

# CHALMERS



## WHAT DOES IT TAKE FOR A BUILDING CONSTRUCTION COMPANY TO SYSTEMATICALLY WORK ENVIRONMENTALLY?

*-A study of internal stakeholders' perspectives on environmental management systems*

Master's Thesis of the Master Programmes' Industrial Ecology and Environmental  
Measurements and Assessments

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Gothenburg, Sweden 2013  
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What does it take for a building construction company to systematically work environmentally?

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## **ABSTRACT**

Globally an increasing number of larger organisations devote substantial time and resources to environmental management today and the natural environment has come to be one of the most important aspects of an organisation's business (Henriques & Sadorsky, 1999). Requirements are today put forward by authorities, clients and other stakeholders concerning more environmental-friendlier products and processes and are expected to be even more far-reaching in the years to come (Andersen & Neergaard, 2005). Implementation of various environmental management systems is today a commonly used tool for organisations in order to improve their overall environmental performance and also a reply on the authorities and external stakeholders growing demands on an active environmental work (Ammenberg, 2004). Regardless of this development, many organisations within the building construction sector are reluctant to implement an environmental management system due to the perception that the implementation and operation of such a system involves expenses only. Today the building construction and real estate sector accounts for a significant part of Sweden's total environmental impact (Eco-Cycle Council, 2010), which clarifies that companies in the building construction sector should not be submitted without responsibility of changing the negative trend of being a huge contributor to negative environmental impacts.

This masters' thesis is studying a single building construction company named Byggnads AB Tornstaden that is in the process of implementing an environmental management system. The first aim of this study is to investigate how the company's internal stakeholders commit to environmental issues and their future work with the environmental management system. The first question that guided the research was: What does it take for a building constructing company to work environmentally? Additionally, this study aimed to help the company perform an initial environmental review and therefore the second question to guide the research was: What are the significant environmental impacts Byggnads AB Tornstaden contributes to?

In order to answer these questions different data collecting methods have been used including literature reviews, an interviews study, observations, assessment of internal documents and a workshop with the internal stakeholders was held.

This masters' thesis study concludes that negative attitudes towards environmental work must be changed in order to improve the company's current environmental performance and to increase commitment towards environmental work among the internal stakeholders. Further in order for Byggnads AB Tornstaden to get committed internal stakeholders and to get a sustainable environmental work, they have to implement shared environmental values, a common environmental baseline and give all internal stakeholders the opportunity to influence the future environmental efforts. It was also concluded that if the company are aiming on having a sustainable and long-lived EMS, they must include environmental questions and issues on the agenda. Additionally, environmental practise must be integrated in the internal stakeholders' daily activities to avoid the perception that environmental work is an additional element on top of already pressed working positions; otherwise the environmental work will not be prioritised.

The initial environmental review identified that the majority of the environmental aspects of Byggnads AB Tornstaden's were associated with resource use, education and waste management. This result illuminates the need for education and increased knowledge for the internal stakeholders, in order for them to be able to decrease and mitigate the environmental impact created by the company's activities.

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## **ABBREVIATIONS AND VOCABULARY**

<b>EC</b>	Environmental Coordinator
<b>EMAS</b>	Environmental Management Audits Scheme
<b>EMS</b>	Environmental Management Systems
<b>IER</b>	Initial Environmental Review
<b>LCA</b>	Life Cycle Analysis
<b>NGO</b>	Non-governmental Organisations
<b>Swedish EPA</b>	Sweden's Environmental Protection Agency

# 1 INTRODUCTION

In the last two decades, more and more organisations are realising that management of the natural environment has come to be one of the most important aspects of business (Henriques & Sadorsky, 1999). Requirements are today put forward by authorities, clients and other stakeholders concerning environmental-friendlier products and processes and are expected to be even more far-reaching in the years to come (Andersen & Neergaard, 2005). Implementation of various environmental management systems (EMS) is today a commonly used tool for organisations in order to improve their overall environmental performance and also a reply on the authorities and external stakeholders growing demands on an active environmental work (Ammenberg, 2004).

Regardless of this development, many organisations, especially in the building construction sector, are reluctant to implement an environmental management system due to the perception that the implementation and operation of such a system involves expenses only. Today the building construction and real estate sector accounts for a significant part of Sweden's total environmental impact and according to the Eco-Cycle Council (2010) several investigations confirm that the building construction sector in Sweden stands for approximately 40 % of the total energy- and material use and 10 % of the transports. These numbers clarifies that companies in the building construction sector should not be submitted without responsibility of changing the negative trend of being a huge contributor to negative environmental impacts.

In this study, we are investigating a single organisation's current environmental work and its internal stakeholders' perspectives and understandings of EMS and environmental work. Byggnads AB Tornstaden is a building construction company located in Gothenburg that desires an EMS certificate i.e. ISO 14001. One of Byggnads AB Tornstaden's initial steps when implementing the work of ISO 14001 Standard is to identify their environmental impacts and their most significant environmental aspects. This master thesis will first try to perform the initial environmental review of Byggnads AB Tornstaden and to identify their significant environmental aspects.

According to environmental management literature all types of EMS requires a genuine commitment from the top management and other internal stakeholders in order to function efficiently in a long-term perspective (Ammenberg, 2004; Buzzelli 1991; Sharma, 2000). Accordingly it is important to identify internal stakeholders' view on EMS and their future role within the company in connection to a new management system. A second focus is to analyse the internal stakeholders' perspectives on EMS and also to answer the question; "What does it take for a building constructing company to work environmentally?"

## 1.1 Aim and Objectives

The aim of this study is to investigate how internal stakeholders, in a traditional building construction company, commit to environmental issues in the process of implementing and maintaining an environmental management system, i.e. ISO 14001 Standard. The process will be evaluated with respect to internal negotiations, potential conflicts and sense making of the work. The first question that will guide our research is:

1. What does it take for a building constructing company to work environmentally?

Additionally, this study aims to perform an initial environmental review, therefore the second question to guide our research is:

## 2. What are the significant environmental impacts Byggnads AB Tornstaden contributes to?

In order to answer these questions several research approaches has been made including an interview study, an initial environmental review, observations during field visits and at the Main Office, additionally a workshop with the internal stakeholders was held.

### 1.2 Delimitations

The study is delimited to help Byggnads AB Tornstaden get started with their ISO 14001 application, by identifying their environmental aspects with regards to national and local environmental goals, laws and regulations. The company and all their historical and on-going building projects have exclusively been or are situated in the Gothenburg area and this study will solely perform an initial environmental review of the company. The company itself will manage further steps within the EMS-cycle.

The analytical focus of this study is limited to understand and analyse Byggnads AB Tornstaden's internal stakeholders' perspectives and attitudes towards EMS, its value for their business development and how they can influence future environmental work within the company. The target group of this thesis is limited to internal stakeholders within the company, including the top management more specifically; the CEO, members of the directorate, heads of divisions, site managers and foremen. The collected data used in this thesis have originally been in both Swedish and English and the authors have done all translations.

### 1.3 Outline of Thesis

The first five chapters of this master thesis are necessary for the understanding of the topic and are to be considered as the background of the study, including the chapters; *"INTRODUCTION"*, *"STAKEHOLDER THEORY"*, *"ENVIRONMENTAL MANAGEMENT SYSTEMS"*, *"BUILDING CONSTRUCTION SECTOR"* and *"METHODOLOGY"*.

This subsection is a part of the *"INTRODUCTION"* (chapter 1), which presents the matter of the report; "What does it take for a building constructing company to systematically work environmentally?". The introduction contains a background of the study, the aim and objectives of this master thesis (1.1), followed by 1.2 *"Delimitations"* and 1.3 *"Outline of Thesis"*.

Chapter 2 *"STAKEHOLDER THEORY"* presents a general introduction of stakeholder theory and the concept of primary and secondary stakeholders are specified. Subsection 2.1 *"Internal Stakeholders of an Organisation"* treats in what way various internal stakeholders affect or are affected by an organisation. Subsection 2.2 *"Internal Stakeholders and Environmental Performance"* describes how internal stakeholders can influence and be influenced by an organisations' choice of environmental management strategy, furthermore how companies responds to stakeholder pressures.

Chapter 3 *"ENVIRONMENTAL MANAGEMENT SYSTEMS"* describes the basic concept of EMS tools, and the main steps of the continuous process are briefly described. Subsection 3.1.1 *"ISO 14001 Standard"* describes the concept of ISO 14001 and section 3.2 *"Initial Environmental Review"* focuses on the most important elements of an initial environmental review.

In chapter 4 *"BUILDING CONSTRUCTION SECTOR"* it is introduced how the building construction sector impacts the environment. Section 4.1 *"Byggnads AB Tornstaden"* provides the reader with a short presentation of the investigated company Byggnads AB Tornstaden, including the identification of the company's institutional logics and internal stakeholders.

The “*METHODOLOGY*” chapter (5) aims to clarify why a certain research approach was chosen, how the data was collected and also how the study was conducted.

Chapter 6 “*RESULTS*” summarises and presents the main outcomes of the study in four parts, named “*Results gained from the Interview Study*”, “*Results of Initial Environmental Review*”, “*Observations during Field Visits and at the Main Office*” and “*The Workshop at Byggnads AB Tornstaden*”.

In chapter 7 “*ANALYSIS*” the results of the study are analysed and set into relation to the findings made during the literature review, which forms the base of the conclusions of this study.

Chapter 8 “*DISCUSSION*” talks over how the choice of methodology has affected the outcome of the study and discusses some of the perceived difficulties that appeared along the way.

The final chapter of this thesis; “*WHAT DOES IT TAKE FOR A BUILDING CONSTRUCTION COMPANY TO WORK ENVIRONMENTALLY?*” (chapter 9) highlights and concludes the most relevant findings of the research based on the outcome of previous chapters.

## **2 STAKEHOLDER THEORY**

R. Edward Freeman is one of the pioneers behind the theory of stakeholders and “Stakeholder Theory” is today a commonly used concept among business management scholars. Stakeholders are described as any group or individual who have a stake in or claim on the achievements of the organisation’s objectives (Freeman, 1984).

A Scottish researcher named Max B. E. Clarkson (1995) distinguished between primary and secondary stakeholder groups. Primary stakeholders are the persons that an organisation is more or less dependent on like shareholders, employees, customers and suppliers. If these stakeholders become dissatisfied and withdraw from the company’s system the company will become seriously damaged and maybe unable to continue its operations. Also included in primary stakeholders are public stakeholder groups defined as the governments and communities that provide infrastructures, markets, laws and regulations and to whom taxes and other obligations may be due.

Secondary stakeholders are describes as the persons that can affect or are affected by the organisation, but Clarkson (1995) defines them as not “*engaged in transactions with the corporation and are not essential for its survival*”, such as media and other interest groups (Clarkson, 1995). Secondary stakeholders are further labelled as having an ability to influence public opinions and thereby influence the organisation in a positive or negative way. The organisation is not depending on the secondary stakeholders in the same way as on the primary stakeholders (Clarkson, 1995).

Buyse and Verbeke (2003) present another definition of stakeholders as they distinguish between ‘internal primary stakeholder’ and ‘external primary stakeholders’, where employees, shareholders and financial institutions belong to internal primary stakeholders and customers and suppliers belong to external primary stakeholders.

### **2.1 Internal Stakeholders of an Organisation**

This thesis focuses on the primary internal stakeholders of Byggnads AB Tornstaden, i.e. employees, members of the directorate and top management. According to Freeman et al. (2007) all these stakeholders have the right to not be treated as means of financial purposes, and should therefore participate in decision-making when determining the future of the organisation.

Employees are internal stakeholders of a company because they have a stake of its achievements and its objectives, due to their employments and perhaps their livelihood. Freeman (2004) highlights that in return for the employees labour, they expect security, salaries, benefits and a meaningful work. Furthermore the organisation is expected to carry them through tough times in order to gain their loyalty. On the other hand, employees are expected to follow management instructions, to speak favourably about the company and also to be responsible citizens in the local communities in which the company operates. Top management and members of the directorate have special roles within an organisation, as they both have a stake similar to employees with some form of explicit or implicit employment contract and at the same time a duty of safeguarding the welfare and the health of the organisation. The obligations just described involve keeping the relationships among stakeholders in balance. If imbalance between key stakeholders occurs, the survival of an organisation may be in jeopardy (Freeman, 2004).

### **2.2 Internal Stakeholders and Environmental Performance**

Due to the various stakeholders’ levels of influence, organisations’ environmental work and strategy will either be more or less proactive or reactive. An organisation that is proactive is identified as an

organisation willing to take actions and go beyond what is required according to laws and regulations. Moreover, a reactive organisation is characterized by just sticking to the legislation and regulations (Buysse & Verbeke 2003; Henriques & Sadosky 1999; Klassen & Whybark, 1999).

### **2.2.1 Environmental Strategies**

In 'A natural-resource-based view of the firm' Hart (1995) stresses that businesses will both be constrained by and dependent upon natural ecosystems in the future. Therefore it is likely that business strategies and competitive advantages in the up-coming years will include economic activities that are environmentally sustainable. Further Hart (1995) introduces a conceptual framework composed of three strategies: *pollution prevention*, *product stewardship* and *sustainable development*. Each of these strategies is connected to different environmental driving forces and key resources, in order to achieve economic profits and competitive advantages when integrating the environment in management strategies. An organisation can adapt the *pollution prevention* strategy by minimising and controlling their emissions and effluents, which can be achieved through entrapment, storage, treatment or disposal. Another strategy in pollution prevention is to prevent, reduce or change their emissions and effluents by using better housekeeping, material substitution and recycling or process innovations. The strategy of *product stewardship* aims to minimise the environmental impact of the entire supplier system, which is done by implementing a Life-Cycle-Analysis (LCA) of the organisation's product development process in order to minimise the life-cycle cost of their product. This strategy also suggests that the organisation takes an environmentally proactive position toward raw materials and component suppliers. The third defined strategy *sustainable development* fosters a strong sense of social-environmental purposes, which provides the foundation for the organisation's corporate and competitive strategies. An organisation's efforts towards sustainability therefore imply working over an extended period to develop and organise low- impact technologies (Hart, 1995).

### **2.2.2 Companies response to Stakeholder Pressure**

According to Henriques and Sadosky (1999) stakeholders have the ability to express interest and can influence the practices of an organisation through direct pressure or by render information. The demand from primary stakeholders can be fulfilled in different ways and to different extent according to Freeman and Liedtka (1991), which in turn might influence an organisation choice of adopting a more reactive or proactive environmental strategy. Henriques and Sadosky (1999) argues further in their study that an organisation's level of environmental pro-activeness is related to how high the pressure is from what they call organisational and community stakeholders, i.e. customers, suppliers, employees, shareholders and for example non-governmental organisations (NGO) and other social groups. At the same time they suggest that environmental reactivity is related with high pressure from governments and media (Henriques & Sadosky, 1999). In the Buysse and Verbeke (2003) study, the 'internal primary stakeholders' are argued as the only stakeholders that can motivate an organisation to be environmental pro-active.

Buzzelli (1991) describes the employees as the source of a company's success and survival, and a successful environmental performance requires their participation. If employees share an organisation's set of environmental goals, they are more likely to work towards them (Freeman, 2007). Furthermore, the pressure from employees is significant to whether or not an organisation is committed to environmental issues. Hart (1995) phrases it as "*a dynamic process, highly related to the abilities of the firm's members*" (Hart, 1995).

### 2.2.3 Attitudes and Environmental Work

Several scholars argue that support and commitment from top management is essential for environmental strategies and performance of an organisation (Buzzelli 1991; Sharma, 2000). Other scholars' state that it is not just the top management support and commitment that matters, it is also managers' beliefs, attitudes, perceptions, expectations and opinions that determine how environmental practices will be implemented in an organisation (Fineman & Clarke, 1996).

Attitudes are according to Eagly and Kulesa (1997) "*a psychological tendency that is expressed by a particular unit that are evaluated with some degree of advantage or disadvantage*". This tendency only exists in a person's psychological world and is connected to a specific object and it is not until the attitude is connected to a point of view that it starts to exist (Eagly & Kulesa 1997; Krech 1962). An attitude can be divided into three components; cognitive, affective, behavioural. The cognitive component is based on knowledge, perceptions and other attitudes connected to the specific objective. This will result in an attitude that is either good or bad towards the objective in question. The affective component is based on previous experience, interest and engagement and the response will be connected to feelings of pleasure or discomfort. The behavioural component will decide the level of involvement and is based on intentions, sense of responsibility and the motivations to act. Depending on how the components interact with each other the stability of the attitude will differ. A high interaction between the components will give a stable and strong attitude with a clear ideology (Krech, 1962). This is useful during analyse and to understand the internal stakeholders attitudes toward environmental work.

Stakeholder theory highlights the need for top managers to understand the apprehensions of stakeholders in general, in order to develop objectives with the support from stakeholders (Freeman & McVea, 2001). Freeman and McVea (2001) also suggest that "*managers must formulate and implement processes which satisfy all and only those groups who have a stake in the business. The central task in this process is to manage and integrate the relationships and interests of stakeholders in a way that ensures the long-terms success of the firm*" (Freeman & McVea, 2001). Therefore it is important to understand the internal stakeholder perspectives toward EMS before the implementation process begins. To conclude this chapter, Sharma (2000) stresses that numerous studies evidently points to the fact that environmental attitudes within companies is highly affected by the attitudes of top management and their environmental initiatives.

### **3 ENVIROMNENTAL MANAGEMENT SYSTEMS**

Environmental management system (EMS) is a collective name used for different environmental management programs. Today it exists a number of environmental management tools and systems, such as ISO 14001 and Environmental Management Audit Scheme (EMAS) (Ammenberg, 2004). The introduction of EMS has since the mid-1990s become increasingly common for companies and organisations and has in its present form grown rapidly around the world. According to the database Certifiering.nu (2013) there are currently 4434 EMS certified companies listed in Sweden.

According to Almgren et al. (2003) a good EMS is characterised by implicating the following results/effects, regardless of which EMS tool is used:

- to identify, control and prevent environmental impact;
- to ensure that laws, regulations and environmental standards are followed;
- to improve the environmental performance over time;
- to avoid waste of resources;
- to strengthen the brand of the company;
- to give business advantages.

Implementation of EMS within a company is a voluntary commitment and is generally not acquired by any laws or regulations. Two of the most commonly used EMS tools are ISO 14001 and EMAS, which both contain international specification of requirements for EMS. The implementation of an EMS differs from one organisation to another and it is structured differently in different organisations, whether it is ISO 14001, EMAS or any other system. This is partly due to the opportunities and the commitment for environmental work within the organisation and how well established the environmental management is among the internal stakeholders (Ammenberg, 2004).

According to Gluch et al. (2011) EMS has had a big penetrating power in Sweden and certificates of EMS seem to be the leading action in the building construction sector when it comes to environmental work. Furthermore, ISO 14001 is the most dominating EMS tool in this sector (Gluch et al., 2011). This study focuses on the ISO 14001 Standard because that is the EMS tool the investigated company Byggnads AB Tornstaden have chosen to implement.

#### **3.1 The General Structure of an EMS**

An EMS is a management tool designed to provide a coherent, systematic and structured way of working in an organisation. An EMS expresses how the environmental work within the organisation should be targeted, followed and organised. Further, EMS includes mechanisms on how to review the work, make it more efficient over time and how information should be distributed in order to achieve improved environmental performance. The review and verification process should indicate whether the system itself is suitably structured and if the organisation operates according to the system (Ammenberg, 2004). The basic steps of an EMS are showed in Figure 1.

The first step in the process is to perform an initial environmental review that identifies how the company affects the environment. A further description of this step will be given in subsection 3.2 “*The Initial Environmental Review*”. Based on the outcome of the initial environmental review, the company creates an environmental policy or reconstructs the policy if they have a preliminary one. An environmental policy states how the company should look at the environmental work and how they intend to meet the laws and requirements.

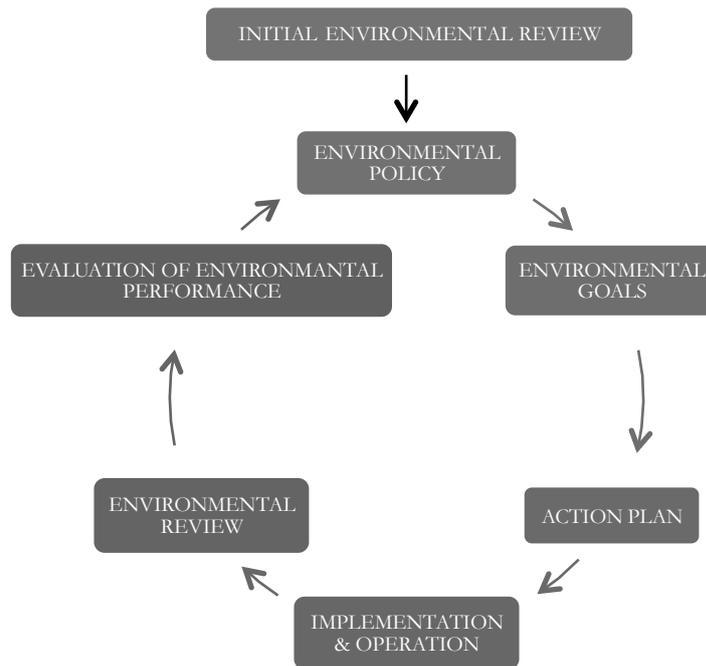


Figure 3. An illustration of EMS's continuous process and its basic concept of constant improvements.

The following step in the continuous process is to develop environmental goals and these should be set at a level such as they are achievable in a relatively short period of time (Henricson et al., 2000). Targets are based on the so-called environmental aspects, which in practice are areas where the organisation affects the environment with their business. Furthermore, the agreed targets must be measurable. An action plan or environment programme is the next step and determines how the environmental targets and the current legislation rules shall be fulfilled.

An important part of the next step '*Implementation & Operation*' is to allocate responsibilities and human resources in order to get the implementation and further work to function as smoothly as possible. When an organisations' environmental work has been implemented for some time, it is time to check the status through assessing the work. In this step of the process an inspection is performed, which controls the company's environmental work, i.e. how the objectives and working methods are followed. The last step in the circle is to make an evaluation of the company's environmental performance. This, together with the environmental review will lead to setting new targets for the next turn in the circle. If the work is following this process, it will lead to continual environmental improvement for the company (Henricson et al., 2000).

### 3.1.1 The ISO 14001 Standard

The EMS of ISO 14001 is part of the ISO 14000 series and is an international standard that support organisations to systematically work with their environmental performance (Henricson et al., 2000). ISO is accountable for the majority of the international standardisations and is an umbrella organisation for national standardisation organisations' in 147 countries. Out of them 70 countries participate actively in the development work of the ISO 14000 series and the technical committee meets annually with the mission to develop the series of environmental management standards. In addition, experts meet worldwide on a regular basis to further develop the system (Almgren et al., 2003).

