmers campus related to solar energy; *Red-* Highly influential, *Yellow-* Moderate, *Green-* Low

Individuals who are connected with research such as students and researchers have very little influence towards management decisions and also funding towards solar research and installation on Chalmers campus. But these players still hold a considerable amount of influence in technical part of the decisions taken by the management and thus they are Positive marginal and represented in green. Jenny and Magnus are considered to be positive key players yet still lack considerable amount of power to influence major decisions. The individuals represented in Red are people who are highly important for management to taken into consideration given their potential to both help and harm any major decisions thus represented as positive key players. The attitude of stakeholders are generally positive expect for Jon-Olof. The reason for this is, the perspective of Jon-olof on Chalmers management right now is not positive and thus the trust between both parties are considerably lacking.

5.4 DIALOGUE WITH STAKEHOLDERS AT CHALLENGE LAB

After having interview with all the stakeholders, availability and willingness of all stakeholders for dialogue were compiled and APRIL27th (1-3PM) was the date and time that most of the stakeholders could agree upon. Though the participants were less than original number of stakeholders interviewed, the mixture of different fields of participants made the dialogue successful event. Dialogue participants were Per Löveryd from Akademiska hus, Magnus Wennergren from Chalmers environmental unit, Jenny Forshufvud from EPOC, Ulf Östermark from JSP, Georgios Georgiadis from Chalmers, Sven Wolf from Solkompaniet, David Andersson from Challenge lab, Siddharth Radhakrishnan from CSS, Eduardo Navarro from Challenge lab, Daniella Mendoza from CSS, Guillermo Sibend from Challenge Lab and Konstantin Mina from Challenge lab. Dialogue was facilitated by me and also initiated by some generic questions.



Figure24 Participants taking part in Dialogue at Challenge Lab

Dialogue started with Check-in, introducing oneself and their background. Topics discussed during dialogue were related to energy on Chalmers campus. Topics were focused on challenges in general related to energy on campus rather than specific to give equal opportunities for all the participants in the conversation. This did not stop the participants to talk about specific topics such as energy measurements, solar panel installation and top level management involvement in the collaborative activities. Some of the stakeholder such as Ulf, Per and Sven couldn't able to take part in the whole allotted 2 hour time limit but yet there were many important topics and ideas were explored during their presence. The Dialogue was part of trust building activity as part of stakeholder engagement process. The dialogue was concluded with a check out asking about participant's reflection and take-in from the dialogue.

There were many topics discussed during the dialogue but the sources of all topics were based on a generic question fed in at regular intervals. Questions asked and different answers and perspectives by participants shared were

What comes to your mind first when I say energy on campus?

Ulf answered with saying it is a Very open idea; many things can prosper along to each other. Magnus discussed about different challenges with work as campus as a whole, and brushed some topics on Energy production, education, research opportunity to work together and Solar cells, heat pumps, biofuels. Jenny discussed about politicians visit to the campus and their interests on Chalmers campus and projects on Chalmers campus. The dialogue was then turned towards energy measurements on Chalmers campus when Per and Georgios talked about different projects that focused on measuring energy usage on Chalmers campus.

What is working well in terms of sustainability?

Most participants accepted that dialogue is working well among them but still said the main concern was the lack of involvement by top management during the dialogue, stops the idea generated during the dialogue in early stages. Ulf talked about different projects of Energy Area of advance that are in pipeline. Per talked about how the value of investment is negligible for sustainable investment when the total investment of the project is considered. Georgios brought the importance of BIG DATA and how to make use of the sensors that are already installed on Chalmers campus buildings.

How can students contribute on the projects and how to know what is going on related to energy on campus?

This question was brought up by one of the CSS member, to understand the role of students on Chalmers campus and how they can influence the management towards sustainable transition. There were many inputs shared by different stakeholders. Ulf suggested frequent workshops related to sustainability on campus would grab the attention of top management and also he gave an example of how CSS managed to make Chalmers disinvest on oil companies. Some of the unorthodox ways of grabbing attention such as flash mob and sketch shows were also discussed.

