NTNU – Trondheim
Norwegian University of
Science and Technology

Objectifying sustainable city development through the application of standards and indicators

Christine Bjåen Sørensen

Master in Industrial Ecology
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Supervisor: John Eilif Hermansen, IØT

Norwegian University of Science and Technology
Department of Industrial Economics and Technology Management

NTNU
Det skapende universitet

MASTERKONTRAKT
- uttak av masteroppgave

1. Studentens personalia

Etternavn, fornavn	Fødselsdato
Sørensen, Christine Bjåen	**01. okt 1985**
E-post	Telefon
chrso@stud.ntnu.no	**99327497**

2. Studieopplysninger

Fakultet	
Fakultet for samfunnsvitenskap og teknologiledelse	
Institutt	
Institutt for industriell økonomi og teknologiledelse	
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Objectifying sustainable city development through application of standards and indicators	
Oppgavetekst/Problembeskrivelse Purpose: To explore the use of standards and indicators applied by business in the construction industry as a mean for monitoring and evaluate the sustainability performance of their building projects. Development of standards and indicators enables the study and assessment of sustainability through objectification of abstract concepts and systems. The study includes discussion of the term objectification in this context and on how it can be concrete and applied on experience from construction projects and city development e.g in Trondheim.	
Hovedveileder ved institutt	Medveileder(e) ved institutt
Førsteamanuensis John Eilif Hermansen	
Merknader	
1 uke ekstra p.g.a påske.	

4. Underskrift

Student: Jeg erklærer herved at jeg har satt meg inn i gjeldende bestemmelser for mastergradsstudiet og at jeg oppfyller kravene for adgang til å påbegynne oppgaven, herunder eventuelle praksiskrav.

Partene er gjort kjent med avtalens vilkår, samt kapitlene i studiehåndboken om generelle regler og aktuell studieplan for masterstudiet.

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Preface

This paper is a master's thesis written under the Masters' programme in Industrial Ecology, under the Department of Industrial Economics and Technology Management (IØT) at the Norwegian University of Science and Technology (NTNU).

It is written with inputs from Standards Norway though its SN/K 548 Bærekraftige lokalsamfunn mirroring committee of the CEN-CENELEC-ETSI coordination group on smart sustainable cities and communities (SSCC-CG).

I would like to thank the mirroring committee, and especially Hilde Aarefjord of Standards Norway for enabling me to get insight into mirroring committee work and the work of SSCC-CG. I would also like to thank Professor Annik Magerholm Fet for introducing me to this standardization work on sustainable cities and communities. Finally, I would like to thank my supervisor, associate professor John Eilif Hermansen, for follow up and suggestions for this work.

Abstract

The initial assumption for this study was that there exist connections between the development of standards and indicators that enables the assessment of abstract concepts and systems trough an objectification process. Systems thinking can be seen as a process of objectification, those who make, apply the standards, as well as the standards themselves, can be understood through the process of objectification. The issues of sustainability and solving them for the attempt to make sustainable transitions in current and future sustainable city developments may benefit from understanding the connection between systems thinking, objectification and standards.

The building of such an understanding through reviewing general issues of sustainability, measurements and sustainable city initiatives pointed to by research, have been concerned with how to enable the making of an understanding of how objectification can be seen as part of knowledge production and that is traceable in both the standard creation process as well as in how we plan for sustainable city development. More specifically, it attempted to explore if there do exist connection between the development of standards and indicators that enables the assessment of abstract concepts and systems that is enabled by an objectification process. For understanding these connections, models based on systems thinking have been developed. This conceptual knowledge system have been developed in order to make connections between standards, objectification and sustainable cities development, as well as to act as a frame of reference to the thinking process, but also to specifically attempting to describe these fuzzy connections. Still, others seeking to understand the connections between knowledge development, systems theory, objectification, sustainable cities development, standards and indicators, or more generally for understanding abstract concepts and systems can apply such an inquiry. The conclusion of this paper is that there exist connections between the development of standards and indicators that enables the assessment of abstract concepts and systems that is enabled by an objectification process. But, such a process is nor clearly evident for researchers or practitioners, nor is objectification used in the way as attempted to in this paper. Still, understanding these connections; the understanding through investigation the objectification process at play in sustainable city initiatives may make the fuzziness of sustainable practices more evident.