Today the ISO 14000 series counts for 24 standards in total, where ISO 14001 is intended to provide organisations with the components of an effective EMS and to be integrated with other management requirements to assist organisations to achieve environmental and economic goals in the development work. According to ISO 14001, an EMS should have the following characteristics/effects:

- Reduce the organisations negative environmental impact, caused by their activities, operations, products or services;
- Be structured and possible to integrate with the overall management work and enable engagement at all levels, particularly at top management;
- Contribute to enhance positive environmental impact;
- Be applicable to all organisations, regardless of type, size and geographical-, cultural- or social conditions;
- The system should function well in international trade. (Swedish Standards Institute, 2004)

The ISO 14001 standard does not have any specific minimum benchmark for an organisations environmental performance, when applying for an ISO 14001 certificate. However, focus is on the continuous future improvements of the organisations overall environmental performance and of the commitments determined in their environmental policy (SIS, 2004). Nor does ISO 14001 specify any detailed instructions on how an EMS will look like or function in practice. The reason for this is to enable an organisation to adapt the system to its own organisation, which denotes that a company determines the level of environmental performance for itself, based on their environmental goals. The level chosen is often established primarily on requirements from various external stakeholders e.g. clients or municipality, but also depending on to the organisations' own identified environmental aspects (Ammenberg, 2004). Numerous organisations have recognised the potential with having an EMS and as environmental pressure and engagement in the society have increased so has the number of ISO-certified organisations (Gluch et al., 2011).

Requirements that are defined in ISO 14001 are that the organisation must publish an annual environmental report as well as an initial environmental investigation should be conducted prior to the introduction and development of the EMS (Ammenberg, 2004).

### **3.2 The Initial Environmental Review**

The application process for an EMS certificate usually begins with performing an Initial Environmental Review (IER), but that is not always the case. To skip an IER is only possible if the company has good knowledge about their environmental situation. However, when an organisation have no earlier experiences of environmental work or knowledge of their current environmental performance, it is essential to identify their environmental aspects in order to understand how they affect the environment. After the IER is performed and presented, the organisation can set relevant and proper objectives and targets for their environmental policy and later make changes to reduce their environmental impacts (Whitelaw, 2004).

According to Ammenberg (2004) the aim with an IER is to identify, analyse and quantify the organisations environmental aspects. An aspect should be described and linked to potential environmental impacts and where in the organisations it appears and why. Further, the aspects should be quantified as far as possible and weighted so that they can be valued according to their significance (Ammenberg, 2004). It includes a check of all relevant documents and other items needed to obtain an assessment of the distance between the current situation and what is required of an EMS.

According to Whitelaw (2004) there are four important elements in an IER: Identification of legislative and regulatory requirements, identification of significant environmental aspects, examination of existing environmental practices and processes and assessment of previous environmental incidents or accidents. In this thesis and for the building construction sector in general, the laws and regulations that are to be followed are controlled by ‘Boverkets’ Building Regulations<sup>1</sup>, the Planning and Building Act<sup>2</sup> and the Swedish Environmental Code.<sup>3</sup> In addition, an IER is performed in order to give the organisation a starting point and a basis for their future environmental work (Ammenberg, 2004).

### 3.2.1 The Environmental Aspects

The definition of an environmental aspect is according to Whitelaw (2004) “*Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation’s activities, products or services*”.

The wide concept of environmental aspects can be divided into five categories; direct, indirect, hard, soft and environmental accidents (see Table 1 for description), though it does not rule out that an aspect can belong to several categories. Depending on the type of organisation, the category of environmental aspect will be different (Ammenberg, 2004) e.g. a transport organisation will have a majority of hard aspects while a consultancy firm will have more soft aspects.

Table 4. Examples on environmental aspect categories, according to Ammenberg (2004).

Environmental Aspect	Description	Example
<b>Direct</b>	Easy for the organisation to control and affect.	Organisations internal transports.
<b>Indirect</b>	Harder to control, aspects that the organisation do not have full control over.	Entrepreneurs and suppliers transports.
<b>Hard (Operational)</b>	Aspects that have a direct impact on material and energy flows and where the environmental impact is relatively well known.	Combustion of fossil fuels.
<b>Soft (Organisational)</b>	Aspects that are of organisational character and are characterised by the fact that it is difficult to give a clear description of the associated environmental impact.	Knowledge and decision-making.
<b>Environmental Accidents</b>	Aspects in an organisation that could lead to an environmental accident, with a potential environmental impact.	Diesel tank leakage.

Ammenberg (2004) also states that it is up to the organisation to determine which significant aspects the organisation are willing to focus on, but it is important to have a societal perspective on the environmental impacts found. This means that the organisation should focus on the aspects with the greatest environmental impacts in their production chain. Without a societal perspective when

<sup>1</sup> Boverkets Bygg Regler, BBR

<sup>2</sup> Plan- och Bygglagen, PBL

<sup>3</sup> Miljöbalken

determining which aspects are significant, there is a risk that aspects categorised as 'indirect' automatically acquires low priority (Ammenberg, 2004).

### **3.2.2 The Significance of Environmental Aspects**

The process of ranking the significance of the environmental aspects related to their environmental impacts, requires a methodological approach to enable an unbiased evaluation. Due to the cyclic process of ISO 14001 constant improvements and internal audits, the chosen approach must be reproducible, robust and be able to withstand scrutiny. Therefore the significant criteria should be clearly defined and the evaluation process of the aspects against the criteria must be obvious, in order to maintain an unbiased ranking (Whitelaw, 2004).

## 4 THE BUILDING CONSTRUCTION SECTOR

The building construction and real estate sector accounts for a significant part of Sweden's total environmental impact. According to the Eco-Cycle Council (2010) several investigations confirm that the building construction sector in Sweden stands for approximately 40 % of the total energy- and material use and 10 % of the transports. Statistics on the amount of waste coming from the construction sector has been estimated to 9.4 million tonnes (2010); 8.7 million tonnes of non-hazardous waste and 640,000 tonnes of hazardous waste. Out of 9.4 million tonnes waste from the construction sector, 54.9% was put on landfills, 2.9% was sent to soil treatment, 3.3% was incinerated, 1.7% was recycled and 37.2% were classified and treated as dredged material (Swedish EPA, 2010).

Results published by Toller et al. (2009), also indicate that the sector's use of dangerous chemicals, hazardous substances and the contribution of greenhouse gas emissions contribute to the deterioration of air quality and give rise to human toxic effects that are significant, including nitrogen oxides and particulates. Indoor environments are also negatively affected by the sector by contributing to noise, radon, moisture and mold. Nelson (2007) states the building construction sector *“as one of the principal users of natural resources, the real estate sector stands as a central target of global efforts to reduce the ‘carbon foot print’ of economic activities”*. Therefore it is important to put in efforts to reduce the environmental impact coming from the building construction sector.

According to Gluch, et al. (2011) the attitudes of companies in the building construction sectors towards environmental work has changed during the last decade, from something ‘out there’ to something that you have an obligation to mitigate and ‘take care of’. Results from the research done in “Miljöbarometern” (performed in 2011), show that organisations today are working more actively in order to reduce their environmental impacts compared with the situation in the early 21<sup>st</sup> century. The result indicates a clear trend towards that environmental work and strategies are becoming more integrated and institutionalised within the building sector. However, the numbers of identified obstacles that are limiting companies’ environmental work have increased during the last eight years (Gluch et al., 2011). The most recognised internal obstacles are the attitudes that environmental work is expensive and that there is a lack of financial resources. Other identified obstacles are lack of cooperation and exchange of experience between the internal projects and a lack of knowledge on environmental tools, but there is also an absence of qualified environmental competencies (Gluch et al., 2011).

Identified external obstacles that are obstructing the environmental work are the lack of a market for ‘green’ products or services, the lack of a competitive market and that there is a lack of willingness to cooperate by clients, customers and suppliers (Gluch et al., 2011).

### 4.1 Byggnads AB Tornstaden

Byggnads AB Tornstaden is a privately owned building construction company located in Gothenburg with 90 employees in total, including both civil servants and craftsmen. The company was founded in 2005 and has today a turnover slightly above 500 Million SEK and has been selected as one of Sweden’s “Superföretag” three years in a row. The award is based on the financial performance of all Swedish joint-stock companies and takes into account and considers growth, profit, return, efficiency, capital structure and funding (PAR & Veckans Affärer, 2013).

Byggnads AB Tornstaden strives to be known as the modern and innovative building constructor with the competence to develop, construct, own and manage all types of real estates. Their business

concept reads as follows; “together with our customers and partners, we shall through knowledge and commitment realise ideas into finished projects. With a resource-efficient and cost-conscious construction, we create greater customer value and good environments” (Byggnads AB Tornstaden, 2013).

The company prefers to work with turnkey contracts which imply that the builder sign the contract to fully design, construct and equip a facility and turn the project over to the client when it is ready for operation (Edlund, 2013).

Most building constructing entrepreneurs, as well as Byggnads AB Tornstaden works exclusively with projects. Their investment budget is today distributed across approximately 15 projects per year. In order to deliver successful future projects repeatedly, adaptation of different standardisations tools will help the company to improve both the quality of future projects and gain knowledge and learn from past mistakes (Ammenberg, 2004). Byggnads AB Tornstaden has recently been certified with ISO 9001, which has given them guidance to continuously improve the quality of their projects and the final products. The company is now about to start with the implementation of ISO 14001, which will minister their environmental work and the improvements of environmental performance.

#### 4.1.1 Organisational Structure and Institutional Logics

Byggnads AB Tornstaden is described as having a flat organisational structure, which promotes internal stakeholders involvement through a decentralized decision-making process. Byggnads AB Tornstaden’s organisational structure is illustrated below in Figure 3.

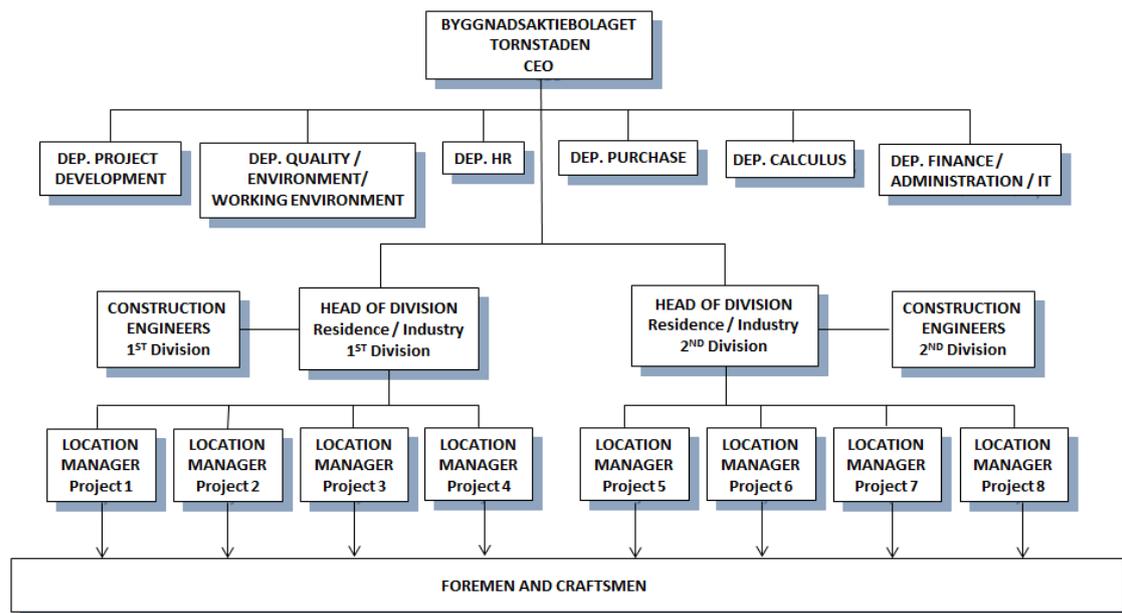


Figure 4. Illustration of Byggnads AB Tornstaden’s organisational structure.

Organisations in general as well as Byggnads AB Tornstaden are driven by value or belief systems, which decide how the organisation will behave in a specific situation, so-called institutional-logic (Tan & Wang, 2011). Byggnads AB Tornstaden’s main drivers, identified by the authors of this thesis, are economy and image. This is expressed by one of the stakeholders “[... it is clear that the cost is definitely the most important factor. It is ranked both as the first, second and third most important factor...]”. Further, another important driver for the company is the image and the company wants to be recognised as

'the modern construction company', which is a recurrent theme in their marketing strategy viewed online and also stressed during the interviews.

#### **4.1.2 Internal Stakeholders of Byggnads AB Tornstaden**

The internal stakeholders of Byggnads AB Tornstaden when it comes to the EMS process can be subdivided into two groups, primary internal stakeholders and secondary internal stakeholders. The primary internal stakeholders are identified as employees with power, i.e. they have the right to decide over money and strategic development. The secondary internal stakeholders are the persons with execution mandate i.e. the performers or the employees that execute the decisions. The identified primary internal stakeholders in Byggnads AB Tornstaden are the CEO and the persons in the directorate. The identified secondary internal stakeholders are the Environmental Coordinator (EC), the Heads of Divisions, Construction Engineers, Site Managers and foremen.

Even if the external stakeholders of Byggnads AB Tornstaden do not have mediate mandate to stress strategic decisions, they can still affect the primary stakeholders by implementing additional pressure, such as clients and the municipality of Gothenburg.

## 5 METHODOLOGY

This chapter introduces the methodological aspects of the research by describing the research approach, the empirical data collection and the outcome of the study. In research, the outcome of a study is often influenced by the choice of research approach and how to address the research questions. Therefore, it is important to evaluate different approaches before determining which one to use and to explain and discuss the selected approach (Denscombe, 2000).

The core features of this study are practical oriented, change, participation, feedback and constant improvements, which according to Denscombe (2000) can all be associated with ‘action research’. As mentioned, Byggnads AB Tornstaden wants to implement an EMS, which requires continuous improvements and changes within the organisation. Denscombe (2000) and Sandelowski (1995) have been used as support to structure and guide the research process of this master thesis. According to Denscombe (2000) there are four commonly used approaches in qualitative research that are: questionnaires, interviews, observations and documents. Each of these approaches provides an alternative tool for collecting empirical data, which can help a researcher to get a clearer picture, an accurate measurement, facts and evidence about the subject in matter.

The result of findings and the evaluation of the company’s environmental impacts in practice will become the starting point for Byggnads AB Tornstaden environmental work with ISO 14001. A basic requirement for keeping an ISO certificate, once it is achieved, is as mentioned constant improvements, where participation and collaboration of those affected is important. Further on, the methodology will be presented in “*Empirical Data Collection*” (5.1) and later in “*Conducting the Study*” (5.2).

### 5.1 Empirical Data Collection

In order to answer the research questions of this study, different data collecting methods have been used i.e. literature review, semi-constructed interviews, observations, assessment of internal documents and workshop. The literature review was performed throughout the study and became the foundation of the research. By conducting semi-constructed interviews, making general observations at the Main Office and from field trips to on-going projects and viewing internal documents, the intention has been to provide the thesis with both a qualitative and a quantitative point of view.

#### 5.1.1 Literature Review

The initiating phase of this study focused on a literature review regarding previous research in the field of Stakeholder Theory and EMS in general and ISO 14001 Standard in particular, with the aspect of current practice, discussions and trends within these fields and this became the backbone of the interview study.

In order to create and develop the frame of references relevant to literature in connection to ‘Internal Stakeholder Perspectives’, articles were mainly collected from ABI Inform, ISI Web of Knowledge and Google Scholars. Articles were chosen according to most cited and relevance. The search for applicable articles was based on keywords such as: stakeholder theory, environmental management, sustainable strategies, internal stakeholder etc. The literature review for the ‘Internal Stakeholder Perspectives’ part was also based on books and articles, recommended by our supervisor and other papers found at the library of the *Environmental System Analysis* department. The literature review for the IER was also based on books, recommended by our supervisor and other papers found at the library of the *Environmental System Analysis* department. The results from the initial literature review

build the foundation for both the interview study with the internal stakeholders and the IER of Byggnads AB Tornstaden.

In the IER context searches in similar databases were made, including articles from the Chalmers library and governmental publications found at the Swedish Environmental Protection Agency's (Swedish EPA) database. The search was based on keywords such as: significant environmental aspects for the building construction sector, environmental management systems, ISO 14001 and environmental issues.

### **5.1.2 Interviews**

Interviews were chosen as the most suitable method in order to gain insights of the internal stakeholders' opinions, expectations, feelings, emotions, experiences and attitudes. This qualitative method can according to Denscombe (2000) be adapted to the complexity of the subject. Another motivation for using interviews is based on the value of contact with internal stakeholders within the organisation who can give privileged information that others could not. A semi-constructed approach was used for the interviews, i.e. some of the issues and questions were pre-identified and clarified in the interview (Denscombe, 2000). The interviews were conducted in a conversation form, where the goal was to let the respondents develop ideas and speak more freely on the subject raised.

According to environmental management literature all types of EMS requires a genuine commitment from the top management and other internal stakeholders in order to function efficiently in a long-term perspective (Ammenberg, 2004; Freeman & McVea, 2001). Therefore it is important to identify the internal stakeholders' view on EMS and their future role within the company in connection to a new management system.

All interviews were audio-recorded and later transcribed, i.e. a technique that involves the selective preservation of elements of the research interviews (Denscombe, 2000). Practical suggestions when starting a data analysis after an interview study includes getting a sense of the entirety, extracting the facts, identifying key topics or major storylines and using frameworks to reduce data. Sandelowski (1995) states that; "Researchers must first look at their data in order to see what they should look for in their data", which means that it is hard to analyse data that you do not have.

### **5.1.3 Assessment of Internal Documents**

Byggnads AB Tornstaden's internal documents on administration, policies, management, finance and material purchase were assessed. Essential for research studies when using documentary sources in order to get an objective analysis is to consider and evaluate the documents in relation to four basic criteria; authenticity, credibility, representativeness and meaning (Denscombe, 2000).

### **5.1.4 Observations**

Observations were used as a complementary data collection tool to the environmental investigation of the company's environmental aspects. Systematic observations were made during field trips to Byggnads AB Tornstaden's on-going building projects and at the Main Office.

Observation as a method collects data from real life situations and requires the researcher to go in search of information, rather than to rely on secondary sources. The whole point is to observe things as they normally happens. Important to consider when using systematic observation as a tool for collecting data, is the possibility that researchers perceptions of situations might be influenced by personal factors and that the data collected could be compromised (Denscombe, 2000).

### **5.1.5 Workshop**

A workshop opportunity was organised at the company, where all the civil servants at Byggnads AB Tornstaden were invited. The workshop was arranged in order to further confirm the received answers and perceptions gained from the interview study. Themes of particular interest for the study concerned their attitudes, visions and their sense of responsibility towards environmental work and particularly their future work with ISO 14001. Another reason to perform the workshop was to raise the internal stakeholders' knowledge about the basic concept of EMS and the requirements of an ISO 14001 certificate. The result from the interview study and informal conversations also indicated that the internal stakeholders had a lack of knowledge when it came to EMS and therefore had a sense of aversion towards environmental work.

The workshop also includes an introduction of three future scenarios for Byggnads AB Tornstaden, where the internal stakeholders were asked to take a stand, this in order to raise the employees' involvement and engagement in the EMS process and the company's future environmental performance. The three scenarios were allocated into one 'business as usual', one 'some change' and one 'radical change' choice. Complete descriptions of all three scenarios will be found in "*Appendix A*".

## **5.2 Conducting the Study**

This section will describe in detail how the interview study and the initial environmental review were carried out and the chapter is divided in subsections named; "*Interview Study*", "*Performing the Initial Environmental Review*" and "*Performing the Workshop at Byggnads AB Tornstaden*".

### **5.2.1 Interview Study**

Three topics or key values were pre-defined in an attempt to answer the first research question of this thesis and to identify the internal stakeholders' perspectives. The three key values were; Attitude, Commitment, Responsibility. Subsequently, an interview guide with open-ended questions was created, in order to avoid leading questions and to emphasize the respondents' points of interest. The interview guide can be found in "*Appendix B*."

In order to guarantee a satisfying outcome of the interview study, a few criteria's of the respondents were defined. The respondents are all internal stakeholders within Byggnads AB Tornstaden and had sufficient working experience within their sector and the company, this to be able to give fulfilling answers during the interview. The candidates were selected in consultation with our supervisor at Byggnads AB Tornstaden. The interview candidates represented both sexes, a wide range of ages and different occupational roles within the company. The occupational roles found among the respondents were the CEO, Heads of Departments, Construction Engineers, Environmental Coordinator, Site Managers, Foremen and representatives from the Calculus and Human Resources Departments. The persons also represent the primary internal stakeholders of the company i.e. members of the directorate, top management and employees.

The number of qualitative interviews conducted was 13 in total and were performed between the 22<sup>nd</sup> of February and the 19<sup>th</sup> of March 2013. The authors of this thesis led every interview, during each interview one author focused on covering the topics, while the other focused on follow-up questions and on taking notes. All interviews were conducted as 'face-to-face' interviews and the interviews started with a brief introduction of our thesis project and us. During the initial phase a confirmation of a permission to record the discussion and reassurances about the confidentiality of comments made during the interview were also cleared. The goal for that was to set the tone for the rest of the

interview, with a relaxed atmosphere in which the respondent felt free to open up on the topic under consideration (Denscombe, 2000). The interviews lasted between 40 minutes to 1 hour and 30 minutes and were held at their individual workplaces.

To guarantee that the best possible outcome from the interviews was obtained, the interview guide and all technical equipment were tested before the real interview study began. A pilot trial was conducted with a foreman from the company in order to get feedback and a valuable indication of how successful the guide was. The comments and suggestions were evaluated and taken in to consideration when arranging and reconstructing the guide for the final and official interviews, which also was done with support from our thesis supervisor.

The transcribed interview recordings became the raw data for the analysis of internal stakeholders' perspectives on EMS and environmental work. After each ended interview the authors of this thesis, summarised the impressions gained and discussed the respondents' general attitude towards each question. When characterising if an internal stakeholder had a negative, positive or neutral attitude or opinion toward a specific topic or question, the interviewees' tone of voice, body language and choice of words were taken into consideration and evaluated. The interviews were also analysed in order to find differences and similarities within the answers. Recurrent themes or storylines in the interviews might indicate that the ideas or issues are something which is shared among a wider group within the organisation and can therefore be referred to with rather more confidence than any idea or issue which derives from the words of one individual (Sandelowski, 1995; Denscombe, 2000).

The interview data was later verified with other sources of information on the topic together with a supplementary workshop with the internal stakeholders of Byggnads AB Tornstaden, which provided some back up for the content of the interview, or casted some doubt on how relevant the interview data really was.

### **5.2.2 Performing the Initial Environmental Review**

The IER of Byggnads AB Tornstaden included identification of the significant environmental aspects, information collected through literature reviews, interviews, observations from field visits, informal conversations, brainstorming and by assessing internal relevant documents.

In order to get an overall picture of the organisation's structure, the IER was divided into Byggnads AB Tornstaden's already existing routines and organisational processes; Project Start-up, Project Design (Planning), Purchase, Production, Project Review, and Warranty Action. Environmental aspects in connection to the Main Office were also included in the investigation. During the process of identifying environmental aspects the following questions from Whitelaw, K. (2004) was used:

- Does the aspect originate from a non-renewable resource?
- Does the aspect require a high input of energy (heat) for it to be produced or manufactured?
- At the end of the aspects life, is it possible for it to be easily and economically reused, recycled or energy recovered?
- Does the aspect contribute to undesirable by-products during production or manufacturing (gases, particulates etc.)?