5.5 REFLECTIONS ABOUT DIALOGUE FROM STAKEHOLDERS

To analyse the dialogue process based on the stakeholder engagement theory, reflections and feedback about dialogue process and my own performance as a facilitator were asked to stakeholders who took part in the dialogue. The following table explains the reflection of the stakeholders and also the main take aways from dialogue .

Stakeholder	Reflection about Dialogue	Gained from dialogue	
Sven wolf	 Better understanding of complexity of Chalmers organization Exposure to AH solar pv installation 	Follow up meeting with Georgios to work together on topics discussed during dialogue	
Magnus Wennergren	• Importance of the energy efficiency topic among the stakeholders	Importance of incorporating data measuring hubs in the existing energy system	
Per Löveryd	• Helped to understand different perspectives and AH role to help others on campus	Importance of Energy on campus discussion among Chalmers campus stakeholders	
Jenny Forshufvud	 Missed top management in the dialogue Helped to understand different perspectives 	Not quite sure about what gained as most of the participants are connected daily and topics of dialogue was discussed couple of times during the daily meeting.	
Ulf Östermark	 Helped to talk personal experiences about solar energy Opportunity to gain new contacts 	Follow up with Georgios and also contacts gained from Georgios regarding Information technology mainly BIG DATA	
Siddharth Radhakrishnan	 Better understanding about Chalmers campus Importance of middle level and low level players on Campus 	Helped to discuss some of the dialogue topics on CSS board meeting	

 Table9 Reflections of Stakeholders about dialogue

5.6 ANALYSIS OF DIALOGUE BASED ON THE PROCESS AND REFLECTION

As part of stakeholder engagement process discussed in the theoretical framework, reporting to stakeholders after an event and analysing the process based on the feedback received from the stakeholders are important. 2-3 weeks post dialogue, stakeholders were contacted and asked questions about dialogue that would reflect the importance of the dialogue and also recuperation the dialogue had on their usual collaborative activities. The questions framed were in a way to understand the difference in the stakeholder's network and also changes in the perspectives pre and post dialogue. Some of the stakeholders expressed that the relationship between them got strengthened post dialogue as the dialogue brought some wide topics which dint fall in the agenda of their usual meetings. For example, Magnus pointed out the importance of understanding the energy efficiency measures in researcher's perspective which was of less priority in the energy efficiency activities taking place in the campus. Some stakeholders who took part in the dialogue tried to meet after dialogue to discuss about the topics that were brought up during the dialogue and also to discuss about their own projects. Georgios and Sven met days after dialogue to discuss about the current projects they were part of and also future planned projects.



Figure25 Changes in stakeholder map post dialogue

Note: Arrows with pink glow represents new connection and arrows with blue glow represent the strengthened relationship between stakeholders.

Chapter 6 Discussions and Conclusion

6.1 DISCUSSIONS

This section analyses the whole Challenge Lab process and the also the study conducted during the Phase2 of the thesis.

6.1.1 CHALLENGE LAB PROCESS

The Challenge Lab process helped me to understand different ways to work towards sustainable future along with 13 master students of different departments. The notion of understanding the current situation and finding the problem by ourselves rather than problem being handed to us(C-lab students) was efficient method to understand the system on a whole. This method gave me more leverage to look at the system with different perspective and also an opportunity to look at different problems at the same time and trying to relate those problems with my own field of interest. Though at first I was critical about the time it took me to find a research question, later I understood the importance of spending more time on finding the exact problem before jumping to wrong judgements.

Among many, Inside-out approach was one main takeaway for me in the whole Challenge Lab process as it helped me understand my own potential and way to channel my strengths. Inside-out approach also helped to narrow down my research area as solar energy in particular has vast borders and many complications to look into. Preparatory course (Leadership for Sustainability Transitions ENM145) before Challenge lab process helped me understand the whole process much better in a short time. Stakeholder meetings during the Phase1 of Challenge Lab gave me good understanding about the current projects and people involved in those projects which helped later in finding the right stakeholders apart from the snowball method used.