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List of Abbreviations

BCA-GM	Building and Construction Authority Green Mark
BREEAM	British Research Establishment Environmental Assessment Method
BRE	Building Research Establishment
CASBEE	Comprehensive Assessment System for Building Environment Efficiency
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
ETSI	The European Telecommunications Standards Institute
GOBAS	Green Olympic Building Assessment
IEC	International Electrotechnical Commission
ISO	International Standardization Organization
ITU	International Telecommunication Union
HK-BEAM	Hong Kong Building Environment Assessment Method
LEED	Leadership in Energy and Environmental Design
NSBs	National Standardization Bodies
NABERS	National Australian Olympic Building Assessment System, China)
SBtool	Sustainable Building Tool
SSCC-CG	Smart Sustainable Cities and Communities - Coordination Group
UM	Urban Metabolism
UN-Habitat	United Nations Human Settlements Program
WCED	The World Commission on Environment and Development

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1. Introduction

1.1 Background

A well-known definition of sustainable development was posed by The World Commission on Environment and Development (WCED) (1987), often referred to as the Brundtland report: ‘‘Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs’’. This definition involves social, economic and environmental sustainability. Though, sustainable development can be defined in many ways, it involves the recognition that humans have impact on their surroundings and natural environment through production and consumption of natural resources, and that these resources in which our existence depend upon should be preserved in such a way that we do not destroy the basis of our own and other living things on this planet. This is particularly interesting in a city, or urban development context. Populations of cities are consuming a lot more resources compared to people living in rural areas and thus the ecologically footprint posed by people in cities are considerable in comparison. 2007 was a year marking a change in human settlement history. Form this year on, more than half of the world’s population lives in cities (UN-Habitat 2006/7). This tendency is predicted to continue, and might reach 9billon in the middle of this century. This development is predicted to continue fostering both social, economic and environmental sustainability issues now that 2% of the world’s land surface is occupied by cities but at the same time consume ¾ of the world’s resources. Facing sustainability challenges in the context of fast growing cities and communities creates the need for new types of governance in order to meet goals for sustainable development (Joss, 2013, Bukeley and Bestill, 2005, McGrew 2005). Further, the growth of urban development and the challenges it creates for sustainability have fuelled the development of various frameworks, policies, laws and agreements of different types aiming for a better management of sustainable development. Monitoring such development towards sustainability is generally done by creating goals that need to be met within a certain time frame by specifying an action plan of how this should be done. Still, there is no agreed upon definition of sustainable cities and what they should contain. This is because of the complexity of the term and thus a need for a discourse among researches, policy makers and those who seek to make the concept into practice (Joss 2013). Sustainable city initiatives often describe a variety of purposes and forms, but also with overlapping meanings, but still differences are apparent when it comes to goals, technologies emphasized and in terms of governance. There is also variation in the content of the terms of environmental-, economical- and social sustainability. They also vary in terms of goals and commitments.

1.2 Research issues

Challenges in the content of sustainable development have raised a debate of the need of a more harmonized or common framework. International standards and indicators for assessing and monitoring sustainable city development have only recently reached the agenda of researchers and politicians. This is to an increasingly degree also related to sustainability indicators. Today, most agree that indicators for sustainability are needed, still what these indicators should be composed is not clear (Bell and Morse, 2008). Different initiatives apply different standards and indicators which makes comparison between initiatives difficult. Planning for sustainable city development has become a battle to show the best practice through sustainability lighthouse projects as part of governmental planning or private developments. Here more sophisticated tools for monitoring and assessing sustainability are needed to show how certain means contribute to wanted ends. Currently, standards are being developed for the purpose of contribute to sustainable housing and even sustainable community and city development. The effectiveness of the application of these are for now to a large extent unknown, but some research have been conducted in this context? This study aims at contributing to the understanding of these forthcoming standards.

Aiding this understanding will be the path of understanding realities; through the process of objectification where one obtain a new and common understanding that is not considered subjective or tied to particular individual interest. Through such a process of objectification the individual perspectives are transformed to new structures and standards. Along this path, different initiatives like standards of the International Standardization Organization and others like BREEAM, are competing to become the main standard within the field of sustainable city development; individual standards or a set of standards of standards framework that might move the existing practice to meeting the goals of sustainable development. Still the effect of these standards and initiatives are to a large extent unknown. For meeting requirements and expectations tied to sustainable constructions and planning, the building sector (entrepreneurs) are in need of project tools. BREEAM can be viewed as such a tool for steering projects in the making. These developments are new, so still a part of the learning of how to make sustainability in practice. How this works will in this study be exemplified through looking at initiatives carried out in practice; case example(s).

The overall aim of this study:

To explore how the development of (future) standards aiming at sustainable city development through a process of objectification enables the study and assessment of abstract concepts and systems.