All aspects from the IER were identified, described and connected to the resources needed to perform the aspect and how it affects the environment (see Table 2 for the layout structure). The aspects were also if possible quantified and connected to existing laws and regulations. Subsequently,

the environmental aspects in each process phase were identified according to hard-, soft-, direct- or indirect aspects, as well as identified as reasons for potential environmental accidents. The aspects were also linked to the Swedish Environmental Goals, weighted according to their significance and divided into aspect groups. Finally, the specific environmental aspect was also given a suggested indicator if possible. The result is both summarised in chapter 6.2 “*Results of the Initial Environmental Review*” and presented in more detail in “*Appendix C*”.

In order to locate the most significant environmental aspects, each aspect was weighted as low, medium or high. An aspect weighted as *high* significance means that the aspect is more important to mitigate or to reduce in order to gain as big environmental impact reduction as possible.

Table 5. Adapted layout and structure of the IER document, with the aspect ‘Utilization of land’ as an example.

ENVIRONMENTAL ASPECTS	RESOURCES	DESCRIPTION	ENVIRONMENTAL IMPACTS	QUANTITIES	LAWS/REGULATIONS	ENVIRONMENTAL GOALS	SIGNIFICANCE
Utilization of land.	Virgin soil, contaminated soil or already developed land.	The land surface needed for the construction.	Biodiversity, influence on sensitive areas and the water table. Consolidation and rebuilding generally invokes more contaminated soil and less virgin soil.	- m <sup>2</sup>	-	A Rich Diversity of Plant and Animal Life, a Non-Toxic Environment, a Safe Radiation Environment and Good Urban Environment.	Low

The method used for ranking the significance of the aspects originates from Almgren & Brorson (2006) handbook of implementing ISO 14001 for small and medium sized organisations. The weighting is based on three system levels; global, regional, local. The environmental goals are connected to their specific geological area in terms of their contribution, where a global impact gets a high significance while a local impact gets a low significance (Almgren & Brorson, 2006). This thesis ranking of the significance environmental aspects related to their environmental goals is presented in Table 3. The identified aspects often contribute to several different environmental impacts, where the environmental goal that the aspect contributes most to, was listed first. If an aspect had more than one environmental goal associated with it, the goal that was listed as the first were used.

Table 6. Ranking of significance of environmental aspects, according to Almgren and Brorson (2006).

Global Impact– High Significance	Reduced Climate Impact, a Protective Ozone Layer and a Non-Toxic Environment.
Regional Impact – Medium Significance	Clean Air, Natural Acidification Only, Zero Eutrophication, Flourishing Lakes and Stream, a Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos, Sustainable Forests and a Rich Diversity of Plant and Animal Life.
Local Impact – Low Significance	A Good Urban Environment, Groundwater of good quality, a Safe Radiation Environment, Thriving Wetlands, a Varied Agricultural Landscape and Magnificent Mountain Landscape.

To facilitate and further divide the aspects into manageable groups they were divided into eight different aspect groups, named; Chemical Use, Education, Energy Use, Resource Use, System Selection, Transport, Waste Management and Water Use. This was performed as a wish from Byggnads AB Tornstaden to enable the implementation and continued work with ISO 14001.

### **Chemical Inventory**

During the IER an investigation of the organisations chemical use was performed. By reviewing two recently completed projects (i.e. Mölnlycke and Landvetter) chemical safety sheets, a chemical list was created. The chemicals were controlled according to the registry of BASTA, which is one of the building construction industry evaluation tools for chemical products. In the BASTA registry only approved chemicals are allowed and registered.

The chemicals were described, in order of hazardous properties/classification, content of dangerous components in them, their EG-nr or REACH-reg. nr, ecotoxicology information and their area of usage. Additionally, the chemicals were listed as if they were registered in BASTA or not, for layout see Table 4.

Table 7. Layout of the chemical register at Byggnads AB Tornstaden, with the product ‘Plastic Padding Elastics’ as an example.

PRODUCT NAME	HAZARDOUS PROPERTIES/ CLASSIFICATION	DANGERUS COMPONENT	EG-NR; REACH-REG NR	ECOTOXICOLOG Y INFORMATION	AREA OF USAGE	BASTA
Plastic Padding Elastics	FLAMMABLE, harmful, dangerous if inhaled, irritating to eyes and skin.	Styrene 100-42-5	202-851-5	Let it not get into the sewer system/surface waters/groundwater.	2-component Putty	-

### **5.2.3 Performing the Workshop at Byggnads AB Tornstaden**

The agenda at the workshop was as followed; a presentation on the basics of a typical EMS, the results from the IER and an introduction of the three different scenarios. Thereafter the employees’ were offered a coffee break while dividing themselves into groups. The groups were later given the pre-defined questions at issue, pens, colour pencils and papers.

The total number of employees that attended the presentation and workshop were 22, 13 of them were site managers or foremen, five were construction engineers, two calculus managers, one head of division and one EC. The attendants divided themselves into four groups with five to six persons in each group and the following questions were discussed within all groups:

- Which of the three scenarios is the best choice for Byggnads AB Tornstaden? Select one alternative and give three motivations of why it is the best choice?
- Identify three problems connected to the selected scenario and what types of obstacles are there in order for you to reach that scenario? Try to find solutions to the identified obstacles!

The groups were given approximately 50 minutes to solve and discuss the given questions. During the group discussions the authors of this thesis were circulating between the groups in order to gain useful information about their thoughts, speculations and reflections over the topics raised and also to help the participants to move forward in case of questions or if they got stuck in a fixed mind-set.

The workshop ended with 30 minutes of summary of the different suggestions and answers from the groups, to which the employees' were invited to discuss and to share ideas about the subject in matter.

## 6 RESULTS

In previous chapters “*Stakeholder Theory*” (2) and “*Environmental Management Systems*” (3) the importance of internal stakeholders and top managements engagement when it comes to the environmental performance of an organisation was highlighted. In the following chapter the identified attitudes and opinions of the internal stakeholders and top management of Byggnads AB Tornstaden are presented. All relevant findings gathered from the study are arranged according to a four-part structure as described in the chapter 5 “*METHODOLOGY*”, including the interview study, the initial environmental review, observations and outcomes from the workshop.

### 6.1 Results gained from the Interview Study

This section presents and summarises the findings from the interview study of Byggnads AB Tornstaden’s internal stakeholders. The first subsection “*General Attitudes and Opinions within Byggnads AB Tornstaden*” (6.1.1) presents the internal stakeholders general opinions and attitudes; these are either weighted as negative, positive or neutral. Subsequently, the results are sorted in three subsections that are associated with the topics: “*Internal Stakeholders’ Perspectives on the Current State of Environmental Performance*”, “*Internal Stakeholders’ Perspectives on the Environmental Impacts from Byggnads AB Tornstaden*” and “*Internal Stakeholders’ Perspectives of Environmental Management Systems*”. In these subsections the findings are linked according to the topics raised. However, considering that the interviewees were encouraged to speak freely, the findings will in some cases overlap the structure. The final subsection is “*Recurrent Themes*” (6.1.5), which highlights recurrent themes found in the interviews. The results are presented in both text and figures to clarify which category the finding originates from.

#### 6.1.1 General Attitudes and Opinions within Byggnads AB Tornstaden

The general opinions that are highlighted concerns; the importance of discussing environmental issues, current environmental work at the company, colleagues’ opinions on the current environmental work, general perceptions on Byggnads AB Tornstaden’s current way of conducting internal communication. The overall opinions among the internal stakeholders concerning the importance of highlighting and discussing environmental issues were that it is essential (67% had a positive opinion). At the same time it was those that did not perceive environmental issues as important to discuss (25%) and the rest, 8% had a neutral opinion, see Figure 3 below.

The internal stakeholders general opinions toward Byggnads AB Tornstaden’s current environmental work are negatively loaded (46%) i.e. they do not feel that the organisation has a fulfilling environmental commitment. Some interviewees stated it like this;

*”I would say that the environmental work is not non-existent, but it only occurs when our clients have requests or requirements for it”.*

or,

*“There is a certain potential for improvement, one can easily say. I think that the environmental work that takes place today is done without really knowing why. Many pieces are missing, before one can say that it is a good environmental work”*

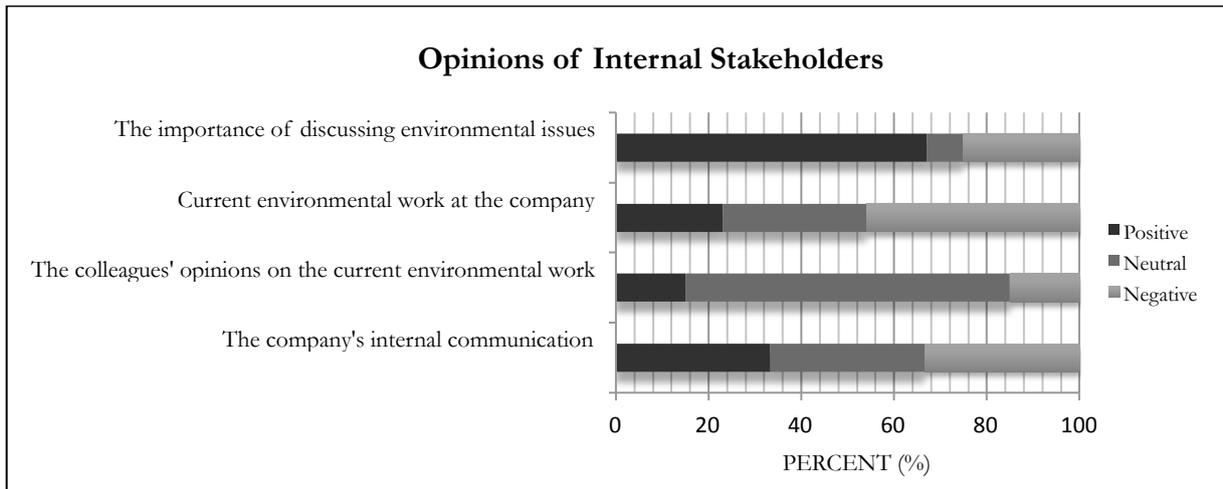


Figure 5. Positively, neutral or negatively weighted opinions of internal stakeholders at Byggnads AB Tornstaden.

However, it was still almost a fourth that had positive view of their current environmental work and additionally 31% had a neutral opinion, as this quotation illustrates;

*“Today it looks better than it did in the beginning, then there was no environmental work. In my production, I have not done much with it, incredibly little indeed. One often thinks economically and when the environmental focus becomes a bit lagging and I think it is like that at Tornstaden in general”.*

The majority (70%) of the interviewed internal stakeholders had neutral reactions about how their colleagues felt about the organisation’s environmental work. One internal stakeholder expressed his/her neutral opinion like this:

*“I think there are different views. A person that is very active and environmentally conscious would certainly say that we do not work with it at all. Then, a person who is a little more average Joe would say that we do not build in anything that is environmentally harmful, that we know of”.*

Other thought that their colleagues had either positive or negative perspective of the organisation’s current environmental work. Views on Byggnads AB Tornstaden’s current way of conducting internal communication are today distributed equally among positively, negatively and neutral views.

The general attitudes that are highlighted in this section concerns: personal responsibility in the EMS process, EMS implementation, possibilities of increasing personal knowledge in the environmental field and general attitudes towards environmental work.

Overall attitudes towards implementation and practise of EMS and ISO 14001 in particular are that it is necessary and they have a positive stand towards the implementation, as shown in Figure 4. On the other hand the internal stakeholders’ general attitudes to environmental work were negative (46%), which is illustrated in the following quote:

*“As soon as we have a political opinion that it is environmentally friendly, then it is environmentally friendly, it does not matter what it is. It is not that they do a proper analysis”.*

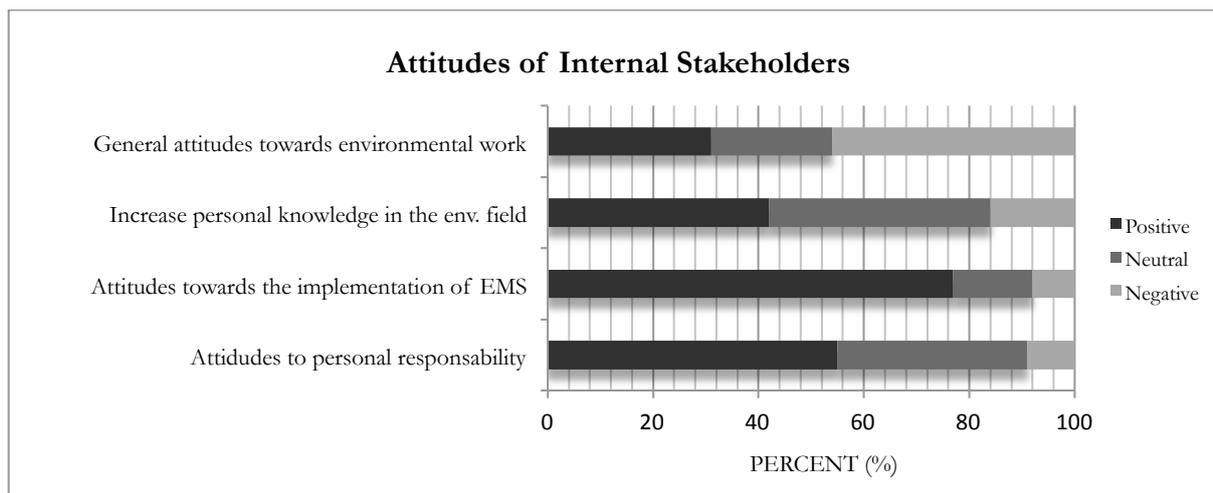


Figure 6. Positively, neutral or negatively weighted attitudes of internal stakeholders at Byggnads AB Tornstaden.

Results on attitudes towards increase the personal knowledge of the environmental field indicate that there is a resistance towards more education. An internal stakeholder with neutral attitudes reasoned as follows:

*“Knowledge but no education, it would be a balancing act between those... It depends on what an evening course involves education or information? Just to get the knowledge to work with the environmental issues, I do not think will help me in my work”*

There was a general optimistic attitude towards increase the personal responsibility of environmental work and the ISO 14001 system, additionally 36% of the interviewees were unbiased as one stakeholder stated; *“Responsibility should be centrally located and primarily at the environmental coordinator”*.

### 6.1.2 Internal Stakeholders’ Perspectives on the Current State of the Environmental Performance

In order to grasp the internal stakeholders’ perspectives on how the company’s current environmental work functions in more detail, three questions were asked:

- How does Byggnads AB Tornstaden’s environmental work look like today?
- What is your colleague’s perception on how the company’s environmental activities are managed today?
- What barriers affect the company's environmental work today?

The overall and most frequent perspective on the company’s current environmental work was that there is potential for improvements, they have no structured environmental work today. It is rather up to the individuals and the environmental work exists because of the decision on getting an ISO-certification and the employment of their environmental coordinator, see Figure 5.

Several also mentioned that the company has guidelines for waste disposal at the construction site, which is a form of environmental commitment and that they constantly work with environmental issues and documentation in connection to the environmentally classified projects (e.g. ‘Miljöbyggnad-Silver’<sup>4</sup> or ‘Sunda Hus’<sup>5</sup>).

<sup>4</sup> A Swedish classification on a building’s environmental performance, called Environmental Building (freely translated).

<sup>5</sup> A Swedish classification on a building’s environmental performance, called Healthy House (freely translated).

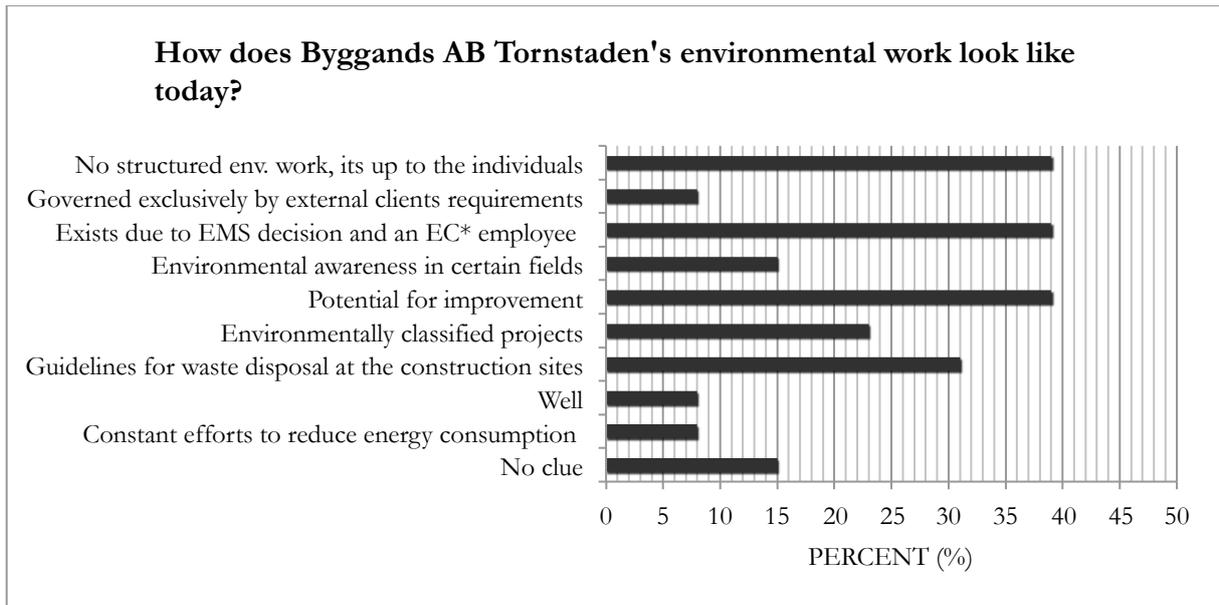


Figure 5. Internal stakeholders' perspectives on Byggnads AB Tornstaden's current environmental work (\* Environmental Coordinator).

An interesting group is the “no clue” group, who claim that they do not know at the same time as others identified different measures that the company does to reduce the environmental impact such as energy consumption and responding to external stakeholder pressures. Statements from the “no clue”-group sounded like this:

*“I do not know! The company has pretty good track of the situation, we have diligent projects, both financially and workmanship wise. But then if it's full focus on the economy or the environment, I do not know. That, I cannot answer”.*

and,

*“I do not know, I do not know, no idea really. All I know is that we have hired an EC working with the issue. But concrete directives to the construction sites and stuff, I know nothing about it or I have not seen anything of that”.*

A large group of the internal stakeholders expressed that they believed that their colleagues perceptions on the company's current environmental work depends on individual and personal engagement, i.e. colleagues with commitment to environmental issues felt frustration while colleagues with no engagement do not think about it or do not care at all, see Figure 6 below. One stakeholder expressed that;

*“I think it depends on the person has a personal commitment and thinks it is important, then I believe that they feel a degree of frustration that the company do not do more. Then we have the ones who wants quick solutions and that never will read through environmental documents and just hand it over to make the customer happy”.*

A common belief is also that the colleagues think that Byggnads AB Tornstaden's environmental performance is neither worse nor better than any other entrepreneur in town. Another belief is that their co-workers perceive the environmental performance as operating well and others have no perception about what others think.

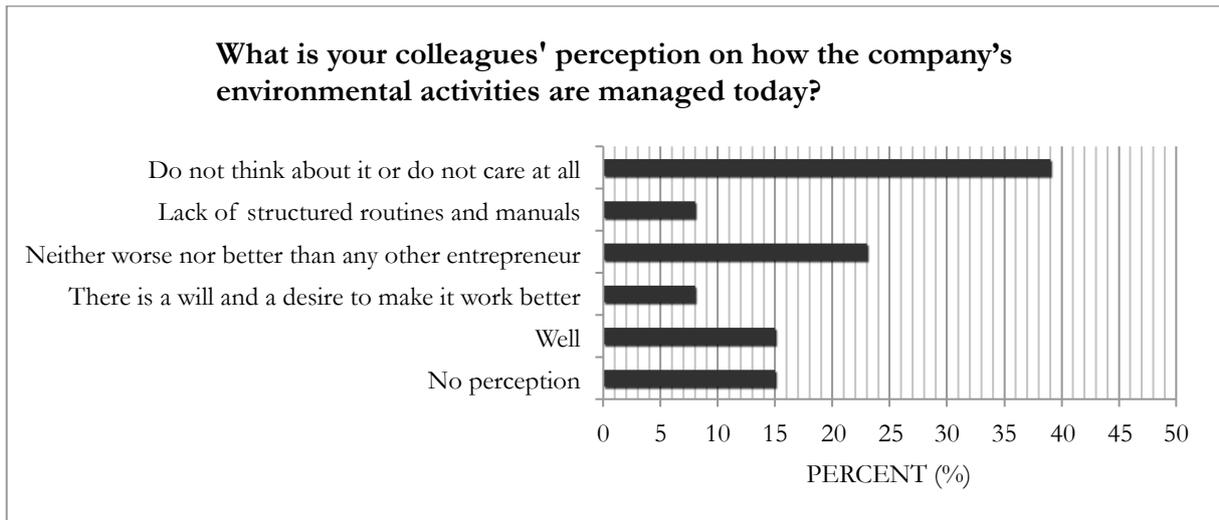


Figure 6. Internal stakeholders' perspectives of their colleagues' perceptions of the company's current environmental work.

By far the most declared barrier towards the company's environmental work were people's negative attitudes and disinterest towards environmental work, as showed in Figure 7. Economy and fear of an increased administration load were also common mentioned barriers. Internal stakeholders expressed their perspectives like this:

*“Environmental work is often associated with a cost and then you have to weigh it in, I would say. Costs are important it is the factor that influences the choice most, especially for our clients. We cannot steamroll our clients, we must do it together and it is clear that the cost is clearly the most important factor. It is ranked both as the first, second and third most important factor and there is where incentives have to be found in order to reach better environmental performance”*

and,

*“The big fear within the organisation is supposedly that environmental work contributes to a higher administration load, which will affect the already strained positions such as site manager, construction engineer out in the projects”.*

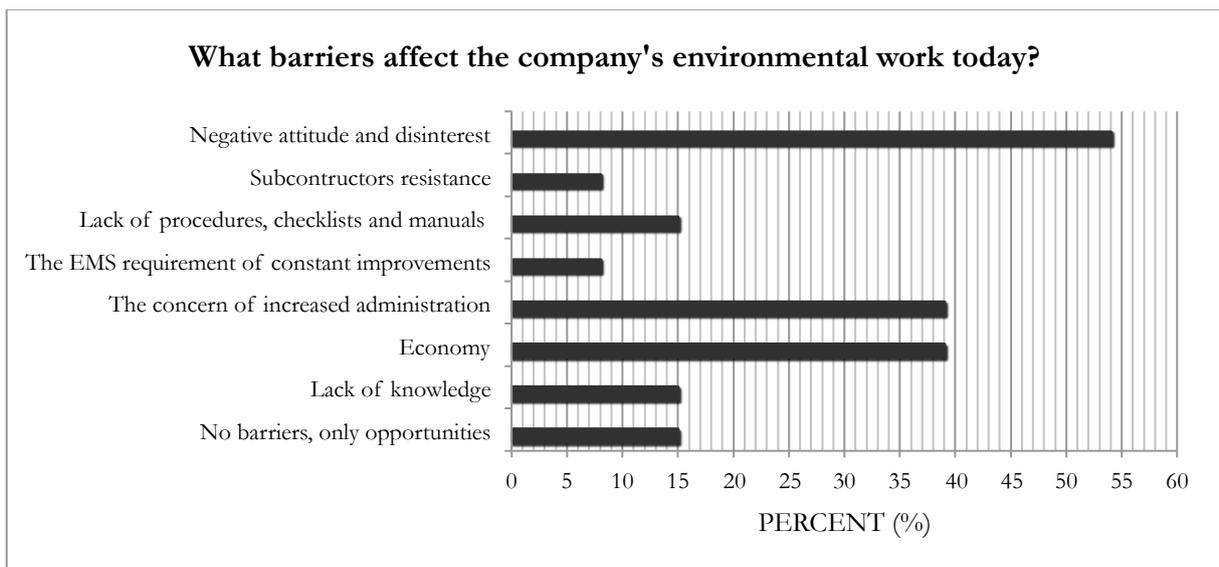


Figure 7. Barriers affecting the company's current environmental work.