Workshops on self-leadership and dialogue helped me understand the process much better than reading it on theory; particularly dialogue workshop with Martin Sande (2014) helped me facilitate stakeholder's dialogue during Phase2 of my thesis. Though it is really hard to incorporate all tools learned into the scope of a single master thesis, it would be really helpful to start the Phase1 bit earlier such a way students could understand how to connect those tools in their master thesis.

The Process of looking at the bigger challenges and then narrowing it down to regional and local level helped me understand the problem intensity at different levels and also the different implications of same problem at different levels.

One of the aims of Challenge Lab process is to connect students of different fields of study to work together on bigger sustainable challenge. This year the common theme given to us was 'Sustainable Urbanization'. During criteria and vision formulation during the Phase1 Challenge lab students benefited from each other and understood the importance of collaboration but later in Phase2 not many felt the collaboration was of same level as Phase1. It would be helpful to incorporate some ways to collaborate till the end of the whole study. The lack of collaboration with many during Phase2 sometimes made me feel disconnected with the common theme of 'Sustainable Urbanization'.

6.1.2 STAKEHOLDER COLLABORATION

The interviews with most of the stakeholders were semi-structured and were mainly motivated to understand the perspective of the stakeholders. The discussions of the study and recommendations are based on the qualitative data collected during the interviews. The perspectives of different stakeholders discussed are based on the data collected during the dialogue and interviews. This study tries to show the different potential for collaboration through backcasting process and tools that were introduced in Challenge Lab process.

It would be an understatement to say there are no collaboration activities happening on Chalmers campus. For example: Chalmerssolar.org, a website formed couple of years back as an information source about different solar activities that were happening in and out of Chalmers campus. The website is inactive currently due to lack of funding for maintenance and also lack of interest in such a collaborative activity. Lately on Chalmers campus, as suggested by many stakeholders, interest towards solar initiative has been increasing and some of the stakeholders felt reinitiating chalmerssolar.org would be a great asset to support such initiatives and also induce collaboration among these initiatives. One other important factor learned during the stakeholder meeting was to add more stakeholders in energy group as suggested by one of the member of the group. As learned from the stakeholder interview the current mix of members of energy group could benefit even further by including more researchers in energy field.

Apart from learning that different groups were formed to improve the collaboration of energy related activities it was also interesting to learn some of the motives behind the stakeholders mix that were chosen in these groups. One such example was indirect involvement of AH in campus development group even though AH has a strong presence in Chalmers campus. The main reason for no direct connection with the group was risk of losing the relationship when the group talks about economic prospects of different projects.

The interviews with stakeholders also gave a clear understanding of the exact influence each stakeholder hold irrespective of their role on Chalmers campus. The interviews shed light on different development group on Chalmers campus and also stakeholders connected with those groups. The dialogue between stakeholders brought many interesting topics onto discussion and served the purpose of building relationship and improving trust mong stakeholders.

The stakeholder analysis and assessment based on the qualitative data gave an understanding of different influence each stakeholder has, as an organization and as an individual in Chalmers campus.

6.2 CONCLUSION

This chapter concludes the thesis by all the process and findings done from starting of Phase1 to ending of Phase2. Phase1 started with exploring interest areas and then finding the challenges in the interest area that was chosen. The challenge found out after having preliminary interview was lack of collaboration between stakeholders in many solar projects and also lack of awareness among stakeholders involved in those solar projects. To find, if the whole study served the purpose of finding answer to the research question the research question is stated again

How Backcasting can be used as a method to facilitate collaboration between different stakeholders involved in solar projects on the Chalmers campus.

Backcasting steps were followed from start to end of this thesis. First setting criteria for the sustainable future followed by finding problems in the current system, system in this thesis being Chalmers campus and problem being lack of collaboration. During the criteria formulation Challenge lab students worked together on a common theme 'sustainable urban development'.

Post criteria formulation challenge lab students started to focus on different sustainable projects in Gothenburg and some looked outside Gothenburg. Students tried to contact stakeholders involved in projects which reflected students' area of interest. The area of interest behind this thesis was solar energy. The project that interested me during the early phase was Johanneberg district factor 10. The preliminary interviews with stakeholders involved around Johanneberg district gave a broad understanding of different challenges and perspectives related to solar. The scope was then narrowed down to solar projects on Chalmers campus as the Chalmers campus represented many projects inside Johanneberg district and also the problem found out during those preliminary interviews mainly reflected upon the collaboration between stakeholders on Chalmers campus.