: abstract concepts and systems: an ordered understanding of sustainable cities as a concept and as a system

: concept – what is or planned to be

: system – what it contains and how practices, knowledge – structures enables the understanding and execution of sustainable city plans.

The specific aims to meet the general aims of this study are
- To address general issues of sustainable city planning and initiatives addressed in research literature
- To present examples of standards aiming at sustainable city development through viewing the current literature on the subject as well as to relate this to the forthcoming standards for sustainable city development
- To point to standards as an objectification process – form individual understandings and measurements to common understandings.
- To link standards and objectification to planning for sustainable cities planning and development in general and in practice through case example(s).

All these aims will be connected, as described in the methodology chapter, through conceptual knowledge system based on systems thinking.

1.3 Case examples

This thesis is interested in the various ways of how to make sustainability in practice is perceived today. This can be viewed in the bigger context of sustainable city development and planning. Such planning viewed as a process from a general idea and vision to development of a plan of how to meet such a vision and the goals in this regard, are in need of some sort of tools for monitoring, assessing and evaluate progress and performance.

Currently, Standardization Organizations like the International Organization for Standardization (ISO) and a coordination group of the European Standardization Organizations, European Committee for Standardization (CEN), European Committee for Electrotechnical Standardization (CENELEC) and The European Telecommunications Standards Institute (ETSI) are working on standards for sustainable city development. This present study is conducted on the basis of reviewing of the current ongoing work of the CEN-CENELEC-ETSI coordination group on smart sustainable cities and communities (SSCC-CG), investigating the European needs for sustainable city standards. As such *this study is interested in the understanding of sustainable cities in relation to a possible future standard's framework for making sustainable cities in practice.*

Further, cases in Norway will be presented through reviewing the Framtidens Byer initiative and Brøset urban area. Brøset sustainable city development project is currently in the planning phase. Sustainable city initiatives will in this study be related to how they make use of project tools in the planning and making of the city area a sustainable. This may be understood through how standardized tools for measures and evaluations make these becoming part of an accepted ways of dealing with sustainable cities developments through the process of objectification; from being just individual practices, such tools enable the understanding of

others external to the project; a trait of standardized procedures and displaying of evaluations that is common to those applying the same type of standard.

1.4 Structure of the study

The structure of this study is as follows.

Chapter two will present, methods with the justifications for the application of these will be attended to.

Moving to **chapter three,** the theoretical framework where sustainability will be understood in the context of city planning in general. This will serve as a background for the case description in chapter 4. Chapter three will present the standard development process and how this can be related to objectification. This will take the form of systems thinking with inspiration from industrial ecology in order to develop an industrial ecology systems thinking approach for designing, making and evaluating man-made systems in chapter 3.1.6. an understanding of objectification will be made in relation to knowledge production, before discussion standards in relation to objectification. A description of the forthcoming ISO standards for sustainable cities and community development will be attended to. Then, challenges for sustainable city (and project) planning pointed to by researchers will also be presented. Ending chapter three, will be a discussion of the proposed systems thinking approach for the making and planning of sustainable city initiatives and standards..

Throughout chapter three a theoretical foundation will be built for the purpose of general understanding of sustainable cities and to create a frame of understanding through applying systems thinking creating a system for perceiving the development and assessment of the sustainability of man-made systems. Further it introduced an understanding of the process of objectification that is both related to knowledge production and as part of standards making possible the perception of our surroundings through classification of knowledge into meaningful entities.

Chapter four will describe specific examples of standards within the sustainable city context, examples of the BREEAM standard and the work of a European standardization organization group, the SSCC-CG, will be presented. Further this chapter will take a brief look at and the Framtidens Byer initiative with its aims and goals. Brøset, Trondheim, sustainable city area project will then be attended to.

In the discussion of **chapter five**, drawing on the knowledge drawn from the theoretical elaboration in chapter three will be discussed against the practical examples of standards, frameworks and sustainable cities initiatives in relation to standardization and objectification.