One interviewee said that the EMS requirement of constant improvements could be a problem or a barrier to the company's future environmental work: *“A routine is established that says how the company*

work with environmental issues, but that is not all, it is a constant effort to follow-up the work, that might be a barrier and a constant challenge not to let it go”.

### Byggnads AB Tornstaden’s Environmental Policy

To understand and to grasp the employees’ general thoughts about the company’s current environmental policy (see Figure 8), a printed version was showed to them during the interview. Printed version can be found in “Appendix D”. The majority (54 %) said that they had seen it once or maybe twice, but that the policy is not guiding their daily activities. As clarified:

“I think I have read the policy some time on the website, a long time ago. I read it out of curiosity. Now I do not know how it is used here in the office, but we do not talk about it out there in the production. However, it has never been brought up during my 2.5 years”.

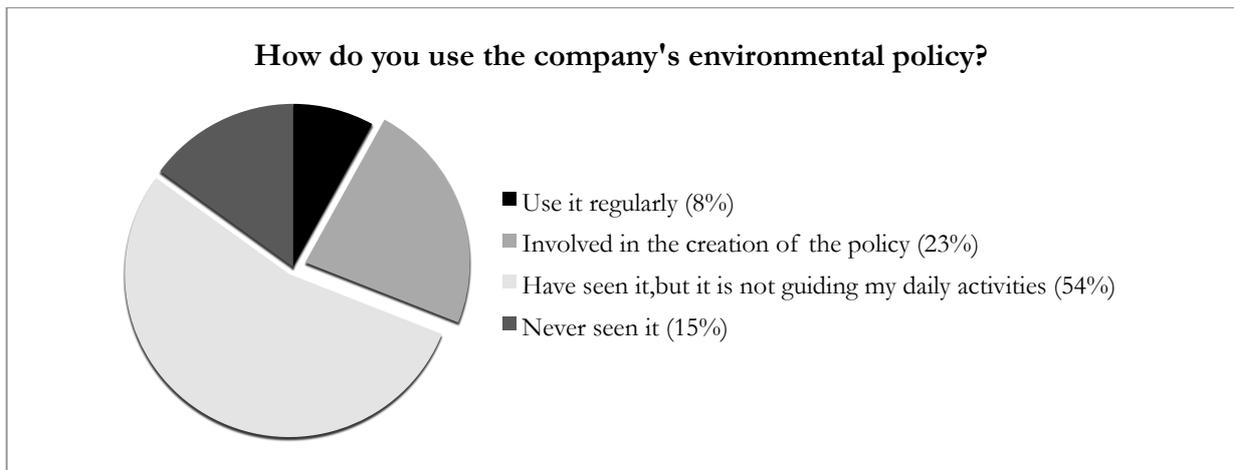


Figure 8. Usage of the company’s current environmental policy.

The internal stakeholders’ general perception of the environmental policy was that it was rather a set of environmental goals than a policy, as showed in Figure 9.

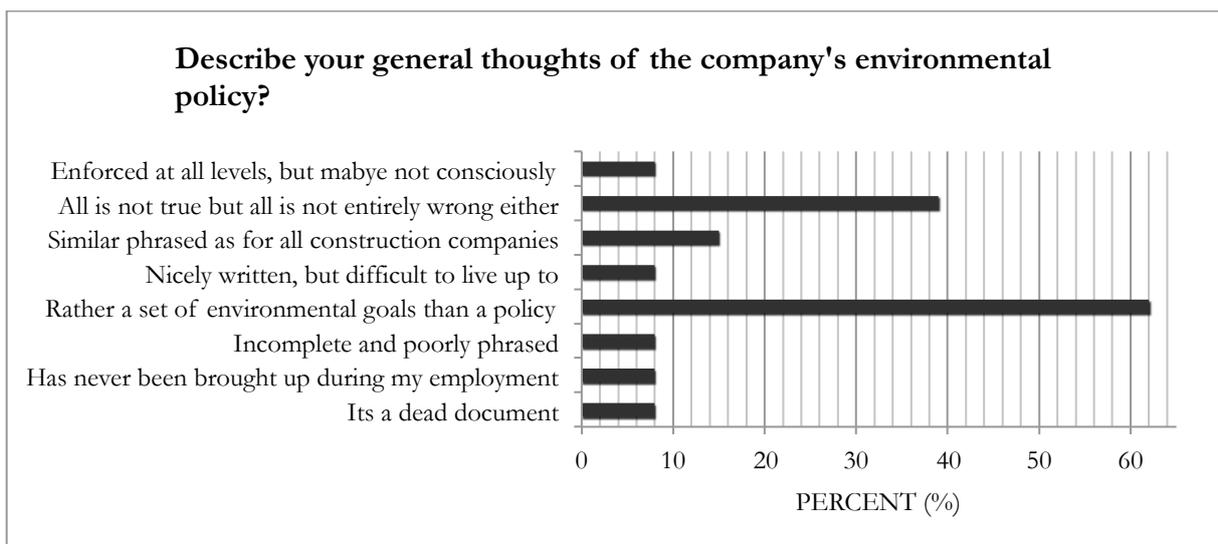


Figure 9. General thoughts from Byggnads AB Tornstaden’s internal stakeholders about the current environmental policy.

Another common belief was that everything is not true in the policy but all is not entirely wrong either. This was stated by one of the interviewees as: “I cannot say that the environmental policy is a guiding

*principle in my daily work, because that would be a lie. We use it to talk about what we stand for, much of what is written we do but not everything. But that is also why we have said that we need to proceed with our environmental work. All is not true, but all is not entirely wrong either”.*

One interviewee said that the policy was nicely written but difficult to live up to. Others disagreed about the phrasing and said that it was incomplete and poorly written and one said it was a dead document.

### 6.1.3 Internal Stakeholders’ Perspectives on the Environmental Impacts from Byggnads AB Tornstaden

With the intention of examining the internal stakeholder’s perspectives and apprehension on how the company and the building construction sector as such impacts the environment, two questions are highlighted here:

- What is your idea on aspects concerning how Byggnads AB Tornstaden affects the environment?
- In what way might your own department or profession affect the environment?

There seems to be a general understanding of the building construction sectors main environmental challenges among the internal stakeholders of Byggnads AB Tornstaden, as they identified transport, material and system selections at the design phase, energy use and waste management as significant environmental impact.

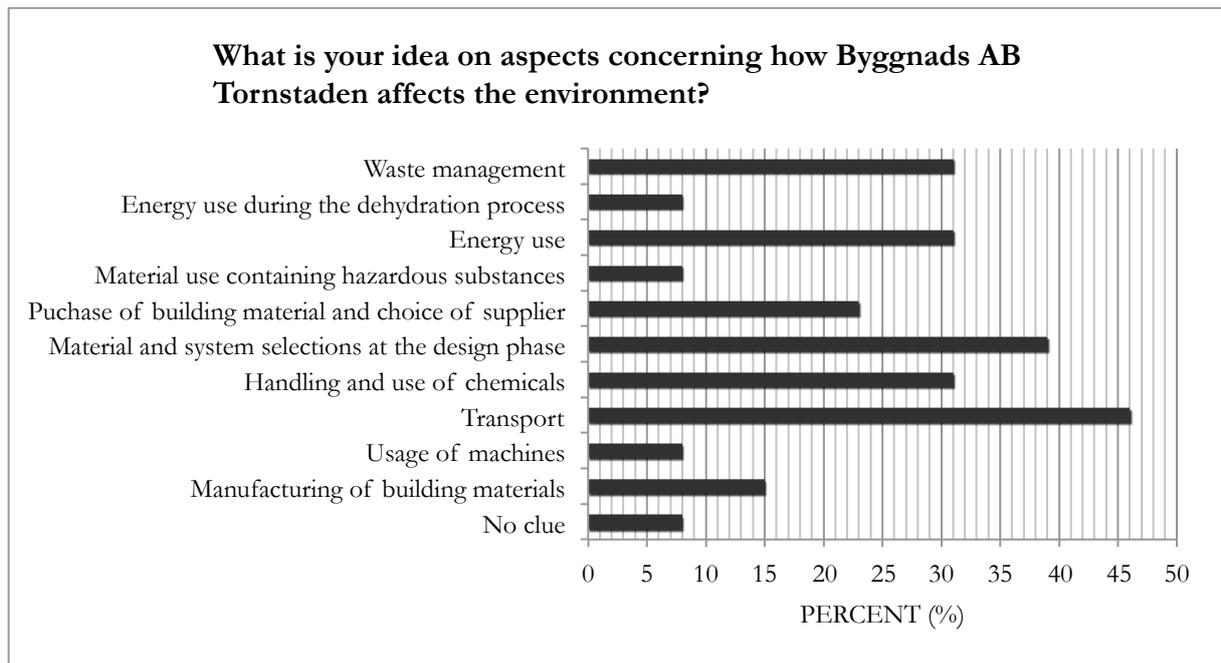


Figure 10. The company’s significant environmental aspects, according to the internal stakeholders.

Single stakeholders believed that the use of machines during the production process was a significant aspect or had no clue or did not dare to guess, as one stated *“A good question actually. No idea, it is not something I have thought about”*.

The general perception among the internal stakeholders on how their own department or profession could affect the environment is that they were responsible for waste management at the construction site or that they had no clue, see Figure 11 below. A quote from the “no clue”-group: *“Honestly,*

*environmental issues are nothing that I focus on. When it comes to the purchase of bricks for example, the manufacturing process requires a lot of energy and there exists better building material options, but if the customer or client wants to have a brick facade, I cannot interfere with that. Trying to add an additional dimension, it is really hard and I am not the right man for it”.*

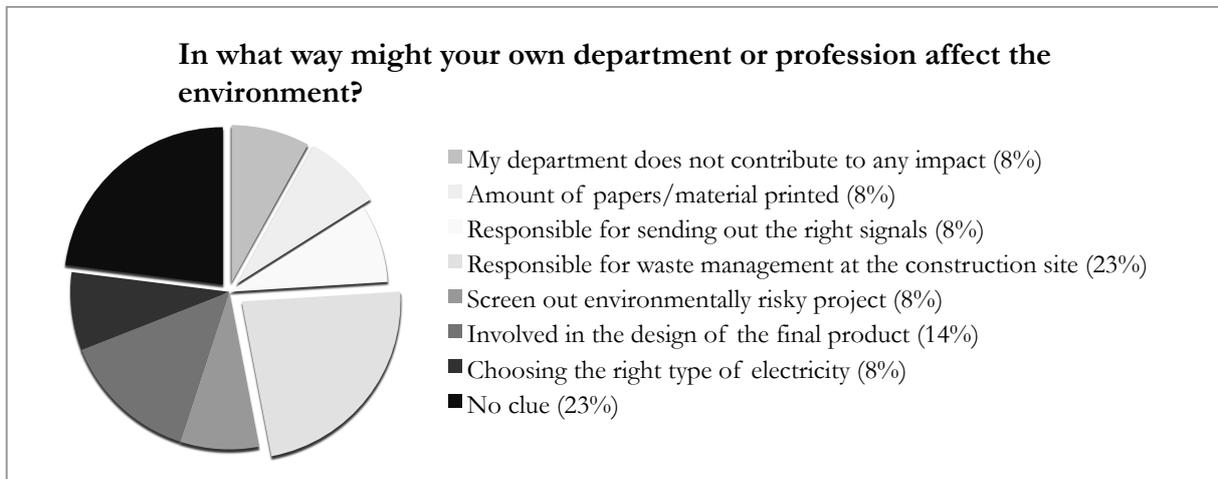


Figure 11. Perspectives on how the internal stakeholders' own department or profession may affect the environment.

Others interviewees mentioned that their department made an impact on the environment when choosing how much paper to print and one interviewee said that his or her department did not contribute to any impact at all.

#### 6.1.4 Internal Stakeholders' Perspectives of Environmental Management Systems

In the attempt to clarify the internal stakeholders' perspectives on EMS in general and on how it may help Byggnads AB Tornstaden's environmental performance, a great number of questions were asked. Six of the question from the interview study is highlighted in this subsection:

- Why should Byggnads AB Tornstaden implement an EMS?
- Advantages and disadvantages with an EMS?
- What types of changes/improvements are needed, in order to get a well-functioning EMS?
- What type of knowledge/resources is needed for the introduction and maintenance of the EMS?
- Describe your own role in the EMS process?
- Describe a good allocation of responsibility in an EMS context?

The overall motives for why the company took the decision to implement an EMS were mainly because of external requirements or because of the ability to access all types of projects including public procurements, as Figure 12 illustrates.

A common view was also that it is because the company lack a shared and structured working method, which they believed and hoped that the system will give them.

*“There are tougher demands on us from clients because of our size. As well as, to get a common platform for our work and especially to get the tool necessary for us to not reinvent the wheel every time”.*

That an EMS certificate will bring competitive advantages were another commonly mentioned reason for an EMS implementation or that it will become an evidence of how the company works with environmental issues.

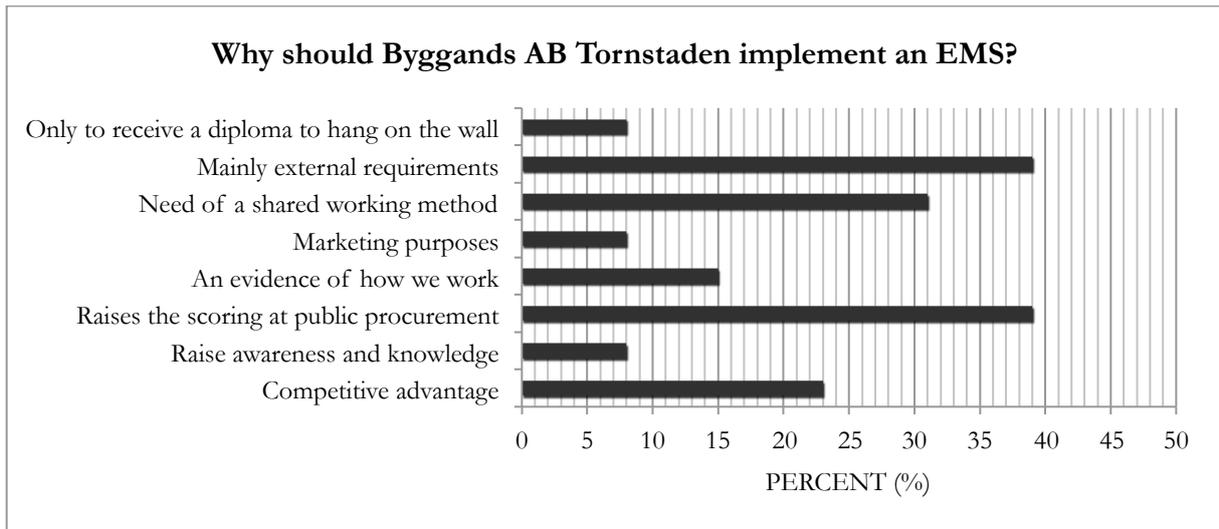


Figure 12. The internal stakeholders' perspective on reasons for an EMS implementation at the company.

A stakeholder believed that the real reason is because the top management wants to receive another diploma;

*“According to my personal opinion, it is only to get another diploma to hang on the wall”.*

According to the internal stakeholders the most general advantage with an EMS is the possibility of raising the company's scores on public procurement see Figure 13. An EMS introduction will also contribute to structured and mutual working methods, raise the focus on environmental related questions and give competitive advantages according to several interviewees.

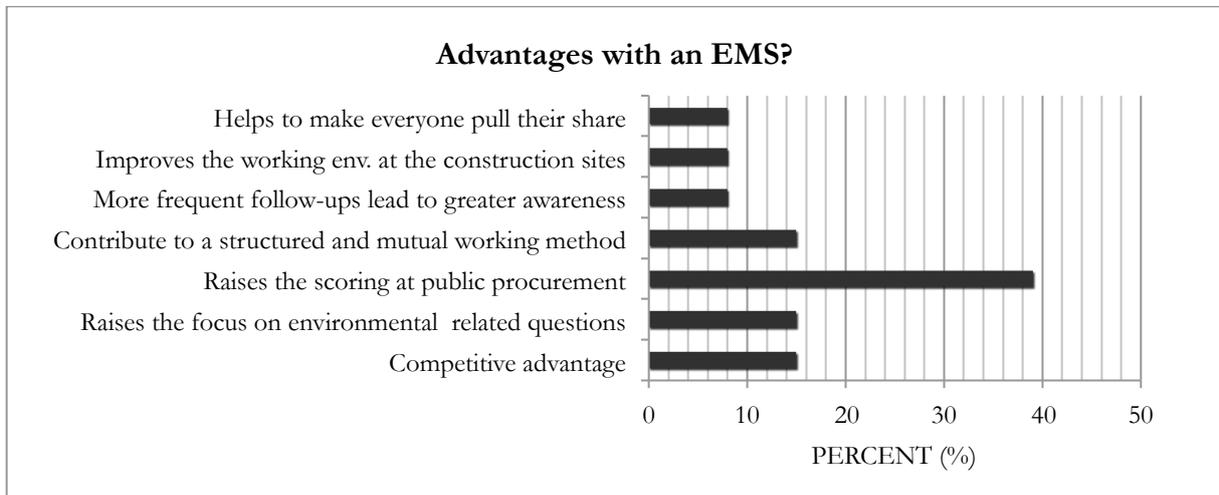


Figure 13. Advantages with an EMS implementation.

The internal stakeholders identified fewer disadvantages with the implementation of the EMS compared with the number of advantages. A large group of the internal stakeholders expressed that an EMS will contribute to a higher workload when it comes to administration. Noticeable is that almost half of the internal stakeholders said there are no disadvantages with an EMS implementation.

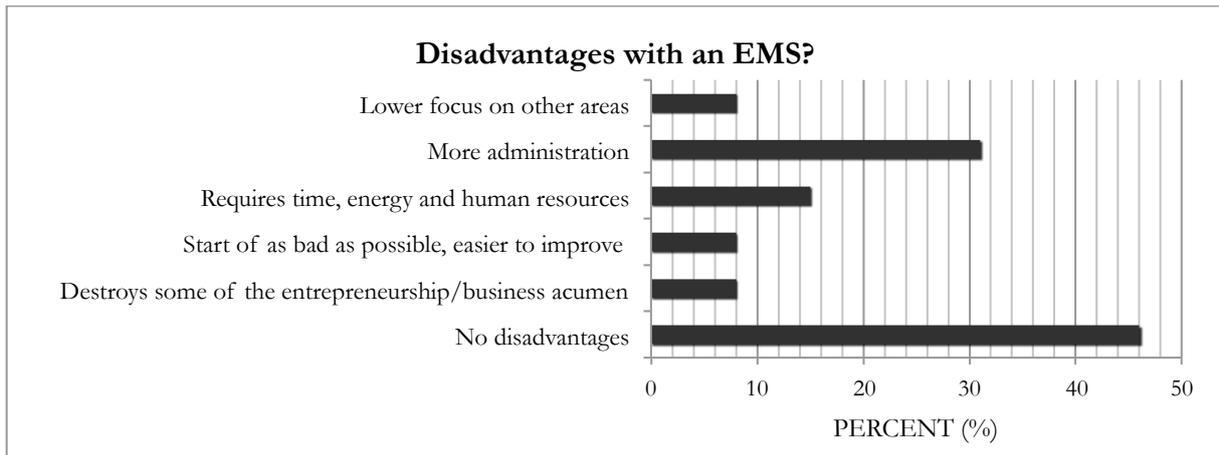


Figure 14. Disadvantages with an EMS implementation.

The general perception on changes or improvements needed, in order to get a well-functioning system and environmental work, were according to the internal stakeholders the necessity of implementing a structured and mutual working method. Furthermore, several internal stakeholders said that everyone's attitudes need to be changed in order to get a successful EMS and others had no clue.

*“Do not know because I do not really know what the system means in practice. But I believe that much of the environmental work will be done here at the office before it comes out to the production sites and then maybe it will turn out in 10 points that we must follow”.*

Single statements on the importance of de-dramatize the meaning of environmental work, increasing the knowledge level and to introduce a framework rather than more templates were also highlighted as things that should be changed to be able to get a successful EMS.

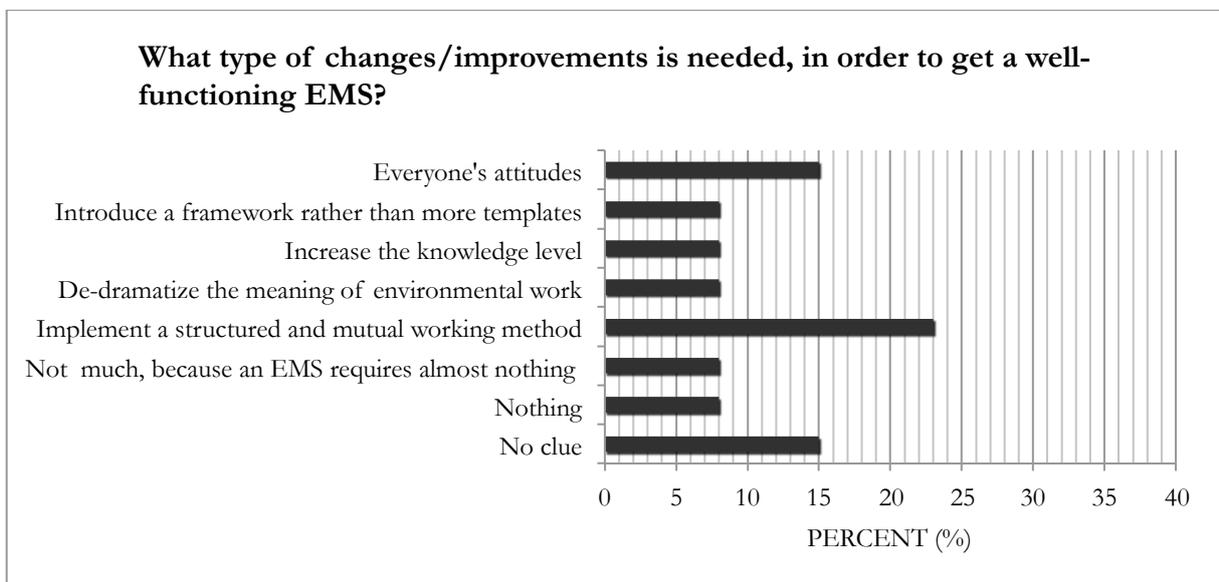


Figure 15. Changes or improvements needed according to the internal stakeholders, in order to get a well-functioning EMS.