The third step of backcasting is Envisioning future situation which in this thesis is solar panel installation on Chalmers campus by collaborating different stakeholders. The future situation adhered to the criteria set earlier in the challenge lab process.

The final step of backcasting is to find strategies to attain the envisioned future. Dialogue between different stakeholders served the purpose of bringing the stakeholders to common ground to discuss about the current challenges and share the perspectives related to those challenges. The dialogue process also served the purpose of strengthening the existing relationship between some of the stakeholders and also exploring new relationship. Dialogue shed light to some of the topics such as use of big data on Chalmers campus and also students' active involvement in the sustainable events.

6.3 FURTHER RECOMMENDATIONS

During the course of whole thesis many interviews and a dialogue conducted gave enough data to analyse the situation of collaboration activities on Chalmers campus. Some of the key recommendations based on the analysis and outcome of the dialogue were

Strengthen the existing and start new collaboration activities:

Re-initiate chalmerssolar.org: The ideas behind solving lack of collaboration need not to be initiating new collaboration activity; it could also be strengthening and re-initiating the earlier efforts. As supported by some of the stakeholders, using the existing resource could help economically avoiding needs for new collaboration activities. Current collaborative groups need a recheck of the existing member counts as many stakeholders in the current groups have different opinions about the efficiency of the groups and the strength of the groups.

Proper point of contacts and raising awareness:

With very minimal collaboration and lack of proper forum as an information source, many initiatives consume more time, energy and money. The interviews and dialogue with different stakeholders made clear that some of the stakeholders have greater influence yet were rarely contacted. Raising awareness via a common forum or by mail could improve the current activities and also would serve as a starting point for new activity.

Chalmers top management involvement:

Though this title doesn't need any detailed explanation, the problem brought out by many stakeholders multiple times clearly points out there is urgent need of top management involvement in many collaborative activities. It would be cumbersome to involve top management in all activities but involving them in dialogue would be an ideal fit and also strengthen the relationship as the dialogue brings out different perspectives.

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APPENDIX I

Steps framed for dialogue Chalmers Stakeholders Dialogue

Introducing myself, my thesis aim and progress till now.

- Explaining the Dialogue process Need for dialogue, why it is important and clarifying the difference between debate and dialogue.
- Expected outcome- Discussion would help analysis of my thesis and also serve as a trigger point for future collaboration plans and also serve as a better trust building activity.
- As most of the attendees already know each other and meet each other many times , How this dialogue differs from the meeting the stakeholders have: Usual meeting has an agenda such as project oriented and also future plan oriented whereas this dialogue is way to express one's own perspective and ideas rather than having a specific agenda linked to the whole discussion(Reminder mail)
- Check-in Asking people to introduce each other briefly and their expectation from the dialogue

General Questions: (Questions might have partially discussed during individual interviews but this discussion to clear the mis-understandings)

- What comes to your mind when I say 'energy on campus? (General on an educational institution)
- What is already working well on Chalmers campus in terms of sustainability?(Do you have seen other things in different campus that is working well)(Everyone can dicuss their own exp on a campus)
- What are different measures taken to develop the current system even more sustainable in the future?
- What are the Collaborative measures taken in terms energy on campus?
- How can you improve current sustainable measures even further(that are already working well)
- Mention one difficulty to achieve a sustainable campus?(could be technical,social,financial,political ,administrative)
- What are the measures planned or discussed to overcome that difficulty?

Specific Questions:

- Can you tell us about different solar projects involved when it comes to energy on campus (could be Chalmers or any other campus) and how the collaboration works in those projects
- Why aren't there are many solar panels on Chalmers campus, I use many not 'no' because there are some panels used as part of research projects but not fully for electricity generation?
- There have been research done about the feasibility of installing solar panels on Chalmers earlier with positive results in terms of electricity generation, and also plan to install solar panels on Student union building but all these initiatives stopped in

planning phase but dint materialise. What are the measures we can take to see many solar panels on Chalmers campus?