2. Methodology

2.1 Introducing the methodological approach in this study and its challenges

For the purpose of describing the methodological approach of this study, I would like to revisit the title of this thesis as well as its initial purpose. Firstly, for the title of this paper, *Objectifying sustainable city development through the application of standards and indicators* might puzzle the reader somewhat. For starters, "objectifying" or the objectification of something, is not commonly used in relation to sustainable city development nor in the research relating to standards or indicators. The initial assumption in this regard was that there exist connections between the development of standards and indicators that enables the assessment of abstract concepts and systems that is enabled by an objectification process. Further this connection can be studied or made visible through studying how the standards and indicators are applied in the construction industry. Revisiting the initial purpose of this study - *To explore the use of standards and indicators applied by business in the construction industry as a mean for monitoring and evaluate the sustainability performance of their building projects*. Still, these connections are neither commonly pointed to in research, nor easily accessible to those who try to make these connections between standards or standardization and indicators in the context of sustainable city development or the act of planning for such development seeking to make sustainability work in practice. Those who work with planning for sustainable cities development, the city planners, are not just one, but involve various actors from different professional backgrounds. To explore the application of standards and indicators, used for the purpose of reaching goals for the execution of the project to be more sustainable, would benefit from a thorough case study of those involved in such a construction project. This was the reason for the initial plan of the study to investigate experience from construction projects and city development e.g in Trondheim. Unfortunately, key informants were not available for interview. This poses many challenges for the writer of this paper. It would have been beneficial to have a thorough case study of actors involved in the construction and planning of city dwellings or commercial buildings to try to uncover traces of objectification. Case study would be preferable in this regard, because, according to Yin (2014:16) "(…) you want to do case study research because you want to understand a real world case and assume that such an understanding is likely to involve important contextual conditions pertinent to your case". Because the theme of this study is uncommon, with no previous research done pointing to objectification in relation to city planning practice and to the use of standards and indicators, this particular investigation of real life phenomenon and the use of standards and indicators in the construction of city projects, explored in such a way that enables the process of objectification to be detected, would have been preferable. Interviewing people acquainted with the application of standards and indicators would be preferable because, according, Longhurst (2010:108), "usually people are chosen on the basis of their experience related to the research topic". When the plan of conducting a case study did not succeed, this study had to make an alternative approach for the purpose of making the proposed connections that are assumed to be there visible and thereby meeting the purpose of this study. The following elaboration seeks to make it clear the reasoning behind this study.

The methodological approach will be systems thinking, and it will be described in the following paragraph.

2.2 Solving the challenges of meeting the goals of this study: The systems thinking approach

Methodology "refers to the ways in which we acquire knowledge (….) an investigation of the concepts, theories and basic principles of reasoning on a subject" (Moses and Knudsen, 2007: 5). Methods, on the other hand can be understood as the techniques used for conducting research. Different scientific disciplines make use of different methods, but a system thinking methodology will not be limited by a scientific discipline's specific method, but will use theories and methods chosen for the purpose of the study that is to be conducted. The understanding of this information is put together through applying systems thinking.

Under follows a description of the system thinking process used in this study.