The results from the question on what type of knowledge or human resources that was needed for the introduction and maintenance of the EMS were a bit difficult to summarize. However, a great many (~50%) of Byggnads AB Tornstaden's internal stakeholders think that the company has a

general lack of knowledge, both when it comes to environmental issues, -work, -classification systems and EMS.

Almost every stakeholder interviewed highlights the importance of having an Environmental Coordinator (EC) and without this competence in-house they would be unprepared for future environmental challenges and there would be no active environmental work. When discussing if additional human resources were required for the introduction and maintenance of the EMS, most of the interviewees (>50%) did not believe it was needed unless the organisation continues to expand.

According to the statistics illustrated in Figure 16 the internal stakeholders had altered views on their roles in the EMS process. A commonly shared perception from internal stakeholders concerning their own role in the EMS process, were that they had no clue or did not know how their future role in the EMS process would look like. Furthermore, 15 % stated either that they will do as they are told or that their role/department will not be affected by the EMS and the environmental work at the company.

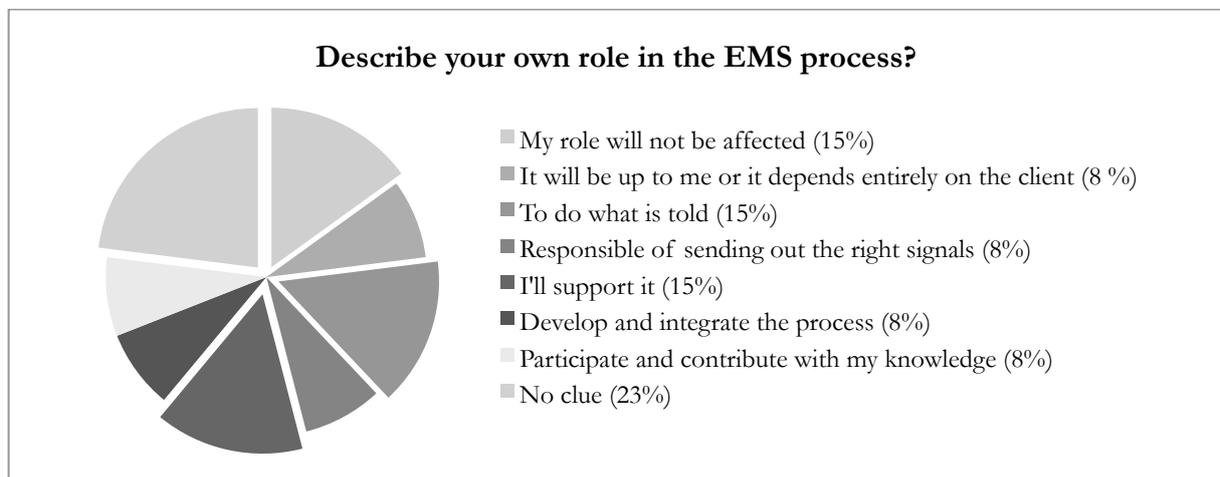


Figure 16. The internal stakeholders' view on their own role in the EMS process.

The most frequent response on the allocation of responsibility in an EMS context was that the responsibility should be divided among everyone and at all levels (39%) and another common notion was that the responsibility should lie centrally and primarily on the environmental coordinator (30%), see Figure 17. This implies that the internal stakeholders are not unanimous when it comes to how the allocation of responsibility should be distributed.

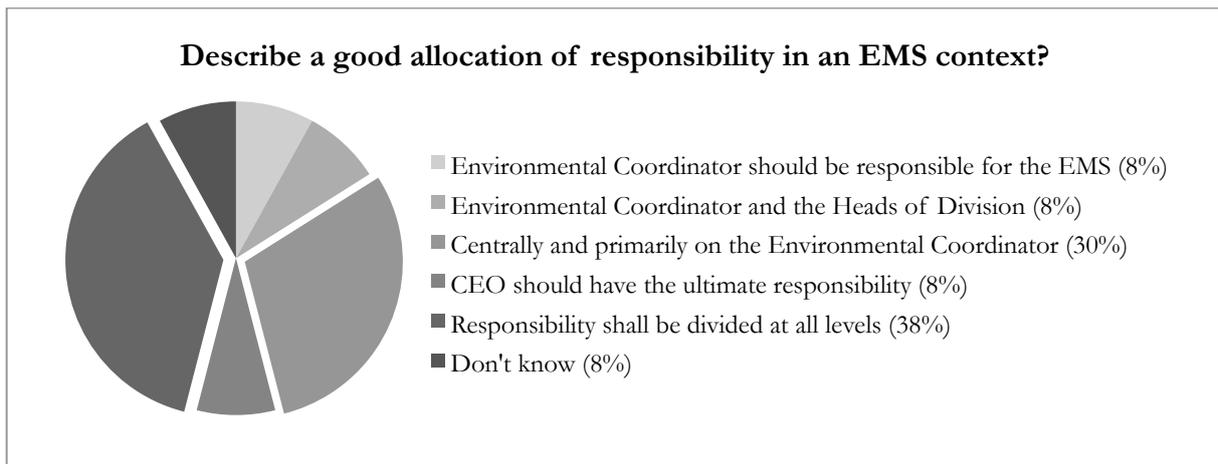


Figure 17. Views on the future allocation of responsibilities in an EMS context.

### 6.1.5 Recurrent Themes

Recurrent themes identified from the interviews were that the company has a general lack of knowledge within the environmental field. Numerous internal stakeholders associated the company's environmental performance with all required parameters and administration of their environmental classified projects, i.e. Sunda Hus or Miljöbyggnad. More than half of the internal stakeholders expressed their doubts on clients' environmental competence and they questioned their motives when it comes to the choice of selecting an environmental classified project. As two internal stakeholders stated:

*“I think that most clients have read something clever from a trade magazine and thought that environmental classified buildings are awesome, let's go for it so we boost ourselves. And later they come to the contractor and say 'look what we read in the magazine, let's go for environmental certification -Here now it is your problem. And if the contractor succeeds then they can write a big sign; look what we have achieved'. I would say that they have not done a damn thing, they just thought it was cool.”*

and,

*“My experience from the past tells me that focus is not on environment questions. Clients' sometimes sets requirements of environmental work, but sometimes one can question it. Have they just added environmental specifications just to make it sound nice? Or are there real values behind them from the beginning? However, once it comes about and it starts to cost money, how much do they value the environment when it comes to the edge? According to my view, the environment must often draw the short straw and there is not much focus on it at all.”*

Another recurrent theme was that the internal stakeholders' had observed an importance of changing the attitudes towards environmental work, this in order for the company to improve their environmental performance and to be able to retain the ISO 14001 certificate. Expressed attitudes were: *'It does not matter what I do, because I cannot change anything anyway, the environmental problems are too big and global'. 'Sweden and the building constructing sector are already doing well, so the focus should be on something else or someone else'*. Another identified attitude was that numerous internal stakeholders tried to disclaim or stress that *'contractors are not conscious environmental villains'*. Others even ridiculed over environmental issues, problems and research.

Monetary dependence was also identified as a recurrent theme; many of the internal stakeholders interviewed stated that shortage of money is one of the reasons why the company and the sector do not put more efforts on environmental issues.

## 6.2 Results of the Initial Environmental Review

This chapter will present the main findings from the IER and the identified significant environmental aspects of Byggnads AB Tornstaden.

### 6.2.1 Byggnads AB Tornstaden's Significant Environmental Aspects

In this chapter Byggnads AB Tornstaden's significant environmental aspects from the Project Process and at the Main Office will be presented, for a detailed version of the IER, see "*Appendix C*"

In the initial environmental review 45 significant environmental aspects were identified, where 21 aspects were found in Purchase Phase, 16 in the Production Phase, five in Project Design (Planning), two in Project Start-up and one aspect in Warranty Actions. Of these 45 identified aspects, 11 of them depend on knowledge as a resource and 34 on material use. The aspects can also be subdivided into aspect classification, whereas 21 are Indirect/Soft, 15 are Direct/Soft, five are Direct/Hard, two are Indirect and one is Hard, see Figure 18. The majority group is categorised as indirect aspects, which means that are hard to control and mitigate. The second largest group is direct aspects that are easier to control and mitigate. The common denominator is that both groups are also classified as soft and are of organisational character, which indicate that they are depending on internal decisions and knowledge of Byggnads AB Tornstaden.

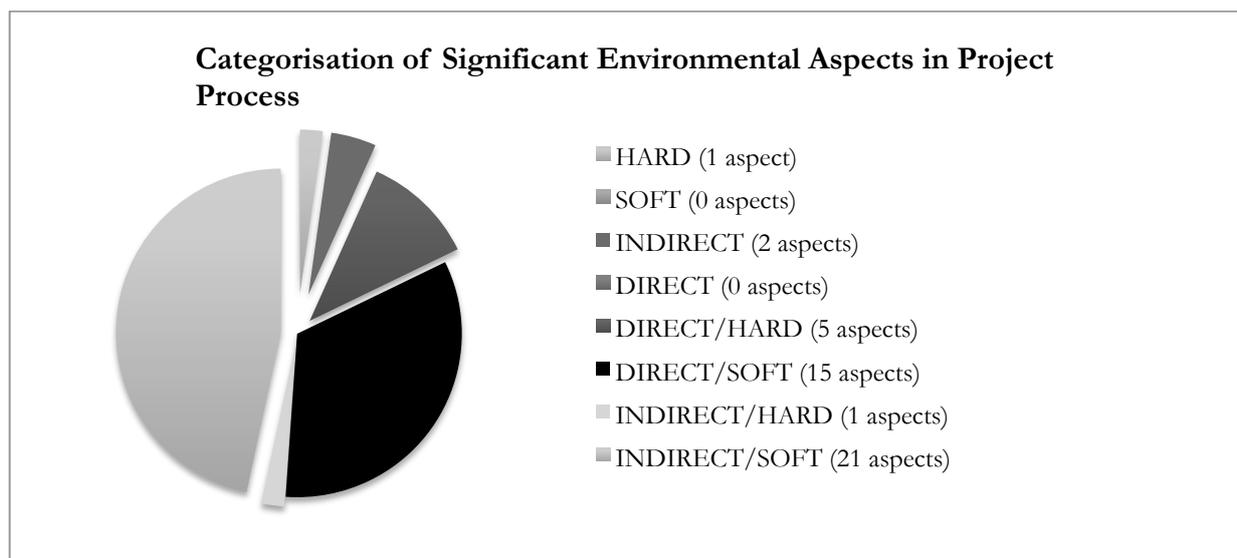


Figure 18. Byggnads AB Tornstaden's significant environmental aspects identified in the Project Process, subdivided into aspect classifications.

The aspects were further divided into different Aspect Groups; Chemical use, Education, Energy use, Resource use, Transport, System selection, Waste management and Water use. The Aspect Group that most aspects were assigned to was Resource use followed by Education and Waste management, see Figure 19.

Environmental aspects identified at the Main Office were counted to 8 significant aspects in total, whereas six depends on material use as resource and two depends on knowledge as a resource. Out of these aspects seven were categorised, as Direct/Hard and one were Indirect/Soft. This means that seven aspects are easy to control or affect and they have a direct impact on material or energy flows, while one aspect is harder to control and has a recognised environmental impact.

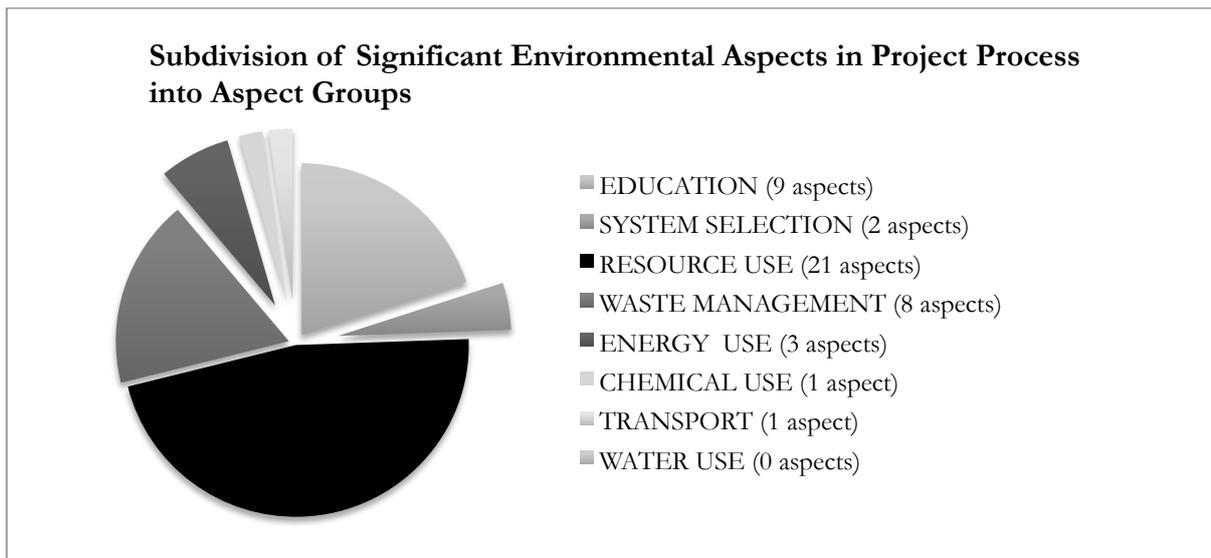


Figure 19. Significant environmental aspects identified in the Project Process.

The aspect groups assigned with the highest number of significant environmental aspects at the Main Office were Education, Transports and Resource use see Figure 20.

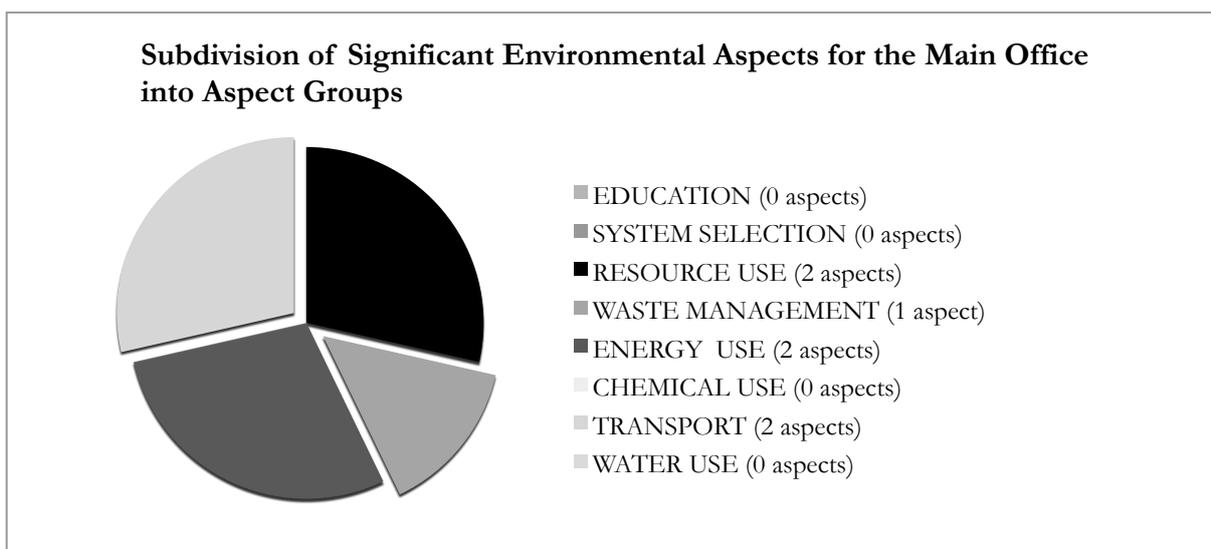


Figure 20. Significant environmental aspects identified at the Main Office.

The result from the chemical inventory investigation showed that Landvetter used 26 chemical products that required a safety data sheet and the number in Mölnlycke was 12. The number of registered product in BASTA was for Landvetter 4 and for Mölnlycke 3. No identified aspects performed by Byggnads AB Tornstaden were identified as to be breaking any national regulations or laws.

### 6.3 Observations during Field Visits and at the Main Office

During the field trips some observation on the different construction sites were made. At one site different containers with warning symbols were placed outside of the 'hazardous waste collection safe' see Figure 23. At the first visit there were about five containers and at the second visit there were seven containers located outside of the 'hazardous waste collection safe'. Between the two visits there had gone seven weeks. Observations made inside the safe revealed that the safe were not

overfilled. At another construction site the containers for the gypsum were open and they also heated uninsulated containers.



Figure 21. Chemical containers placed outside of the hazardous waste collection safe, observed during a field visit.

All production sites indicated that proper waste management only occurs if space and time is available and the choice of different fractions depends on monetary values and clients' requirements instead of environmental concern. Furthermore, the difference between entrepreneurs and suppliers was highlighted in order of their environmental management and products, whereas some products or entrepreneurs require more or less packaging waste. Reluctance towards more environmental work is motivated by the building process and construction sites temporally environmental influence.

Some of the observations made at the Main Office were that they did not have any pronounced recycling scheme, if asked the employees said that they think they had a sorting system where three distinct fractions were separated; paper, cardboard and household waste, they also had a collection point in the basement for used batteries and old IT- technology. However when looking around in the office, very few of the employees had a sorting at their working place and in the copying and printing rooms there were no paper collections.

In the kitchen there where room for more than one fraction sorting but this was not used, instead the employees' threw away glass, metal, plastic and paper in the same household bag. In the garbage room outside of the office there was also room for more waste management, but this was neither arranged nor structured.

Other observations made where that it was only cars that had marked places outside of the office and there was no indicated place for bikes. This can give the impression of an organisation that only wants their employees and clients to arrive by car. This was also the most common transportation system for the employees in order to get to work, even if the bus stopped 50 meters outside of the office every 5 min.

The design of the house also sends out some signals to clients and passers, from the outside the Head Office is big and is built in bricks, with large windows with panoramic view. That can give the impression of luxury and quality. At the inside of the office, there are high ceilings and a lot of space to move around in, the employees have own offices and only a few persons share an office. This can at a first impression give an indication of an organisation with a lack of environmental concern.

## 6.4 The Workshop at Byggnads AB Tornstaden

The majority of the groups i.e. three out of four groups chose the ‘radical change’ scenario (i.e. scenario 2) while one group chose the ‘some change’ scenario (i.e. scenario 1). Some of the motivations for choosing the ‘radical change’ scenario for Byggnads AB Tornstaden were:

*“To be competitive”,*

*“It will be economical in the long run”,*

*“If you are supposed to be ‘the modern building contractor’ then we shall be in the forefront of environmental work”,*

*“Everybody is allowed to be involved and is able to influence the environmental work”,*

*“To deepen the knowledge and increase the competence in-house, the company will become more attractive for our clients”*

and,

*“To minimise our environmental impact”*

The motivations given from the group that selected the “some change” scenario, were that the vision in the ‘radical change’ alternative was set too high and it would be difficult to be able to live up to. Therefore they thought that the ‘some change’ alternative was better and they could instead gradually improve the environmental performance in the long run.

### 6.4.1 Findings from the Workshop

The general opinion was that lack of knowledge about environmental issues is an obstacle in the organisation today. It is a reason for the employees’ negative attitudes towards environmental work and by information or education this obstacle can be reduced. The lack of knowledge is also a hinder in the sense of their environmental performance when it comes to EMS and building classification systems. However, nobody reasoned how this lack of knowledge was supposed to be reduced, more than that it is up to the organisations EC to make sure that it happens. The words, education or information were never mentioned in that sense. On the other hand the groups instead identified a way around this issue and focus more on implementing the right routines or structures, in form of checklist or guidelines that could be of use at the working places.

Another identified recurrent theme from the workshop was the lack of central governance, structures and routines. In order to make sure that the environmental work or visions are fully implemented and permeates the whole organisation including suppliers and subcontractors the employees’ requests better information, standpoints and governance from the management of Byggnads AB Tornstaden.

One group suggested that an environmental bonus system could be implemented in the organisation, which will benefit the projects that are considering the environment in the projects, in order for the employees to work more environmentally. A bonus system already exists at Byggnads AB Tornstaden but as it is structures now the employees are rewarded if the projects are managed well and are executed in time.

### 6.4.2 Observations made at the Workshop

While presenting and providing the employees with knowledge about EMS and the result from the initial environmental review, it were difficult to engage and involve the audience into discussion or to get them to respond to the question asked.

Observation made during the group discussion, indicated an honest commitment from most of the employees, which apparently according to the organisations EC was not the case in the previous workshop. The group dividing might also have been obstructing for some of the participant, due to the group sizes being too large. The discussion and problem solution might be more efficient and thriving if the groups were smaller in size, i.e. if person should end up in a large group with opposite opinion then it might be difficult to make your voice heard.

## **7 ANALYSIS**

The purpose with this study was to evaluate internal stakeholders' perspectives on environmental work and EMS. This chapter will therefore analyse the findings related to the research questions, of both the "*Interview Study*" and "*The Initial Environmental Review*". The analysis will span over the two-part structure and it is therefore recommended to read the entire text in order to receive the whole analysis of both parts. The results from the interview study will first be presented in accordance to the three key values; Attitude, Commitment, Responsibility. Furthermore in order to answer this thesis research questions, the result will be analysed with respect to internal negotiations, potential conflicts and sense making of environmental work.

A common perspective among the internal stakeholders was that the company's environmental work today is in a 'confinement phase', i.e. it is underway. To start a process with a statement of consensus is always promising, both for the implementation of an EMS and for future environmental work.

### **7.1 Attitudes**

The identified attitudes towards 'environment' as a concept, environmental issues and environmental work presented in the previous chapter vary. The different attitudes can be explained as earlier mentioned by behavioural science, meaning that a person's attitudes are formed from previous knowledge, perceptions, experiences, interests and morality (Eagly & Kulesa, 1997). Previous experiences will form a person's present attitudes and therefore a group of people will have different attitudes and opinions. Consequently, the respondents at Byggnads AB Tornstaden have different previous experience, which all affect and influence their attitudes towards the environment as a concept, environmental work and EMS. The internal stakeholders' attitudes will therefore shift considerably when it comes to environmental issues.

#### **7.1.1 Negative Attitudes**

The results from the interview study shows that the majority of the internal stakeholders' attitudes towards environmental work at Byggnads AB Tornstaden are negative or neutral. According to Gluch (2005) a contributing factor to the internal stakeholders' negative attitude towards environmental work can be the building construction sector's trade magazines, since the building sector's trade magazines portrays environmental work as something difficult, time-consuming and uneconomical. The building constructing sector, as well as Byggnads AB Tornstaden is highly driven by economy, which can be another reason of the negative attitudes towards internal environmental work, because many of the respondents connect environmental work with costs. Environmental work is also seen as an additional task that needs to be performed and is dealt with on top of other working assignments and not as an integrated part of daily business. The internal stakeholders also identified negative attitudes as the main obstacle of the environmental work at Byggnads AB, followed by hinders of economy and the concern of increased administration.