• Energy group and chalmerssolar.org:

Some of the basic functionality of energy group and influence it has on the decisions taken by the management when it comes to energy on campus?

What are the other groups that are connected with energy groups when it comes to energy on campus? (Campus development group)

Do all these different groups formed to tackle the sustainable problems involve different people of different capabilities?

Talk about the Demise of Chalmerssolar.org (Also to see the awareness of this initiative)

APPENDIX II

General questions for the interview

About the interviewee, position and Job description Questions:

- 1. What is a sustainable energy system to you?
- 2. What are the vision and criteria for future sustainable energy systems according to you? (Specially solar)
- 3. What current solar projects are you part of in general, and on Chalmers campus?
- 4. Who are the stakeholders directly involved in the campus solar projects you are part of?
- 5. What kind of collaboration do they have in those solar projects (economic, political, technical, environmental etc)
- 6. In your opinion what other stakeholders are important when it comes to energy(solar) on campus?
- 7. During collaboration in solar projects what kind of support do you expect and from whom?
- 8. Who are the stakeholders you would like to have in your solar projects?
- 9. Did you try approaching them earlier for collaboration and what was the reason they being not part of?
- 10. In your opinion which stakeholder has a great influence when it comes to solar energy on campus but not so interested in solar(person or organization)
- 11. Are you satisfied with the amount of stakeholders you are collaborating right now?

Final question

Are you willing to part of dialogue at challenge lab?

APPENDIX III Interview with researcher at Chalmers

Georgios Georgiadis- Post doc, Computer science and engineering, Chalmers

Торіс	Views				
View about sustainable energy on campus	Self-energy production				
Vision for sustainable energy	Connection beteen micro and macro producers				
Stakeholders required in solar projects	Triple helix together				
Support from key stakeholders	CFAB and Chalmers management				
Stakeholder without positive influence towards solar	CFAB as they have high potential for renewable energy investment yet focusing on energy efficiency				
Current challenges in solar installation on campus and in general	Main challenge is to integrate micro producers with grid. In Chalmers campus not much solar panels to generate data that could be useful				
Awareness about different solar projects on campus	Limited to research projects				
Number of stakeholders in collaboration at the moment	Satisfactory and would like to see CFAB involvement further				
Benefit of collaboration in solar projects	Efficient use of resource and information				

Interview with Solkompaniet

Sven Wolf, Business Development Manager, Solkompaniet

Торіс	Views				
View about sustainable energy on campus	Significant role of solar energy				
Vision for sustainable energy	Zero carbon foot print				
Stakeholders required in solar projects	governmental institutions and academia combined				
Support from key stakeholders	Politicians and governmental institutions				
Stakeholder without positive influence towards solar	Current Swedish policy makers				
Current challenges in solar installation on campus	Not much awareness about the complexity of the organization for an outsider to approach				
Awareness about different solar projects on campus	Not aware of solar test bed and many other solar projects				
Number of stakeholders in collaboration at the moment	Satisfied outside Chalmers but very limited connection with Chalmers				
Benefit of collaboration in solar projects	Economically and environmentally				

Interview with Professor, Civil and Environmental Engineering

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Jan-Olof Dalenbäck,	Professor,	Civil and Envi	ronmental	Engineer	ring, (Chalmers U	University	
				0	U			

Topic	Views
View about sustainable energy on campus	Abundant potential in solar field need to used
Vision for sustainable energy	Not quite clear when it comes to Chalmers campus
Stakeholders required in solar projects	Chalmers top management active involvement
Support from key stakeholders	AH as they take part in many collaborative projects at different universities around Sweden
Stakeholder without positive influence towards solar	Chalmers top management and CFAB
Current challenges in solar installation on campus	Chalmers management is reluctant to invest in solar energy and very little transparency
Awareness about different solar projects on campus	Limited to research projects as no common forum to connect with other projects
Number of stakeholders in collaboration at the moment	Involved in Solar test bed outside campus and also some of research projects inside campus.