A methodological enquiry to systems thinking

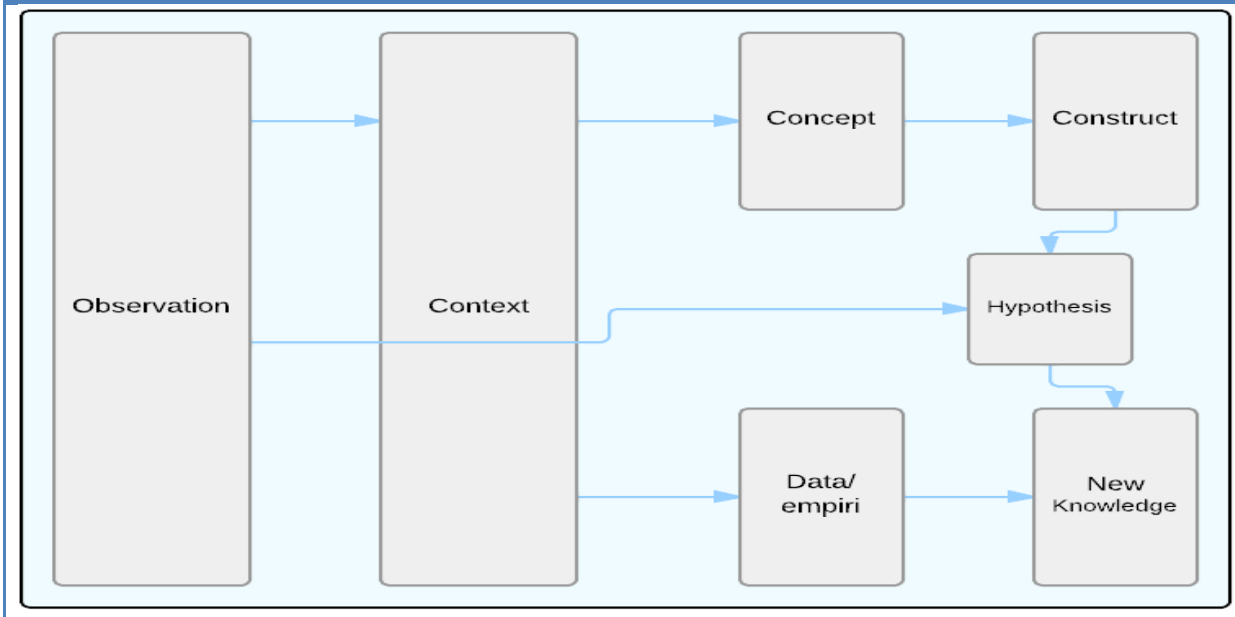

Figure 1. A methodological enquiry to systems thinking
System based in Davis (1996)

The picture above has been made in order to aid the understanding of the approach taken in this study. It is based on Davis (1996), but has been tailored to fit the topic and methodological approach in this paper through communication with my supervisor John Eilif Hermansen. The purpose of this approach is to explain in a systematic manner how this study aims at gaining new knowledge and the different steps in pursuing this while at the same time answering the research questions. Now follows an explanation of the 6 step, based on Davis (1996) leading to new knowledge.

Observation consists of observing something in real life and asking:

- Why is this study needed?
- What can this study contribute with (in relation to the need of the study)?

Observations are according to Davis (1996) what we perceive as real around us. These are drawn from facts. *Facts* are those phenomenon that we believe are true, and usually this belief is shared among those who have observed this same phenomenon. Observation of real world phenomenon together with establishing an understanding of the need of the study will together make up the *context of the study.*

According to Davis (1996: 26) *concepts* can be defined as "abstract ideas generalized from particular facts". Further, concepts are "the basic building blocks of scientific investigation. They are creations of the human mind that are used in the classification and communication of the essence of some set of observations" (ibid). *Constructs*, on the other hand are special types of concepts made to understand a specific theoretical purpose under investigation in a study. These are on a higher level of abstraction compared to concepts. Here, in relation to this study, I would like to distinguish between constructs made by other researchers and the constructs that this study will make; a methodological inquiry to systems thinking, that can be understood as a systematic way of structuring information and makes it possible to make the connections between the sustainable city development/planning, indicators, standards and objectification. This can be viewed as a conceptual knowledge system; serving as like Ambjørnsen (1992 chapter 1 page 2) puts it "a frame of reference for the thinking process"

The conceptual knowledge system will be used in this study as a frame of reference to the thinking process. But also others seeking to understand the connections between knowledge development, systems theory, objectification, sustainable cities development, standards and indicators, or more generally for understanding abstract concepts and systems can apply such an inquiry. In this study the conceptual knowledge system will be used in this manner.

This knowledge system will be applied in order to understand objectification process, the relation between creation of standards, the making of man-made systems (the output of the system engineering process) and how this can be made more (environmental) sustainable through the industrial ecology metaphor for inspiring the design and making and assessment of man- made systems, throughout chapter three. The conceptual knowledge system will also be used as a frame of reference in the discussion chapter.

Further, such an understanding is an "answer" for how to understand the title of this paper.

2.3 On data and information gathering

The literature on sustainable cities was found mainly through the search engine of the NTNU library. Also websites of the European Union, the Norwegian Government and the Standardizations organizations were used. Information about the SSCC-CG was provided by Standards Norway. This can be viewed as an overall methodological approach has been chosen for the purpose of getting an overview and an overall understanding about the topic of sustainable cites development entails and how the information all together can provide a systematic understanding of sustainable cities development based on research literature and empirical data.

2.4 On the "quality" of this study

In any study, usually the quality of the approach taken, will need to be attended to. Often this relates to validity, reliability and generalizability (Ringdal, 2001). Validity often referrers to whether one succeed in measuring what we have planned to measure. Reliability is concerned about whether another person with the same measurement tool will arrive at the same answer. Generalizability is concerned with whether the findings from the study may apply to similar circumstances (or that a sample studied may be suitable to describe the whole population). This paper does not include any calculations. Instead, the quality of this paper must be judged in relation to its structure, aims and how these have been reached. The elaborations and descriptions made throughout this paper, have tried to differentiate between the authors own elaborations and what is drawn from other authors in such a way that it should be clear who is the source of the given information. As pointed to, the approach taken is systems thinking. This is the guiding rational that through viewing literature on the area, tries to make connections in a systematic manner with the aim of answering the research aims. Systems' thinking is not tied to a specific method or scientific discipline, but may use methods and theories form specific field in order to develop and explain the system that is created or is being studied. This study has been conducted in this way. The validity (applicability) and reliability (if the study seem to be trustworthy), must be evaluated against this background.