The majority of building construction companies, as well as Byggnads AB Tornstaden, operates primarily through projects with a fixed time horizon and the projects can be likened to temporary small organisations. This complicates the time perspective of environmental issues. Gluch (2005) states that construction projects of today neither provide motivation, nor prerequisites for the project members to have long-termed and holistic environmental perspectives. Furthermore, these projects also foster an extreme focus on production efficiency on behalf of issues which effect falls outside of the project boundaries e.g. demands from the company's environmental department. If this attitude remains during the life of the EMS, Byggnads AB Tornstaden might fail to continuously improve

their environmental work once all the 'low hanging fruits' are mitigated and controlled. The short time horizon of a construction project is also reflected in a result-oriented culture where everything that is not perceived as being hands-on to the current project is regarded as an efficiency obstruction. In order to decrease the lack of environmental practices caused by short time frames, attempts and considerations of this needs to be included in the planning process of the project.

Gluch (2005) found that a project's environmental norms, set by the client, were more concrete for the project members than an organisation's environmental policy. This was also confirmed in our interview study, where the internal stakeholders acknowledged that they either had seen the company's environmental policy once or maybe twice, never seen it, or that the policy is definitely not guiding their daily activities.

### **7.1.2 Positive Attitudes**

The overall attitudes at Byggnads AB Tornstaden towards implementation and practise of EMS (i.e. ISO 14001 in particular) are that it is necessary and that it will contribute to a positive organisational change. The results are indicating that a reason behind this positive attitude towards the implementation is that numerous internal stakeholders believe that the company has a lack of routines and guidelines when it comes to environmental work. Further, they have also started to notice the external requirements on environmental performance and they believe that an EMS certificate will give the company instant competitive advantages. If initial feelings, interests and experiences behind the negative attitudes towards environmental work are changed to positive stands, the commitment to environmental work will increase and it is only then a change of the environmental work can occur (Eagly & Kulesa 1997). The majority (77%) of the internal stakeholders are positive to the implementation of the EMS and this positive feeling can hopefully be used as a starting point for getting the internal stakeholders more positive to environmental work in general and to become more engaged in environmental questions.

## **7.2 Commitment and Engagement**

The outcome of the interview study indicates that environmental related questions have not been prioritised or brought up on Byggnads AB Tornstaden's agenda in the past. Stenberg (2006) argues that if environmental issues are not brought up on the company's agenda for repetitive sense making and discussion, there is a risk that the development within these areas stagnates. This reinforces the importance of introducing these questions to Byggnads AB Tornstaden's agenda, if the company is aiming on having a sustainable and long lived EMS with committed internal stakeholders.

### **7.2.1 Top Management**

In order for the company to reach environmental goals, it is of importance that the top management communicates and legitimises those environmental concerns that correspond to their targets (Ammenberg 2004; Stenberg, 2006). It is also stressed that unless environmental issues have a high priority within a company and if not specific financial resources are put aside for environmental work, it makes the environmental management highly dependent on the commitment and goodwill of internal stakeholders. This in return may lead to a lower level of environmental engagement among the internal stakeholders than would be the case in other structures (Atkinson et al., 2000).

Our result from the interview study also signifies that the recruitment- and introductions process at Byggnads AB Tornstaden does not encompass their environmental values and stand points of the company. In order for the newly recruited to apprehend and embrace the company's norms they need to be introduced to them. Stenberg (2006) argues that if the top management do not make enough

efforts to involve new employees in the collective sense making process and thereby make them part of the overall 'company environmental commitment' they will never be committed. Without a common view on environmental issues, the company runs a risk that tensions in both interpretations and commitment becomes destructive for the strategic environmental work. This is lacking for Byggnads AB Tornstaden today and therefore it is highly important for them to define a shared set of values for their future environmental work.

### **7.2.2 Internal Stakeholders Involvement**

The results from the interview study further show that the internal stakeholders did not have a genuine commitment towards environmental work. Observation made by Stenberg (2005) was that some employees' distance themselves from the environmental commitment and responded with non-action. Perhaps this is also the case for some of the internal stakeholders of Byggnads AB Tornstaden. Once again, without a clear and common view on environmental issues from the CEO and the top management, the company runs a risk that tensions in both interpretations and commitment may prove destructive for the strategic environmental work, which will lead to no-actions.

When discussing organisational management and implementation of organisational change, researchers and managers often talk about bottom up or top-down approach. The results gained from the workshop at Byggnads AB Tornstaden, revealed that the internal stakeholders wants that everybody should be *"allowed to be involved and able to influence the environmental work"*. This indicates that the internal stakeholders promotes to a bottom-up approach. Stenberg (2006) also promotes a bottom-up approach, this in order to mobilise a collective sense making process within the company, which would make the top management succeeded in the ambition to create environmental commitment among organisational members. This suggests that if the internal stakeholders of Byggnads AB Tornstaden are allowed to be more involved in the process and are given the opportunity to influence the future environmental efforts, it will result in greater environmental commitment among the internal stakeholders. Stenberg (2006) further states that an organisation's identity must be 'deeply rooted' in practices and behaviour grounded actions, this is also important for the communication to the outside. If the environmental identity is well anchored it is more likely that the internal stakeholders' actions will support a company's environmental image and also in order to maintain a strong environmental commitment, there is a need for enthusiastic internal stakeholders.

### **7.2.3 Cost and Image**

The importance of having financial incentives to increase involvement to environmental work within the company, were highlighted by the internal stakeholders both at the workshop and during the interviews. This is substantiated by Hannigan (1995) who states that if environmental claims are motivated by representing economic incentives, the chances for getting attention increases. At the workshop one group of internal stakeholders suggested a reward system with a possible environmental bonus if a specific project performs a good environmental work, in order for them to consider it in their daily activities. As shown in the *"RESULTS"* chapter, one internal stakeholder said in the interview that economy is ranked both as the first, second and third most important factor for every project and for the entire company, therefore incentives have to be found in order to reach better environmental performance. Other suggestions or incentives to incorporate into the organisation's operation could be different monitoring systems e.g. wastage of resources, unnecessary transports or wastage of energy, which are connected to the identified environmental aspects and the

environmental goals. A vision of 'zero-wastage' and follow-up structures after each ended project could be implemented in the organisation.

Something that emerged during the interview study was that numerous internal stakeholders had recognised that some competitors have tried to promote themselves by highlighting their environmental engagement in a positive light. Stenberg (2006) refer this to interplay between the organisation and its context and that a successful method can be to use the media as a mediating tool to create a positive image of the organisation outwards. Furthermore she claims that this can also reinforce the image inwards that is to strengthen the company's environmental identity. One of the identified organisational drivers of Byggnads AB Tornstaden was image, they want to be recognised as the *modern* building contractor. At the workshop some internal stakeholders concluded that "*if you are supposed to be 'the modern building contractor' then we shall be in the forefront of environmental work*", which indicates that they believe that environmental engagement goes hand in hand with the image of being modern.

### **7.3 Responsibility**

The results gained from the interview study, indicated that the internal stakeholders of Byggnads AB Tornstaden were disunited when it comes to how the future allocation of responsibility in an EMS context should look like. A disagreement about how these responsibilities should be distributed may result in conflicts within the company. However, it became clear during the workshop that many of the internal stakeholders interpret the word responsibility and its distribution in a different way than we did, i.e. the interpretation of the word responsibility was linked to whom to blame or who should be the one responsible if anything goes wrong. Therefore, it is quite difficult to analyse the result of this particular question. However, the 'misinterpretation' or the sense making of the internal stakeholders needs to be straightened out by the organisations, to avoid conflicts and collision in the line of work. The following subsections present different aspects of how responsibility is interpreted.

#### **7.3.1 Social Dilemmas**

The overall opinion among Byggnads AB Tornstaden's internal stakeholders concerning the importance of highlighting and discussing environmental issues were that it is essential. On the other hand 25 % did still not think it was important to highlight or discuss environmental issues. This might be explained by how internal stakeholders perceive the word 'environment', the result shows that many of the respondents connect it to global environmental issues. Global environmental problems have been discussed and stressed in the media for some period of time, which have enabled the internal stakeholders to develop some sort of attitude towards the topic. The result of the interview study points out that many of the internal stakeholders do not believe that they as individuals can do anything about the global environmental issues and that they do not contribute to any major extent of the global environmental problems. Therefore the internal stakeholders project the environmental problems and put the responsibilities to solve it on others. According to Jagers (2005) this could be entitled as a social dilemma, where the basic hypothesis is that all individuals are rational beings that try to maximise their own benefits. The respondents' opinions also indicated that their business in connection to environmental impacts, were that they are only being a temporarily contributor, since most of the work is performed during temporarily projects.

#### **7.3.2 Internal Legitimacy of Environmental Work**

In the current state at Byggnads AB Tornstaden, the power and the responsibility of choosing the right direction for the future work with EMS, lies at the primary internal stakeholders. Today this group does not include a person with EMS expert knowledge. The EC is in this context a secondary

internal stakeholder and is not directly able to affect the result and outcome of the future direction of the EMS, due to the lack of power. In order for a successful operation of EMS, the EC should therefore be given conducting power, e.g. be devoted a seat in the directorate. We found empirical support of this that suggest that a consequence of having separate communities of practice (EC) and of action (CEO, top management and project members) within an organisation is that contradictions between talk and action in terms of environmental issues may and will arise (Stenberg, 2005). The CEO and the top management represent the financial, market share and technical interests, while the environmental key actors on the other hand represent environmental interests. Consequently, these two communities represent two different discourses, where CEO and project members are guided by short-term strategies (financial results) and the EC is guided by long-term strategies. In order for these two interest to meet, environmental work to be legitimised and for environmental ideas to be enacted at all levels in the organisation, the environmental key actor in this case the EC must be given a mandate of power i.e. the EC should be given a seat in the directorate. Since Byggnads AB Tornstaden's environmental official lack a formal decision-making mandate, the role in the organisations is undermined. At the same time this will also state, to both internal and external stakeholders that environmental work and issues are of importance and are prioritised in the organisation

Furthermore, the top management would need to consider the opportunities of advancement of environmental representatives in the directorate. The current organisational structure at Byggnads AB Tornstaden indicates that the EC does not have any career paths, if this does not change in the long run the organisation are in the risk of losing their environmental expertise.

## **7.4 Byggnads AB Tornstaden and EMS**

According to the outcomes of the interviews, Byggnads AB Tornstaden's environmental coordinator is today taking care of the company's environmental work alone and the company is highly dependent on her capacity and competence. In order to get a successful promotion of future environmental practice, the EC will be highly depended on her rhetorical ability of delivering the message. Therefore, the EC needs to be a skilled communicator who can translate the technical frames into representations that 'speaks' to all types of co-workers. Another positive ability is to have the power to legitimate and create sufficient interest in her perspectives, thus blocking other actors possibilities of mobilise disinterest (Stenberg, 2006).

### **7.4.1 How does Byggnads AB Tornstaden make sense of the EMS?**

The result from the interview study show that the internal stakeholders are either positive or neutral to the implementation of the EMS and the result from the workshop also indicates that the employees were willing and believes that the implementation of the EMS will contribute to something good for the company. Three out of four workshop groups chose the scenario (i.e. radical change) connected to the greatest environmental commitment and responsibility. This can be a hint that the neutral voices identified in the literature study might be more positive towards environmental work then negative. If so the EC will have a less difficult time to implement structures and routines that mitigates and prevents environmental impacts created by Byggnads AB Tornstaden. Also if the secondary internal stakeholders are willing and feel that environmental work is a necessity for the future work of the organisation, they can put an internal pressure on the primary internal stakeholders and in that way make a change.

To conclude, the internal stakeholders have different sense making of EMS and of environmental work, this can be changed by increasing the knowledge and thereby the attitudes. The organisation

can create a knowledge demand from the internal stakeholders by using their positive attitudes towards the EMS.

#### **7.4.2 Potential Conflicts and Internal Negotiations**

The result of the IER showed that Byggnads AB Tornstaden has similar significant environmental aspects as the general building industry (The Eco-Cycle Council, 2001), i.e. their greatest environmental impacts are when using materials, transports, energy and during waste management. Out of the 45 identified aspects the majority was classified as indirect or direct aspects, which means that Byggnads AB Tornstaden have some aspects that will be 'easier' to control and mitigate. However, when looking at the aspects that are indirect i.e. more difficult to control or mitigate, most of them are related to material use and purchase. In reality, in order for Byggnads AB Tornstaden to control these, they will have to set requirements of environmental character on their sub-contractors and suppliers. This is in line with EMS requirements and the responsibility that Byggnads AB Tornstaden has as a turnkey contractor, otherwise the EMS work will stagnate.

Most aspects were also classified as soft, which indicates that they are depending on organisational structures and routines that is connected to the decision-makers knowledge level. In order for the decision-makers to make the 'right' choice in order to minimise the environmental impact, the person needs to have the 'right' information or knowledge, otherwise the environmental impact will be dependent on the result from an economic perspective. The result from the interview study indicates a fear of increased administration load due to the implementation of EMS. The company identified environmental aspects are mainly categorised as soft, which depend on organisational structures and routines. Therefore the implementation of EMS will inevitable lead to an increased administration burden that might lead to internal conflicts.

Potential conflicts can be found in every aspect of where the internal stakeholders at Byggnads AB Tornstaden have different opinions and perceptions about environmental work and EMS in particular. The sense making or the different point of views can be a reason for internal conflicts, therefore it is important to minimise or reduce the potential ulterior factors that could lead to conflicts, by reducing the different understandings or perception of environmental work and EMS.

One example of a potential conflict identified in this report is the apprehension that some of the internal stakeholders did not need any further education within the field of environment, so what will happen if the top management decides that the employees are going to attend further education within the environmental field? Another example is the different understandings on why the organisations are in the process of implementing an EMS. The different perceptions will result in some sort of understanding on what is needed to be done in order to achieve the certificate i.e the level of commitment and working efforts that are needed. Different set of objectives with the EMS will result in different levels of personal interest and efforts, this can lead to conflict among the stakeholders if not a common baseline and environmental objectives are set.

If negative attitudes are not changed the work with EMS will be affected and the EC might get a difficult time to push through greater organisational, changes or structures necessary to implement an effective EMS. The consequence can then be that the company only focuses on direct aspects (i.e. low hanging fruits). If the attitudes remain negative, the feelings towards environmental work will also remain negative, meaning that there will be no change or willingness to improve the company's current environmental path or structures and there will be no improvement of the organisations environmental performance. Herreborg-Jørgensen (2000) states that in order for an organisation to

achieve continuous environmental improvements, which is an established requirement of the EMS, an organisation must be able to change. This can also be a base for conflicts, because the EC and the environment are on one side and the other internal stakeholders and the organisation are on the other. The EC are the driver for more change and proactiveness within the organisation while the other internal stakeholders stay reluctant toward change.

#### **7.4.3 What Does It Take?**

The majority of Byggnads AB Tornstaden's internal stakeholders think that the company has a general lack of knowledge, both when it comes to environmental issues, -work, -classification systems and EMS. If the knowledge level of general environmental work and issues are raised within the company this might generate more positive attitudes. As earlier mentioned, attitudes are coupled to previous knowledge and perceptions (Eagly & Kulesa 1997). Further, the result from the IER illuminates the need to increase the knowledge base and education level of the internal stakeholders, in order for them to be able to decrease and mitigate the environmental impact of Byggnads AB Tornstaden's activities.

One of the recurrent themes identified from the interview study were that the internal stakeholders doubted their clients' environmental competence and they questioned their real motives behind selecting an environmentally classified project. This indicates that the internal stakeholders have a lack of 'system thinking' or knowledge and therefore do not understand why their clients are setting demands of environmental work or performance. It could be that the clients also are in an initial phase of their environmental work and therefore are not able to answer all the questions or it might show that there is a lack of knowledge within the environmental field at the company. Cole (2011) stresses the important role of securing commitment of and the interaction between all the stakeholders involved in delivering a "green" building. Therefore, the internal stakeholders of Byggnads AB Tornstaden should raise their knowledge on their clients' environmental work instead of question it.

The internal stakeholders have in the workshop pointed out what future scenario they want for the company and what they are expecting of the EMS implementation. The writers of this thesis have performed an IER for the company, which points out where the organisation stands today. Additionally, potential conflicts and difficulties in connection to future environmental work were pointed out, now it is up to the top management of the company to change these difficulties into possibilities. A starting point to get the internal stakeholders more positive to environmental work and to increase the engagement in environmental questions, the organisation could use the implementation of the EMS to further enhance positive feelings towards environmental work in general. Results gained from the interviews and the workshop showed that the internal stakeholders had a positive feeling toward the EMS system and to further enhance and develop more progressive environmental work these positive feelings could be used.

## **8 DISCUSSION**

This chapter will discuss in what way the choice of methodology has affected the outcome and highlight some of the findings of this study and discuss them in relation to areas of application and perceived difficulties.

### **8.1 How the Result has been affected by the Choice of Research Approach**

The most challenging aspect of this study has been the interviewing itself in combination with listening enough to the respondent in order to fast come up with interesting and relevant follow-up questions. It is also not as easy as it sounds to only ask open-ended questions or no leading questions, it requires practice and maybe additional test-interviews would have been preferable. Further challenges in connection to the interview study, were to stay objective and to not show any emotions even though a respondent had a totally different opinions then yourself. Relevant questions that could be asked for the interview study; did all the respondents always tell the truth or shared their real opinions? How were the respondents influenced by our positions as environmental engineering students?

#### **8.1.1 The Interview Study**

A semi-constructed interview approach was chosen for this study, which is a bit challenging to perform and requires practice. This research approach was necessary in order to provide the writers of this thesis with the most accurate type of data. Since this thesis aim was to study internal stakeholder perspectives on EMS and environmental work, a qualitative approach was recognised as the best alternative. If the researchers had chosen a quantitative approach of the interview study, the internal stakeholders would have had to answered questions with standardised predefined alternatives (e.g. questionnaires). This might have given the researchers an opportunity to understand the internal stakeholders' perspectives from a more mainstream standpoint and perform numeric analysis of the data. However, this would not have given the study the tone desired to fit its purpose, therefore it was never an option.

The number of interviews that was performed was 13 in total, which in theory is not a significant number if looking at the total of employees at the company. However in reality this figure was hard to handle. During the last interviews it was difficult to stay alert, objective and curious due to the similarity of answers from some of the respondents, but also that the questions asked were familiar to us and the spontaneity when asking follow-up questions was reduced. The number of interviews was also hard to handle when it came to the transcription and the analysis of the material. The transcribed interviews where from 11-13 pages long and resulted in a lot of information, which were difficult to sort and to pin point the most important essence of the material. The transcribed material was neither showed nor confirmed by the respondent, which normally would be the case in order to validate that you have perceived and acknowledged respondent right. This has affected the result in the way that the transcribed material and the interpretation of the interviews are only based on our "objective" sense making.

#### **8.1.2 The Selection of Respondents**

The selection of internal stakeholder to interview is another thing that could be discussed and the candidates were as mentioned selected in consultation with our supervisor at Byggnads AB Tornstaden. The interviewed candidates represented both sexes and had different occupational roles within the company, but it turn out to be a high percentage that was members of the directorate. This could have had an impact on the outcome of the interview study, because this group sits together and

discusses strategies and business management and their personal views are therefore influenced. However, the members of the directorate and their attitudes towards EMS, is important for the implementation and success of the new management system. Therefore the high percentage of representatives from the directorate might instead have been an advantage. The results might also have turned out differently if e.g. the craftsmen of the company were included in the interview study, or if more employees were interviewed that were not members of the directorate, because they have another perspective due to other working assignments and conditions.

## **8.2 How the IER has been affected by the Choice of Research Approach**

The method used for the IER work was guided by Whitelaw's *ISO 14001 Environmental Systems Handbook* and the layout was taken from 'Byggsektorns' Eco-Cycle Council's<sup>6</sup> (2001) summary of the environmental review of the construction industry, which appeared to suit this particular investigation quite well, but it took somewhat long for us to decide how to structure the work. A good idea would have been to interview a consultant that works with IER regularly, in order to get some advice beforehand on how to start. This could have enhanced our IER document and made it more effective and more structured.

The method used for ranking the significance of the aspects originates from Almgren & Brorson (2006) and was a relative easy and simple method, which suited this study. This ranking method will also be fairly easy for Byggnads AB Tornstaden to follow in the future. However, there are a number of different methods and ranking systems to use and depending on the chosen model the result will differ. Therefore the result from the ranking process would be different if another model had been selected.

Perceived difficulties with the structure and the layout when performing the IER was the lack of available quantities, this affected the outcome of the IER. If more quantities would be available it would have affected the choice of ranking method, which would have given another final result of the IER, perhaps a more accurately result with a more detailed ranking system.

## **8.3 Is the Result Representative for the Building Construction Sector?**

The result of this study is compared and confirmed to the research performed by 'Miljöbarometern', which indicates that the opinions and perspectives expressed by the internal stakeholders of Byggnads AB Tornstaden are representative for the general feelings within the building construction sector. However, the results from the workshop indicated that the employees at Byggnads AB Tornstaden seemed to be more positive, involved and engaged in the outcome and direction of the future environmental work in the company. This speaks as an advantage of Byggnads AB Tornstaden that they might find incentives and opportunities that could put them in the forefront of environmental work in the building construction sector in Gothenburg.

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<sup>6</sup> Kretsloppsrådet

## **9 WHAT DOES IT TAKE FOR A BUILDING CONSTRUCTION COMPANY TO WORK ENVIRONMENTALLY?**

This chapter highlights and concludes the most relevant findings of the research based on the outcome of the previous chapters and will present some important recommendations regarding Byggnads AB Tornstaden's future environmental work.

- The negative attitudes towards environmental work must be changed otherwise the future environmental work will be negatively affected, meaning that the willingness to improve the company's current environmental performance is not there and the environmental commitment among the internal stakeholders will not increase. According to our results one solution to decrease the negative attitudes is to increase the general knowledge level within the environmental field. If the internal stakeholders' knowledge levels and 'system thinking' is raised, they will understand their clients' environmental attempts instead of question it. If the knowledge level of general environmental work and issues are raised within the company this might generate more positive attitudes, which is necessary for Byggnads AB Tornstaden's future environmental work. Increased knowledge and education will also lead to that the environmental impacts identified in the IER will decrease.
- The environmental practises must be integrated in the internal stakeholders' daily activities, to avoid the perception that environmental work is an additional element on-top of already pressed working positions; otherwise the environmental work will not be prioritised.
- Byggnads AB Tornstaden's must introduce and include environmental questions and issues on the agenda, if the company is aiming on having a sustainable and long-lived EMS.
- In order for Byggnads AB Tornstaden to get committed internal stakeholders and a sustainable environmental work, they have to implement shared environmental values and a common environmental baseline. Without a clear statement and good governance on environmental issues from the CEO and the top management, the company runs a risk that tension in both interpretations and commitment, will result in non-action. Additionally, for the company to reach future set environmental goals, it is of the utmost importance that the top management communicates and legitimises those environmental concerns that correspond to the goals.
- As Byggnads AB Tornstaden is now structured, it is up to the EC to increase the knowledge levels and the commitments of the internal stakeholders. The success of this is therefore highly dependent on the rhetorical ability and communication skills of the EC. To additionally increase the legitimacy of environmental work and issues at Byggnads AB Tornstaden the EC must be empowered with decision-making mandates or with some sort of conducting power i.e. she should be given a seat in the directorate. This will also give the environment a voice in the decision-making processes and by doing so the top-management will also legitimise the work of the EC. At the same time send the signal (state) to both internal and external stakeholders that environmental work and issues are of importance and are prioritised in the organisation.