2.5 Limitations of this study

The aims of this study require a broad understanding. As such it might not be able to cover all areas in detail, though it would have been beneficial. The overview provided in this study, can be used in further investigation of the topic of standardization and objectification of sustainable city development in the future. As pointed to, it would have benefited from a thorough case study to be able more specifically point to the connection between standards, indicators and objectification.

3. Theoretical framework - standardization and objectification for knowing the sustainability of city planning and development

This chapter is concerned about building the theoretical foundation for the purpose of general understanding of sustainable cities and to create a frame of understanding to be applied, together with the presentation in chapter 4, to the discussion chapter. This frame of understanding will be made through applying systems thinking creating a system for perceiving the development and assessment of the sustainability of man-made systems. It will introduce an understanding of the process of objectification that is both related to knowledge production and as part of standards making possible the perception of our surroundings through classification of knowledge into meaningful entities. This elaboration presented will then be applied in a discussion of objectification in relation to the sustainable city system. Ending this chapter will be a presentation of the research literature on issues related to sustainable city initiatives.

3.1 Standardization and Objectification: What can we know about the world? Classification of objects into meaningful entities – a process of objectification

Currently standards are being developed for the purpose of making sustainable communities in practice by ISO. This poses the question of if these will contribute to making sustainability in society more feasible. On this background, the current chapter is interested in understanding how standards can be viewed as a form of classification. Further objectification and knowledge accumulation through research, as well as through being part of networks might have the potential of giving and orderly understanding of how to follow development of requirements needed for sustainability in general, and cities in particular. Objectification understood in this way is not commonly used, but still this chapter aims at making such and understanding more clear. But, before we turn to objectification, an understanding of standards and systems will be attended to.

3.1.1 Standards

First, let us be reminded of the definition of a standard according to the International Standardization Organization (ISO), the European Committee for Standardization (CEN) and Standards Norway (NS). What is a standard?

A standard is a

> "standard document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context" (Source: EN 45020:2006, NS-EN 45020:2006, and ISO/IEC Guide 2:2004).

Standards have been developed since 1957 by The International Organization for standardization (ISO), initially as technical standards used by engineers and other technical experts. In Norway, Norwegian standards are developed by Standards Norway, a member of CEN and obliged to implement all European standards and making them Norwegian standard.

Consequently, 95% of Norwegian Standards have their origin in Europe. (Standards Norway, 2014).

The standardization process from imitating a new project to implementation of a standard follows approximately the same step in Standards Norway, European standardization organization (CEN and CENELEC) as well as in the International Organization for Standardization (ISO). The standardization process has the following eight steps (Standards Norway, 2011), as shown in Figure 2.

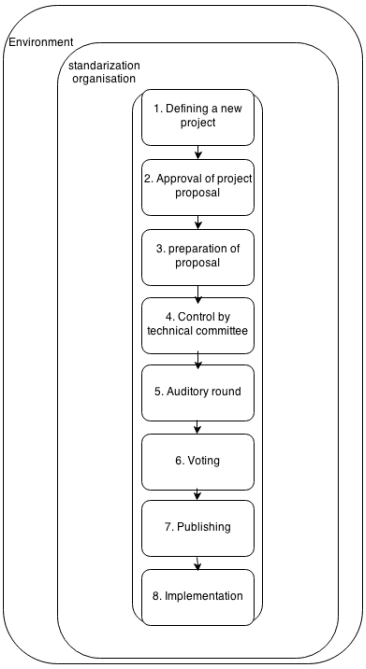

Figure 2. The process of making a standard

Initiating a project must represent a need for a standard and resources must be available. The member organizations investigate the national needs. If no technical committee exists in the area of interest, a new committee will be established. Experts will then work on the standard proposal. Before the proposal is sent to the technical committee for control, consensus among the experts must be reached. The working groups are responsible for meeting the formal requirements as well as the professionalism of its content. Before the proposal is sent to the secretariat of CEN/CENELEC, a technical committee will control whether the proposal is in accordance with the assigned mission and that the general requirements have been followed. If consensus is reached, the proposal will be sent out for comments to all members (represented by national standardizations organizations). Relevant professionals will also need to be involved in the auditory round. After the proposal have been reviewed and evaluated by the members, the final proposal will be voted for. Members will have vote weighing in accordance with the population of the country. For the proposal to be verified, at least 71% of votes must be in favor of the proposal. The standard is distributed and ratified in by the members in which will have to implement the standard within six months.