- If the internal stakeholders of Byggnads AB Tornstaden are allowed to be more involved in the process of implementing the EMS and get the opportunity to influence the future environmental efforts, it will result in greater environmental commitment among the internal stakeholders.

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# APPENDICES

## **Scenario 1. (Some Changes)**

### **Attitudes towards environmental work:**

- We can do what is obvious. Interesting, motivating economically reasonable.
- The employees are aware of the complexity of environmental work and issues, the organisations have recurrent workshops about environmental theme.
- Good knowledge about different environmental classification systems of building.

### **How to reduce environmental impacts:**

- The organisations focus on aspects that are:
  - Easy to mitigate and reduce (direct aspects).
  - Direct and has an impact on material- and energy flows (hard aspects).
  - Organisational character (soft aspects).

### **Waste- and Resource management:**

- Sorting in minimum 3 different fractions.
- A chemical list exists in the organisation with approved chemicals.
- The goal is to have a resource- and energy efficient building. Our environmental work only includes our own business.

### **Education:**

- Continuous environmental education is available.
- Engaged and interested civil servants feel confident in answering environmental questions.

### **Responsibility for EMS:**

- The top management and Environmental Coordinator (Eva) formulate the environmental goals and are responsible for the system.

### **Vision & reputation:**

- A good builder/constructor with happy clients.



## **Scenario 2. (Radical Change)**

### **Attitudes towards environmental work:**

- It is relevant, interesting and one feels knowledgeable.
- Regular workshops are held with environmental theme.
- The company can obtain more work/clients due to our environmental work.
- You see the benefits with environmental classified building and you know and are aware of your client's environmental work and demands (Riksbyggen, Wallenstam, the City of Gothenburg etc.).

### **How to reduce environmental impacts:**

- All different categories are included and are prevented or mitigated.
  - Easy to mitigate and prevent (direct).
  - Direct impact on energy, - and material flows (hard).
  - Organisational character (soft).
  - More difficult to prevent and mitigate (indirect).
  - Environmental accidents.

### **Waste- and Resource management:**

- We will always have a preventive environmental work, with active waste management.
- We will always have a resource - and energy efficient construction management.
- We will always affect the purchase of supplies and services. Our environmental work always includes all business, as well our own employees as subcontractors and suppliers.

### **Education:**

- All employees feel confident in answering environmental questions.

### **Responsibility of EMS:**

- All employees in the organisation have the ability to affect and participate in the formulations of environmental goals and have a shared responsibility.

### **Vision & Reputation:**

- Tornstaden is the modern entrepreneur with 100 % satisfied customers and well-managed projects.



### **Scenario 3. (Business as Usual)**

#### **Attitudes towards environmental work:**

- I cannot affect anything; the environmental problem is too big and global.
- Difficult, boring, time-consuming, ridiculous & non-economic.
- We are already that good; focus should be at something or someone else.
- It is Eva's (EC) headache not mine.

#### **How to reduce environmental impacts:**

- Focus on aspects that are:
  - Easy to mitigate and prevent (direct).

#### **Waste- and Resource management:**

- Active waste management are performed if time and space exists.
- No chemical list exists, the responsibility lies at subcontractors and suppliers.
- Decisions and planning are conducted accordingly to 'gut feeling'.

#### **Education**

- All environmental questions and issues are cited to EC (Eva).

#### **Responsibility of EMS**

- Only the EC (Eva) formulates the environmental goals and has the main responsibility.

#### **Vision & Reputation**

- A building contractor/entrepreneur in Gothenburg.



## **THE INTERVIEW GUIDE**

### Questions for the private individual:

- When we mention the word environment, what does it mean for you?
- Do you have any personal environmental interest, and if so, in what way reflect your spare time?
- What would make you become more involved in environmental issues?
- Do you think that environmental issues are important to highlight? And please elaborate your answer?
- What will be the future environmental challenges?

### Questions for the professional person:

- Describe your professional role and your role in the organisation?
- In what way can you affect strategic decisions within the organisation today?
  
- How does Byggnads AB Tornstaden's environmental work look like today?
- What is your colleague's perception on how the company's environmental activities are managed today?
- What do you perceive the discussion on EMS and environmental issues at the company?
- What is your opinion regarding how Byggnads AB Tornstaden affects the environment? What are your significant environmental aspects?
- How does your department or your profession affect the environment?
- What types of activities or aspects does the company have that could cause an environmental accident?
  
- Why do you think the company will implement an EMS?
- Could it involve any advantages/disadvantages for the company?
- What do you think the company needs to change/improve in order to get a functioning EMS?  
Does your department/profession have to change/improve anything?
- What type of knowledge/human resources will the company need to include the EMS?
- What would be your role in the EMS process?
- How would a good allocation of responsibilities look like, in connection to environmental work and the EMS?

## *Appendix B*

- How can the company influence its clients / sub-contractors / sub-suppliers?
- Tell us about Byggnads AB Tornstaden and future corporate social responsibility?
- How does your communication within the company?

### *Environmental Policy*

- What are your general thoughts when you read it?
  - Do you use environmental policy in your daily work?
  - What would have to be changed for you to use/think about it more often?
- 
- What will be the future environmental challenges for the construction sector?
  - What are your thoughts on possible future environmental laws and requirements?
  - What requirements will the future tenant have?
  - How do you view possibility of submitting green tenders?
  - How does Byggnads AB Tornstaden's foresight look like, relative to above asked questions?
- 
- If you would be the CEO of Byggnads AB Tornstaden, how would you like the company developed? (You can control it however you want!) 5 -10 year perspective.
  - If you were the environmental coordinators, how would you like the company developed?

### *Special Questions:*

#### *Environmental Coordinator:*

- What type of means do you need to manage the company's environmental work?
- How are your matters received by the top management and the board members?

#### *HR manager:*

- How does the recruitment process look like?
- How did the recruiting process look like when you hired the environmental coordinator?

#### *CEO:*

- How does the recruitment process look like?
- What is your vision with an ISO-14001 certificate (or an EMS)?
- What is your vision for Byggnads AB Tornstaden?
- What is the company's future reputation if you get to decide?

## THE PROJECT PROCESS

ENVIRONMENTAL ASPECTS	RESOURCES	DESCRIPTION	ENVIRONMENTAL IMPACTS	
			NATURAL RESOURCES	ECOSYSTEMS
<b>PROJECT START-UP</b>				
<i>Demands/goals from client. [Indirect]</i>	Knowledge.	Different classification systems that the company are currently working with; Miljöbyggnad, Miljöanpassat byggande GBG, Sunda Hus. Other demands from clients can be about design, material choices, size, budget or energy performance. Demands/goals will affect the final product and the environmental impacts.	Indirect: The choice of building materials may differ depending on classification system.	Indirect: Depending on material choice and where it is produced, ecosystems will be affected differently.
<i>Environmental plan [Soft-Indirect]</i>	Knowledge/time.	The routines connected to the selected classification system (e.g. Miljöbyggnad, Sunda Hus) for the building, is usually integrated in the environmental plan. More frequent monitoring tend to generate better environmental performance.	Negligible.	Negligible.

ENVIRONMENTAL ASPECTS	RESOURCES	DESCRIPTION	ENVIRONMENTAL IMPACTS	
			NATURAL RESOURCES	ECOSYSTEMS
<b>PLANNING (Project Design)</b>				
<i>Environmental demands on entrepreneurs and suppliers. [Direct- Soft]</i>	Knowledge. (Env. certification or others).	Depending on which environmental prestanda is demanded, a supplier's or an entrepreneur's impact will differ. Higher environmental performance leads to lower environmental impacts.	Indirect: Higher environmental demands might lead to that less natural resources are used or more environmental friendly materials.	Indirect effects: Hopefully higher environmental demands will lead to less environmental stress.
<i>Designing of building envelope incl. hazardous substances. [Direct- Soft]</i>	Knowledge of material choices and their environmental effects in a lifecycle perspective. Chemicals, metals in e.g. additive agents, joint fillers, sealers, adhesive, solvents etc.	The design and the choice of materials to the building envelope have a huge influence on a building's environmental impact throughout its whole life cycle. If the building is designed and constructed to last for 50-100 years the greatest environmental impact will appear during the operational phase (Byggspektorns kretsloppsråd, 2001) (Kretsloppsrådet, 2012) Building materials containing hazardous substances (e.g. radon) may affect indoor air climate negatively. Designing of buildings with construction, systems and building material incl. hazardous substances. Control of supplier list.	Negligible. Indirect effects, use of both renewable and finite resources.	Climate change. Indirect: If hazardous substances/materials are released in the environment, local ecosystem may be affected. Long decompose time. (US EPA, 2013)
<i>Designing of indoor thermal climate quality and choice of energy system. [Direct- Soft]</i>	Knowledge on building components, systems, operation and maintenance system.	Design of management and maintenance of systems and material concerning indoor thermal climate quality and energy system. Best available technology for choice of energy system and indoor climate system in order to minimise the energy use, a building is usually constructed to last for 50-100 years, so the greatest environmental impact will appear during the operational phase (Byggspektorns kretsloppsråd, 2001) (Kretsloppsrådet, 2012).	Negligible / Indirect: depending on how efficient the climate system is the energy demand/use will differ.	Indirect: Climate change.
<i>Design and installation of water gauge. [Direct- Soft]</i>	Knowledge on building components, systems, operation and maintenance system.	Studies show that installations of water gauge within apartments tend to decrease the tenants water consumption (SVD, 2007). Design of management and maintenance of systems, installation and material concerning indoor fresh water quality.	Negligible. Indirect effects, use of both renewable and finite resources.	Negligible. Indirect: Higher water consumption increasing the pressure on our sewage treatment plants, which on days when large volumes are handled might force them to let untreated water go in to the Göta Älv and ecosystems are affected.
<i>Identifications of sensitive areas, cultural heritage and water reservoirs at (or closeby) the project site, possibilities of contaminated land (soil/water), old construction residues and radon concentration in the ground. [Direct- Soft]</i>	Knowledge. EIA, APD-plan, municipal plans and documents, Risk Assessment.	Environmental accidents can be prevented if good pre-identification and preparations have been performed for the actual site (identification of wells, hydrogeological conditions, accident plan/rutines)(Almgren et al., 2003). If no EIA is performed it is the clients task to provide Tornstaden with information.	Negligible.	Indirect: Negative effects on local ecosystems, habitat losses. Pollution to surface- and groundwater.

ENVIRONMENTAL ASPECTS	RESOURCES	DESCRIPTION	ENVIRONMENTAL IMPACTS	
			NATURAL RESOURCES	ECOSYSTEMS
<b>PURCHASE</b>				
<i>Manufacturing of building materials; from resource extraction to final product. [Indirect]</i>	Concrete, steel, gravel, asphalt, stones, macadam, bricks, ceramic materials, plaster, isolation, surface layers, metal products, plastics, water proofing, additive agents, joint fillers, sealers, adhesive, solvents, white goods etc.	LCA-thinking. Many of the materials used for the construction of a building is both energy- and resource intensive to both extract, manufacture and to recycle, including of transportation. (Byggspektorns kretsloppsråd, 2001)	Natural resource intensive both renewable and finite resources.	Climate change. Affects ecosystems locally and globally.
<i>Building material/products containing hazardous substances. [Indirect- Soft]</i>	Knowledge. Chemicals, metals in e.g. additive agents, joint fillers, sealers, adhesive, solvents etc.	Material/products containing hazardous substances can affect ecosystems, human health and indoor climate negatively. Apply the precautionary principle, even when the risks connected to the material/product are not sufficiently known (Byggspektorns kretsloppsråd, 2001) (See Kemikalieregister).	To some extent not renewable.	Negligible.
<i>Concrete [Indirect- Soft]</i>	Gravel, sand, stones, cement (mainly limestone), water, chemical admixtures and energy.	Water, natural gravel and limestone are a finite resource. The production of concrete is energy demanding and CO2 releasing. Requires a lot of transport kilometers especially when the prefabricated elements are bought from abroad. Cement production consumes a lot of energy. Include steps like; extraction of limestone mining, transport and storage of raw materials, grinding of raw materials, heating of the clinker minerals in coal combustion, grinding of the clinker with addition of gypsum and grinding aids cement (Betong.se, 2013).	Finite resources are used.	Climate change. Indirect: Concrete constructions contribute to more surface runoff, which can cause heavy soil erosion and water pollution (Movium Fakta, 2013).
<i>Prefab elements [Indirect- Soft]</i>	Concrete, insulation (e.g. frigolit, Cellular Plastic) etc.	Mostly made out of finite resources. By using prefabricated elements you will use the exact amount of resources needed, this might decrease the amount of abandoned material compared to site casting (Ibrahim & Nimesh, 2009). However, prefabricated elements will usually be transported from further distances than the site casted concrete.	Both made out of renewable and finite resources.	Increase of transport emissions when using Prefab, due to long distances between production factory and building site. Contributes to more greenhouse gas emissions.
<i>Piles and retaining walls [Indirect- Soft]</i>	Timber, iron and concrete.	The piles are hammered or vibrated into the ground which requires energy. Production of concrete and the extraction of iron requires energy. Tornstaden is hiring an entrepreneur who is responsible for the purchase of piles and retaining walls.	Finite resources.	Climate change, eutrophication and acidification. Increases the demand on virgin materials. Affects local ecosystems close to the production plant and extraction site.
<i>Reinforcement (mainly steel) [Indirect- Soft]</i>	Energy, iron, coal, lime, alloying elements and other metals.	Production of steel is highly energy and resource demanding. Emissions from production to air and water CO, CO2, NOx, SO2, metals, oxygen-consuming substances. Organic compounds (hydrocarbon, dioxins). (Jernkontoret.se, 2013)	Finite resources.	Climate change, eutrophication and acidification. Affects local ecosystems close to the production plant.
<i>Steel (e.g. framework and other elements) [Indirect- Soft]</i>	Energy, iron, coal, lime, alloying elements and other metals.	Production of steel is highly energy and resource demanding. Emissions from production to air and water CO, CO2, NOx, SO2, metals, oxygen-consuming substances. Organic compounds (hydrocarbon, dioxins). (Jernkontoret.se, 2013)	Finite resources.	Climate change, eutrophication and acidification. Affects local ecosystems close to the production plant.
<i>Wood excl. impregnated wood. [Indirect- Soft]</i>	Wood (e.g. pine, birch, oak)	Deforestation is required and contributes to increased levels of mercury (methyl-mercury) to local area. Control if origins from a sustainable forestry is desirable. Fsc-labels.	A renewable resource and recyclable; Trees/biomas.	Climate change. Might give rise to loss of biodiversity if the wood do not origin from sustainable forestry.

HUMAN HEALTH	QUANTITIES/LEVELS		LAWS/REGULATIONS	ENVIRONMENTAL GOAL	ASPECT GROUP	INDICATORS
	Normal	Significance				
Negligible.	-	High	-	Indirect: <i>Reduced Climate Impact, Natural Acidification only, a Non-Toxic Environment, a Protective Ozone layer and a Good Urban Environment.</i>	EDUCATION	-
Negligible.	-	Low	-	Indirect: <i>A Good Urban Environment and Non-Toxic Environment.</i>	EDUCATION	-

HUMAN HEALTH	QUANTITIES/LEVELS		LAWS/REGULATIONS	ENVIRONMENTAL GOAL	ASPECT GROUP	INDICATORS
	Normal	Significance				
Negligible.	-	High	-	Indirect: <i>Reduced Climate Impact, a Non-Toxic Environment and a Good Urban Environment.</i>	EDUCATION	-
Indirect: Inhalation and ingestion of fumes from chemicals/hazardous substances can be health degrading, some chemicals are toxic. (See Kemikalleregister)	-	High	Control of BASTA-regulation	Indirect: <i>Reduced Climate Impact, a Non-Toxic Environment and a Good Urban Environment.</i>	EDUCATION	-
Negligible.	-	High	YES, BBR-krav	Indirect: <i>Reduced Climate Impact and a Good Urban Environment and.</i>	SYSTEM SELECTION	kWh/kvm
Negligible.	-	Medium	-	Indirect: <i>Flourishing Lakes and Stream, a Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos.</i>	SYSTEM SELECTION	Number of installed water gauge/ project.
Negligible.	-	Medium	1998:808 Miljöbalken Chapter 2: General rules of consideration. Localization Principle - You should choose such a place that the object can be achieved with minimal damage or detriment to human health and the environment.	<i>Flourishing Lakes and Streams, Groundwater of Good Quality and a Safe Radiation Environment. Indirect: A Rich Diversity of Plant and Animal Life, a Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos and Thriving Wetlands.</i>	EDUCATION	-

HUMAN HEALTH	QUANTITIES/LEVELS		LAWS/REGULATIONS	ENVIRONMENTAL GOAL	ASPECT GROUP	INDICATORS
	Normal	Significance				
The working force during the resource extraction might be affected.	-	High	-	<i>Reduced Climate Impact, Clean Air, a Protective Ozone layer, Natural Acidification only, Non-Toxic Environment and Zero Eutrophication.</i>	RESOURCE USE	-
Inhalation and ingestion of fumes and chemicals can be health degrading, chemicals can be caustic.	No available documentation .	High	-	<i>A Non-Toxic Environment, a Good Built Environment and a Protective Ozone Layer.</i>	EDUCATION	% of used eco-labeled or recycled materials.
Indirect: Production of concrete and cement generates noise, vibrations and dust/particles, which can lead to inhalation diseases and sleep disorder for people producing it.		High	-	<i>Reduced Climate Impact, Clean Air, Natural Acidification only and Flourishing Lakes and Streams.</i>	RESOURCE USE	% of used eco-labeled concrete
Negligible.		High	-	<i>Reduced Climate Impact, Clean Air, Natural Acidification only and Zero Eutrophication.</i>	RESOURCE USE	% of used eco-labeled concrete
Negligible. Contributes to noise and vibration when installed.		High	-	<i>Reduced Climate Impact, Clean Air, Non-Toxic Environment, Natural Acidification only and Flourishing Lakes and Streams.</i>	RESOURCE USE	% of used eco-labeled or recycled materials.
Indirect: Noise and vibrations from construction site when sheet piling and manufacturing of pilings.		High	-	<i>Reduced Climate Impact, Clean Air, Non-Toxic Environment, Natural Acidification only Zero Eutrophication and Flourishing Lakes and Streams.</i>	RESOURCE USE	% of used eco-labeled or recycled materials.
Noise and vibrations from construction site when sheet piling and manufacturing of pilings.		High	-	<i>Reduced Climate Impact, Clean Air, Non-Toxic Environment, Zero Eutrophication and Natural Acidification only. Indirect: Thriving Wetlands.</i>	RESOURCE USE	% of used eco-labeled or recycled materials.
Negligible.		Medium	-	<i>Sustainable Forests, Reduced Climate Impact, Natural Acidification only, Non-Toxic Environment and a Rich Diversity of Plant and Animal Life .</i>	RESOURCE USE	% of used FSC-labeled wood

ENVIRONMENTAL ASPECTS	RESOURCES	DESCRIPTION	ENVIRONMENTAL IMPACTS	
			NATURAL RESOURCES	ECOSYSTEMS
<i>Copper [Indirect-Soft].</i>	Copper ore, energy, water.	SO <sub>2</sub> , cadmium, lead, mercury and POPs are released during copper production. High energy use (electricity, oil, gas). Copper is 100% recyclable. (Swedish EPA, 2012)	Mostly finite resource.	Emissions to both water and air at the production site; Climate change, acidification, eutrophication.
<i>Aluminium [Indirect-Soft].</i>	Energy, bauxite, water.	Primary production is 20 times energy demanding than production of aluminium from recycled. Emissions of PFC and CO <sub>2</sub> at primary production. Soil emissions such as "Red mud" and "lak rester". Generally are Aluminium produced outside of EU. Al is almost 100% recyclable. (Swedish EPA, 2010)	Semi renewable resources are used. Fossil fuels are finite resources.	Emission to both water and air at the production site; Climate change,
<i>Insulation [Indirect-Soft].</i>	Energy, mineral wool (glass, stone sand).	Within building construction foam, sealing foam and mineral wool (glass wool or rock wool) and treated cellulose are the most common alternatives. Depending on the thickness and the kind of insulation, energy can be saved during a buildings lifetime.	Both made out of renewable and finite resources.	Negligible.
<i>Gypsum wallboard [Indirect-Soft].</i>	Energy, water, gypsum, additives, cardboard.	Gypsum and cardboard can be both from a recycled source and a finite source. Additives are generally a finite resource. Energy used dehydrating is most likely coming from a finite resource. (Gyproc.se, 2013)	Both finite and recyclable resources are used. Fossil fuels are a finite source.	Climate change, acidification.
<i>Windows (i.e glass is counted as the main component) [Indirect-Soft].</i>	Glass, wood, steel etc. The production is energy-intensive.	The choice of windows will affect the energy consumption during the use phase. Glass production is energy-intensive and coal is mostly used for heating the melting furnaces in glass manufacturing. The main components of glass are glass formers (e.g sand), flux agents (e.g sodium- or potassium dioxide), stabilizers and refining aid. Glass is recyclable, 20% less energy use than when starting from the raw material: sand, soda and lime. (Svensk Glasätvervning, 2013)	Fossil fuels for energy- finite resource. Window material is both made out of renewable and finite resources.	Climate change.
<i>Paint [Indirect-Soft].</i>	Binders, pigments and fillers (e.g zink and lead), solvents and additives (different petroleum products).	The environmental impacts that follows when using paint depends on the components used. Important to account for the paint function and longevity. VOC as solvent, together with the nitrogen oxides from e.g. traffic and sunlight contribute to the formation of so-called tropospheric ozone. (See Kemikalieregister)	Some of the components are non-renewable.	Slow decomposition in nature. In contact with NO <sub>x</sub> , tropospheric ozone is formed.
<i>Tile [Indirect-Soft].</i>	Energy, clay, glass.	High energy demand when dehydration of tiles. Energy usually comes from fossil fuels. Emissions to air when burning fossil fuels.	Both finite and renewable resources are used.	Climate change.
<i>Putty [Indirect-Soft].</i>	Cellulose derivatives and dispersion type polymers. Filling materials such as White Alps marble.	Tornstaden is hiring an entrepreneur who is responsible for the purchase of this product. (See Kemikalieregister)	Mostly finite resources.	Climate change.
<i>Plastic-based materials [Indirect-Soft].</i>	Linolium-, vinyl-, plastic- wet room wallpaper floors.	Plastic products are made from fossil fuels.	Finite resource.	Climate change.
<i>Elastic sealants (joint) [Indirect-Soft].</i>	Cement, natural sand.	See cement and concrete. Tornstaden is hiring an entrepreneur who is responsible for the purchase of this product. (See Kemikalieregister)	Mostly finite resources.	Climate change.
<i>Filling material [Indirect-Soft].</i>	Made of natural gravel, crushed rock, macadam (single gravel).	Filling material is for example used during the ground establishment phase. Natural gravel is a scarce commodity in Sweden.	Natural gravels, rock and macadam are finite resources.	Loss of habitats at mining sites.
<i>Bricks [Indirect-Soft].</i>	Energy (heat), brickclay,	Brick is a building product that will last for hundreds of years without maintenance and is in that sense a environmentally friendly choice.	Finite resources are used.	Climate change.

ENVIRONMENTAL ASPECTS	RESOURCES	DESCRIPTION	ENVIRONMENTAL IMPACTS	
			NATURAL RESOURCES	ECOSYSTEMS
<b>PRODUCTION PHASE</b>				
<i>Demolition and handling of building- and demolition waste [Hard].</i>	Engine fuels, hydraulic oils, building- and demolition waste.	Building- and demolition waste might contain hazardous substances. This aspect is usually preformed and handled by subcontractors and not by Tornstaden.	Finite resources, some recyclable waste.	Negligible.
<i>Utilization of land [Direct-Hard]</i>	Virgin soil, contaminated soil or already developed land.	The land surface needed for the construction.	Land surface. Consolidation and rebuilding generally invokes more contaminated soil and less virgin soil.	Biodiversity, influence on sensitive areas and the water table.
<i>Casting of concrete segments [Direct-Hard].</i>	Knowledge, concrete (see purchase concrete). Energy.	Casting is energy-intensive and concrete consists of finite resource. Water can be a finite resource depending on where from it is excavated (renewable in Gothenburg). Depending on which energy source that are used, it can be a finite resource.	Finite resources (i.e. for material and for energy).	Climate change.
<i>Managing of hazardous products and waste [Direct-Soft]</i>	Knowledge and education.	Chemicals in products and waste e.g. additive agents, joint fillers, sealers, adhesive, solvents, 2 components, oils, cooling medium, clear coat, spray etc. (See Kemikalieregister Tornstaden)	Negligible.	Toxic to local ecosystems and species.
<i>Transport of building materials, products and waste to and from the construction site [Indirect-Hard]</i>	Is performed exclusively with diesel driven trucks.	Transportation of building materials and other products during the production phase are a major part of the society's total goods flow. Give rise to emissions of CO <sub>2</sub> , CO, NO <sub>x</sub> , hydrocarbons, sulfur oxides, soot and particles (Byggssektorns kretsloppsråd, 2001) (Kretsloppsrådet, 2012).	Diesel and hydraulic oils are finite resources.	Climate change, acidification, eutrophication and groundlevel ozone. <i>Indirect:</i> Loss of habitat/biodiversity
<i>Mixed waste (combustible) [Direct-Soft]</i>	Wood, emballage, paper/cardboard, plastic, untreated wood, particle board etc.	Combustible and recyclable. Waste combustion is often considered to be a preferred method in relation to the landfill, but inferior in relation to recycling. Recycling of cardboard and paper reduces the carbon footprint by almost 20 % compared to cardboard/paper produced from virgin materials. (RagnSells, 2013) Tornstaden do sometimes throw all types of waste in the same container and RagnSells/Renova are payed to sort the waste. The materials are either combusted, recyclable nor re-used.	Both renewable and finite resources/components.	Combustion of waste give rise to some greenhouse gas emissions, even after filtered discharges. <i>Positive impact:</i> Energy recovery and less demand for virgin materials.
<i>Impregnated wood [Direct-Soft]</i>	Wood joists or beams etc.	Can both be classified as hazardous and non-hazardous waste. Worn out CCA- and creosote impregnated wood is classified as hazardous waste. Wood preservatives agents of class AB is not classified as hazardous waste and is combusted.	Renewable resource	Combustion of impregnated wood give rise to some GHG emissions, even after filtered discharges. <i>Positive impact:</i> Energy recovery, if classified as non-hazardous and combusted. The rest is put on deponi.
<i>Gypsum [Direct-Soft]</i>	Gypsum.	Recyclable. 90% less energy is used if recycled compared to new production.	Both renewable and finite resources are used.	<i>Positive impact:</i> Energy recovery.
<i>Scrap metal [Direct-Soft]</i>	E.g. Iron, nickel, stainless steel, steel, brass, aluminum, copper, zinc, tin, lead and cables.	Recyclable. The main part of the scrap metal is fragmented, and broken down so it can be separate into the clean materials, such as aluminum. The metals are then processed and used in new processes.	Finite resources.	<i>Positive impact:</i> Decreases the pressure on ecosystems because less virgin materials are required.

## Appendix C

HUMAN HEALTH	QUANTITIES/LEVELS		LAWS/REGULATIONS	ENVIRONMENTAL GOAL	ASPECT GROUP	INDICATORS
	Normal	Significance				
Noise from production factory.		High	-	<i>Reduced Climate Change, Clean Air, Non-Toxic Environment, Natural Acidification and Zero Eutrophication.</i>	RESOURCE USE	% of used eco-labeled or recycled materials.
		High	-	<i>Reduced Climate Impact, Natural Acidification and Zero Eutrophication.</i>	RESOURCE USE	% of used eco-labeled or recycled materials.
Negligible.		High	-	<i>Reduced Climate Impact.</i>	RESOURCE USE	% of used eco-labeled or recycled materials.
Indirect: Noise from production. Dust and fine particulates from production, excavation etc. can contribute to inhalation diseases (asthma) mm.		High	-	<i>Reduced Climate Impact, Clean Air, Non-Toxic Environment, Natural Acidification only and Flourishing Lakes and Streams.</i>	RESOURCE USE	% of used eco-labeled or recycled materials.
Reduces noise from outside activities.		High	-	<i>Reduced Climate Impact and Natural Acidification Only.</i>	RESOURCE USE	% of used eco-labeled or recycled materials.
Can affect indoor climate. Can also irritate the respiratory tract/eyes and gives unpleasant smell when applying the paint.		Low	-	<i>A Good Urban Environment and Non-Toxic Environment.</i>	RESOURCE USE	% of used eco-labeled products.
Negligible.		High	-	<i>Reduced Climate Impact and Clean Air.</i>	RESOURCE USE	% of used eco-labeled materials.
Negligible.		High	-	<i>Reduced Climate Impact, Clean Air.</i>	RESOURCE USE	% of used eco-labeled products.
Negligible.		High	-	<i>Reduced Climate Impact, Clean Air.</i>	RESOURCE USE	% of used eco-labeled products.
Negligible.		High	-	<i>Reduced Climate Impact, Clean Air.</i>	RESOURCE USE	% of used eco-labeled products.
Excavation and crushing of gravels are noisy and gives rise to dust and particles but also vibrations.		Medium	-	<i>A Rich Diversity of Plant and Animal Life.</i>	RESOURCE USE	% of used filling material that originates from crushed materials.
Negligible.		High	-	<i>Reduced Climate Impact.</i>	RESOURCE USE	% of used eco-labeled or recycled materials.

HUMAN HEALTH	QUANTITIES/LEVELS		LAWS/REGULATIONS	ENVIRONMENTAL GOAL	ASPECT GROUP	INDICATORS
	Normal	Significance				
Demolition is noisy and can give rise to dust and particles.	-	High	Construction or demolition activities are not notifiable or do not need permits according to <i>Miljöbalken kap 9.</i>	<i>Reduced Climate Impact and A Non-Toxic Environment.</i>	WASTE MANAGEMENT	% of demolition waste containing hazardous products.
Negligible.	- m <sup>2</sup>	Medium	-	<i>A Rich Diversity of Plant and Animal Life, a Non-Toxic Environment and Good Urban Environment.</i>	RESOURCE USE	% of planned green area.
Negligible.	-	High	-	<i>Reduced Climate Impact and Natural Acidification Only.</i>	ENERGY USE	Diesel (l) used/project, % of used energy that originates from renewable resources.
Inhalation of fumes and ingestion of chemicals can be health degrading, chemicals can be caustic.	-	High	<i>1998:808 Miljöbalken kap 15: Avfall och producentansvar.</i> The municipality has the right to request information about waste arising at the companies. No person shall litter outdoors in a place that the public has access or visibility to.	<i>A Non-Toxic Environment and a Good Urban Environment. Indirect: Flourishing Lakes and Streams and a Safe Radiation Environment.</i>	CHEMICAL USE	Number (%) of used hypoallergenic products.
Deterioration of local air quality, transports are noisy and the fumes and dust created can increase inhalation diseases.	Difficult to quantify.	High	-	<i>Reduced Climate Impact, Clean Air, Natural Acidification Only and Zero Eutrophication</i>	TRANSPORT	Number of local producers or suppliers.
Negligible.	126,07 ton	High	<i>SFS 2001:1063 Avfallsförordningen.</i> Combustible waste must be stored and transported separately from other waste.	<i>Reduced Climate Impact and Natural Acidification Only</i>	WASTE MANAGEMENT	Number (%) waste/ project.
Negligible.	2,14 ton	High	<i>SFS 2001:1063 Avfallsförordningen.</i> The sender of the waste is required to verify that the carrier has the necessary permits. In the case of hazardous waste, waste sender establish a transport document for each shipment of hazardous waste.	<i>Reduced Climate Impact.</i>	WASTE MANAGEMENT	Number (%) waste/ project.
Negligible.	27,08 ton	High	-	<i>Reduced Climate Impact and Natural Acidification Only.</i>	WASTE MANAGEMENT	Number (%) waste/ project.
Negligible.	8,06 ton	High	-	<i>Reduced Climate Impact.</i>	WASTE MANAGEMENT	Number (%) waste/ project.

ENVIRONMENTAL ASPECTS	RESOURCES	DESCRIPTION	ENVIRONMENTAL IMPACTS	
			NATURAL RESOURCES	ECOSYSTEMS
<i>Landfill material [Direct-Soft]</i>	Concrete, tile, gravel, insulation and Hg etc. Non-combustible industrial waste.	Residual material that is not suitable for either recycling or energy recovery is put on a landfill.	Mostly finite resources. Heat from a deponi can be re-used.	Ecotystem is not harmed if the waste is taken care of instead of ending up in the nature.
<i>Hazardous waste [Direct-Soft]</i>	Additive agents (different petroleum products), batteries, joint fillers, sealers, adhesive, solvents, pigments and fillers (e.g zink and lead) etc.	Waste with hazardous properties, such as toxic, carcinogenic, corrosive, developmental, ecotoxic, infectious or flammable are classified as hazardous waste. Depending on material; recyclable, combustible, deponi or storage.	Mostly finite resources.	Ecotystem is not harmed if the waste is stored in controlled conditions of instead of ending up in the nature.
<i>Contaminated volumes [Direct-Soft]</i>	Chemicals, metals, organic and non-organic materials. Examples of substances and parameters that could be found lead (Pb), mercury (Hg), cadmium (Cd), creosot, PAH and PCB.	Contaminated volumes are puted on deponi or treated in-situ or ex-situ. The disposal of contaminated volumes is often taken care of by the contracted consultant.	Finite resources and some renewable.	<i>Positive impact:</i> If contaminated soil is excavated or cleaned it give rise to a positive impact on local surroundings/ ecosystems.
<i>Water consumption [Direct-Hard]</i>	Fresh water.	Household and hygiene use. Watering of concrete and washing of tools, mixing of putty masses etc.	Fresh water is a renewable resource in Gothenburg.	Indirect; it depend on the type of emissions or chemicals released into the waste water.
<i>Heating of construction trailers and containers.[Direct-Hard]</i>	Electricity.	Energy consumption varies depending on if the trailers/containers are isolated or not. Depending on how the electricity is produced different sources are used. Tornstadens has no alternates in their electricity contracts and therefore 100% of the electricity from nuclear power.	Electricity from nuclear power. Uranium is a finite resource.	Uranium is classified as radioactive waste and today there is no alternatives uranium disposal/storage. Ecotystem will be negatively affected.
<i>Heating of concrete construction for dehydration and hardening. [Direct-Hard]</i>	Energy from distric heating, electricity or sometimes diesel.	Depending on how the electricity is produced different sources are used. Energy based on fossil fuels give rise to emissions of CO2, CO, NOx, hydrocarbons, sulfur oxides, soot and particles. Tornstadens has no alternates in their electricity contracts and therefore 100% of the electricity from nuclear power. The environmental impact of district heating depends on the fuel used in production and the extent of energy losses in the local district heating network (Energimyndigheten, 2013). Waste, surplus heat and biomass are preferred fuels, but during cold days/winters, it is possible that these fuels are not sufficient to supply district heating, and then oil is used. Production of district heating contributes to SO2, NOx and CO2 emissions (Livsmiljöbarometern, 2011). Emissions of sulfur dioxide and carbon dioxide have decreased significantly in recent years as the use of heating oil has fallen. Emissions of nitrogen oxides have also decreased significantly since many plants have been equipped with a catalyst that purifies exhaust gases from nitrogen oxides (Livsmiljöbarometern, 2011).	Electricity from nuclear power. Uranium is a finite resource. Biomass is sometimes used as a fuel for district heating.	Climat change, acidification and eutrophication.
<i>Identification of possible environmental accidents [Direct-Soft]</i>	Fuels, hazardous waste, chemicals, asbestos, aerosols or other hazardous products, can all cause environmental accidents.	Misplacement of hazardous waste and products can lead to leakages at construction site. Spills will effect the local ecosystems at site, can lead to water contamination if not prevented.	Fossil fuels and hydraulic oils are finite resources.	Negative effects on local ecosystems, habitat losses. Pollution to surface- and groundwater.

ENVIRONMENTAL ASPECTS	RESOURCES	DESCRIPTION	ENVIRONMENTAL IMPACTS	
			NATURAL RESOURCES	ECOSYSTEMS
<b>WARRANTY ACTIONS</b>				
<i>Follow-up and register of warranty actions. [Direct-Soft]</i>	Knowledge, information and documentation.	The guarantee commitments are documented. Tornstadens aim to have zero remarks at the supplementary inspection. By using sustainable materials, products and systems contributes to decreased demand for renovation, maintenance and replacement, which in turn leads to less stress on natural resources and ecosystems. Warranty action meetings and follow-ups can prohibit that the same mistakes are made twice.	Depends on which resource or material that is used.	Less resource use --> less stress on ecotystem

**MAIN OFFICE**

ENVIRONMENTAL ASPECTS	RESOURCES	DESCRIPTION	ENVIRONMENTAL IMPACTS	
			NATURAL RESOURCES	ECOSYSTEMS
<b>PRODUCTS</b>				
<i>The demand for new technology and the exposure of their radiation [Direct].</i>	Knowledge, cell phones, computers, printers etc.	The computers are given by the IT-craftsmen. The mobiles are purchase by the employees themselves. The IT- products are collected by the IT-technicians for recycling. Cell phones and other IT- products emits radiation that can harm humans if exposed to a great extent. Therefore it is important to choose IT products that emits low doses of radiation.	Metals, heavy metals, flame retardants, phthalates, plastic(oil etc.). Recyclable and finite resources.	Ecotystems at excavation and landfill sites are highly affected.
<b>RESOURCES</b>				
<i>Fire wood [Direct- Hard]</i>	Wood.	The fireplace is usually lit to every morning break. Both to lift the cosiness and temperature within the building. Emission of CO2 when combusting wood is approximately 0.18 kg/kWh (Engineering toolbox, 2013) Emissions from fires contains NOx CO, CO2, PM10, soot and metals.	Renewable resource.	Climate change and deforestation.
<i>Energy use for operation activities [Direct-Hard].</i>	Electricity to ventilation, heating of water, electronics, light and other equipment.	The indoor climate is controlled centrally. The organization have gym equipment that requires electricity but no single apparatus consume large quantities. Depending on how the electricity is produced different sources are used. Tornstadens has no alternates in their electricity contract and therefore 100% of the electricity from nuclear power. Most of the environment effects from nuclear power occurs in the production of fuel. The consumption of electricity and fuel in the different process steps in the production is crucial. The uranium mining is contributing to local change in the environment(Svensk Energi, 2013). There is still no agreed solution to the problem of how to deal with the nuclear waste and the research on how the local/global environment will be affected in the long run is defective. The risk of leakage from a waste disposal site can not be eliminated (Schiermeier et al. 2008).	Electricity from nuclear power. Uranium is a finite resource.	Local ecotystem are affected at the site where the uranium mining takes place. Nuclear waste is radioactive which is not good for any ecotystem (Svensk Energi, 2013).
<i>Energy use for heating the office [Direct-Hard].</i>	Geothermal Heat Pump.	The indoor climate is controlled centrally. Use of a geothermal heat pump is a good choice for the environment compared to other alternatives.	Geothermal heat.	-
<i>Water consumption [Direct-Hard]</i>	Fresh water.	Water are consumed for e.g. showering, washing, drinking etc. Byggnads AB Tornstadens do not pay for the water consumption it is includes in their rent.	Renewable resource (in Gothenburg).	Negligible.

## Appendix C

HUMAN HEALTH	QUANTITIES/LEVELS		LAWS/REGULATIONS	ENVIRONMENTAL GOAL	ASPECT GROUP	INDICATORS
	Normal	Significance				
Negligible.	9,34 ton	High	-	A Non-Toxic Environment.	WASTE MANAGEMENT	Number (%) waste/ project.
Negligible.	-	High	Transport of hazardous waste/products must be performed by an approved transporter. 42 § Avfallsförordningen (2011:927).	A Protective Ozone Layer, Clean Air and A Non-Toxic Environment.	WASTE MANAGEMENT	Number (%) waste/ project.
Decreases the risk of human exposure (inhalation, dermal, ingestion).	-	High	Transport of contaminated volumes must be performed by an approved transporter for hazardous waste. 42 § Avfallsförordningen (2011:927).	A Non-Toxic Environment.	WASTE MANAGEMENT	Number (%) waste/ project.
Negligible.	922 m³	Low	-	Groundwater of Good Quality, Flourishing Lakes and Streams, a Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos and Reduced Climate Change..	WATER USE	Water use/year
Negligible. Exposurerisks on humans from nuclear disasters and uranium disposal.	230305 kWh	High	-	Reduced Climate Impact, Non-Toxic Environment and Natural Acidification Only.	ENERGY USE	Energy use/year or % of used energy that originates from renewable resources.
Negligible.	-	High	-	Reduced Climate Impact, Zero Eutrophication and Natural Acidification Only.	ENERGY USE	Energy use/year or % of used energy that originates from renewable resources.
Negligible.	-	High	NSF 2003:24, NSF 2006:16 Miljöbalken, Municipality regulation.	A Non-Toxic Environment, Groundwater of Good Quality, Flourishing Lakes and Streams and a Rich Diversity of Plant and Animal Life. Indirect: a Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos and Thriving Wetlands.	EDUCATION	-

HUMAN HEALTH	QUANTITIES/LEVELS		LAWS/REGULATIONS	ENVIRONMENTAL GOAL	ASPECT GROUP	INDICATORS
	Normal	Significance				
Negligible.	-	High	-	Reduced Climate Impact and Non-Toxic Environment.	EDUCATION	Number of remarks/project during the Follow-up (ÅTA)

HUMAN HEALTH	QUANTITIES/LEVELS		LAWS/REGULATIONS	ENVIRONMENTAL GOAL	ASPECT GROUP	INDICATORS
	Normal	Significance				
At landfill sites, highly affected.	-	High	-	Reduced Climate Change, Natural Acidification Only, A Safe Radiation Environment and a Protective Ozone Layer.	RESOURCE USE	% of purchased product with eco-label.
Negligible.	-	Medium	-	Sustainable Forests, Reduced Climate Change and Clean Air.	RESOURCE USE	% of used FSC-labeled wood
There is a risk for nuclear disasters.	129 041 kWh (2012)	High	-	A Non-Toxic Environment and a Rich Diversity of Plant, Animal Life	ENERGY USE	Energy use/year or % of used energy that originates from renewable resources.
-	-	Low	-	A Good Urban Environment	ENERGY USE	Energy use/year [kWh/y]
Negligible.	172 km (2012)	Low	-	Good-Quality Groundwater, Flourishing lakes and Streams, a Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos and Reduced Climate Change..	WATER USE	Water use/year

## Appendix C

ENVIRONMENTAL ASPECTS	RESOURCES	DESCRIPTION	ENVIRONMENTAL IMPACTS	
			NATURAL RESOURCES	ECOSYSTEMS
<i>Trips and transport of personal. [Direct-Hard]</i>	Generally fossil fuels driven cars.	Is today exclusively done with private cars. Emissions to air NOx, CO, CO2, PM10, sulphur oxides, soot, metals. (Byggsektorns kretsloppsråd, 2001) (Kretsloppsrådet, 2012)	Fossil fuels are finite resources.	Climate change, acidification, eutrophication. <i>Indirect</i> : Loss of habitat/biodiversity and ground level ozone.
<i>Transports of products and waste to/from the office. [Indirect-Hard]</i>	Is performed exclusively with diesel driven trucks.	Give rise to emissions of CO2, CO, NOx, hydrocarbons, sulphur oxides, soot and particles. (Byggsektorns kretsloppsråd, 2001) (Kretsloppsrådet, 2012)	Diesel and hydraulic oils are finite resources.	Climate change, acidification, eutrophication. <i>Indirect</i> : Loss of habitat/biodiversity and ground level ozone.

## Appendix C

	QUANTITIES/LEVELS		LAWS/REGULATIONS	ENVIRONMENTAL GOAL	ASPECT GROUP	INDICATORS
HUMAN HEALTH	Normal	Significance				
Transports are noisy. Fumes can increase inhalation and heart diseases.	9000km/per year and employee	High	-	<i>Reduced Climate Impact, Clean Air, Natural Acidification Only, a Protective Ozone Layer and Zero Eutrophication</i>	TRANSPORT	Driving distance/ year. (1,85tCO2/year, employee)
Transports are noisy. Fumes can increase inhalation diseases.	-	High	-	<i>Reduced Climate Impact, Clean Air, Natural Acidification Only, a Protective Ozone Layer and Zero Eutrophication</i>	TRANSPORT	% of transports performed by a transport driven by renewable resources.

## **Byggnads AB Tornstaden's Environmental Policy**

“Byggnadsaktiebolaget Tornstaden is a company engaged in the construction and real estate sector. We will be a company where our business activities are characterised by long-sightedness and preventive environmental work. We will always try to influence the choice of goods and services to reduce our climate impact. We shall by our well-managed projects, strive towards energy-, resource efficient and sustainable urban planning in order to provide a good and healthy environment to live in. We shall in a systematic and thoughtful way reduce the negative environmental effects at the building sites through active planning and management of goods and services. We shall in all projects use active waste management and reduce the use of hazardous substances. Our environmental work shall cover all our activities, both our own employees and our subcontractors and suppliers”  
(Jan Edlund CEO, Byggnadsaktiebolaget Tornstaden 2009).