Through the EØS-agreement and "the new approach" of the EU-directives, makes standards required means for meeting the technical regulations and laws that earlier were decided by the

legal bodies of governments. Here standards are used in order to specify and supplement European directives, national laws and regulations (SINTEF, 2009). This is also true when it comes to some international agreements like the Kyoto-agreement. In Norway, formal regulations of building projects are described *in Byggteknins forskrift med veiledning* (TEK 10) (Direktoratet for byggkvalitet, 2011). This document states the minimum requirements for the construction of buildings, though it points to it to be beneficial to aim at better performance than what is required. Standards are pointed to as useful tools to be used as an addition to TEK 10. TEK 10 gives functional requirements while pointing to Norwegian standards for possible means to meet the requirements through assessment methods, and methods for the execution of building projects that standards provide, making building projects to be in accordance with TEK 10 (SINTEF, 2009). A graphical explanation of standards in Europe in relation to national laws and requirements is shown in figure 3. (source: SINTEF: 2009).

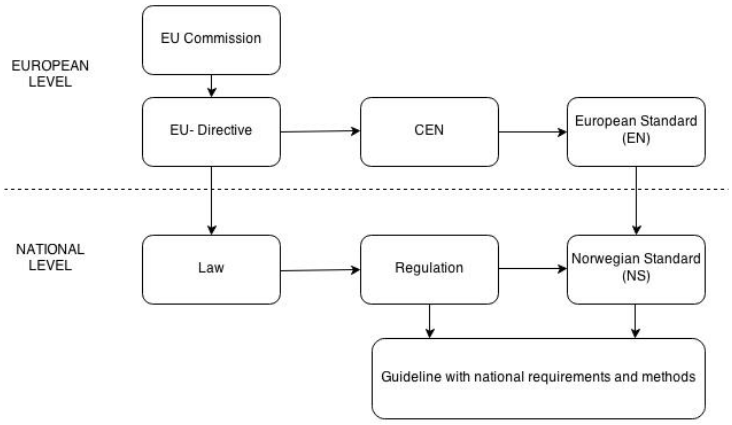

Figure 3. A graphical explanation of standards in Europe

Understanding what standards are, and what they do; standards can be understood as having six different dimensions (Bowker and Star 1999: 13f.):

1. "A 'standard' is any set of agreed-upon rules for the production of (textual or material) objects.
2. A standard spans more than one community of practice (or site of activity). It has temporal reach as well in that it persists over time.
3. Standards are deployed in making things work together over distance and heterogeneous metrics. For example, computer protocols for Internet communication involve a cascade of standards (Abbate and Kahin 1995) that need to work together well for the average user to gain seamless access to the web of information. There are standards for the components to link from your computer to the phone network, for coding and decoding binary streams as sound, for sending messages form one network to another, for attaching documents to messages, and so forth.
4. Legal bodies often enforce standards, be these mandated by professional organizations, manufacturers' organizations, or the state. We might say tomorrow that vloapük, a universal language that boasted some twenty-three journals in 1889 (Proust 1989, 580), or its successor Esperanto shall henceforth be the standard language for international diplomacy. Without a mechanism of enforcement, however, or a grassroots movement, we shall fail.
5. There is no natural law that the best standard shall win – QUERTY, Lotus 123, DOS and VHS are often cited as examples in this context. The standards that do win may do so for a variety of other reasons: they build on an installed base, they had better marketing at the outset, or they were used

by a community or gatekeeper who favored their use. Sometimes standards win due to an outright conspiracy, as in the case of the gas refrigerator documented by Cowan (1985).

6. Standards have significant inertia and can be very difficult and expensive to change".

According to Bowker and Star, form the description above, standards are (1) *agreed upon rules* for the *production of physical (material)* or *textual objects*. (2) Standards are *applied across time and space*, applied *within a certain time frame* to a *specific practice* in accordance with the type of textual or material object that is considered, and accordingly specific standards related to the practice at hand are used. Also important is the standards used for the purpose of (3*) making things work together* regardless of where in the world the physical or textual objects are located and regardless of the different measures used. Governments may make standards part of *how to meet specific laws* (4). The standards that succeed in being the most applied in the marked is not evident (5). Reasons for this may be marketing of the standards, e.g. that there were already a good bases in the market that enabled the standard to more easily be applied. The process of creating new standards or making changes to existing standards (6) is considered a slow and expensive process.

Bowker and Star (1999:14) make further the point of the necessity of the use of standards through considering the building of houses:

> "It is no longer possible to build a complex collective project without standardized measures. Consider a modern housing development where so much needs to come together form distant and proximate sources – electricity, gas, sewer, timber size, screws, nails and so on. The control of standards is central, often under analyzed feature of economic life".

Currently, ISO is making standards for sustainable city development, or according to their website "an innovative standard for sustainable and resilient communities – ISO 37101" is under development (Lazarte 2014). Here, the secretary of the technical committee working on this standard, Bernard Leservoisier, tries to answer

- Why do we need a standard for sustainable communities?
- How can the standard make a difference?
- Who should be using this standard?
- When will it be ready?

His answers were:

"Problem with the communities and the cities is that they are divided into different departments, each of them dealing with a specific sector. For example, in a city you will have the environmental department, the transport department, and the energy department. They all have their own staff, their own budgets, and their own activities. They meet once in a while but they don't really collaborate on a daily basis. The advantage of an international standard is that since they come from the outside, we hope it will be accepted by all those people and foster an active and constant collaboration between their services".

Further he was asked to give an example of how they can do this

” At some point there were a big emphasis on sustainable buildings and we thought that if we have a certain number of sustainable buildings in a city the result would be a sustainable city. But we realized that it does not work that way. Because you can have an addition of sustainable buildings that have little interaction between them and then the sustainability between them is not improved because you need to work on the infrastructure between the buildings, you need to raise awareness of people using the buildings, living in the buildings. You need regulation, and you need standardization. You need basically a holistic and integrated approach”.

Who should be using this standard?

“The standard that we are preparing is targeted towards city and community managers. So of course they will be the main users, but what we hope is that this standard will become so popular that all the stakeholders in the city and in the community will build ownership of it, and they may even go to their city and community management and claim for the implementation of this standard”.

When do we expect the standard to be ready?

“We think it will be published in 2016”.

We can understand from this that there is a lack of cooperation across the various fields in society, dealing with sustainability in such a way that does may not fully allow the meeting of overall societal goals for sustainability. Further cooperation is seen as needed in order to plan for a sustainable society, since this will need the involvement of the separate departments in such a way that enables them to deal with sustainable development more holistically than is typically done today. How particularly such integration and cooperation should work and how standards may fit or may contribute to such cooperation and integration is not clear, however. To know something about such complex connections of information, one will need to know what types of classification of information standards may be, and further how this may relate to the overall production of knowledge. This can be viewed as part of an objectification process as we will turn to later in this chapter. Such an investigation, may point to aspects that can reveal whether future standards for the development of sustainable cities and communities will work or not when it comes to classification of information as part of a way of making sense of complex knowledge, that is form different scientific disciplines and professions that are all needed to contribute to fully understand the issues involved in making society sustainable. This can be made clearer by applying systems thinking and systems theory. The point to be made here is to contributing to an understanding that Standards can be perceived as a way of ordering or classifying information or knowledge that may be done through a systems approach. We will return the systems approach – viewing standards as a form of classification, after we visit an example of ISO Guide 82 for assessing sustainability in standards as well as the standards under ISO Technical Committee 59, Subcommittee 17 (ISO/TC 59/SC 17) – Sustainability in buildings and civil engineering works.

3.1.2 Assessing sustainability in standards

News from the ISO website points to "6 ISO standards you never imagined are making our world cleaner, greener and more sustainable" (Naden 2014). They also claim for sustainability to be such an important issue that they have created a guide that can be used for enabling the inclusion of more sustainability principles into existing standards, called Guide 82 – *Guidelines for assessing sustainability in standards*, a guide aimed at those involved in making ISO standards.

In the Guide 82 (ISO, 2014) introduces concept of sustainability, where the goal of sustainability is the one of sustainable development and further refers to it as "any state if the global system in which the needs of the present are met without compromising the ability of future generations to meet their own needs" (ISO, 2014: introduction page v). Also, the introduction points to:

> "Understanding and achieving a balance between environmental, social and economic systems, ideally in mutually supporting ways, is considered essential for making progress towards sustainability. The achievement of sustainability is now recognized as one of the most important considerations in all human activities." (ISO, 2014: introduction page v).

How ISO standards can support a sustainable development in this way becomes an obvious question to the reader. According to ISO Guide 82 (ibid), ISO standards can contribute directly, or indirectly: Directly meaning that they specifically address issues of sustainability or indirectly, for example where the standards are related to testing, products, procedures, services, terminology, management systems or auditing. Still, it points that there is a need for caution related to reaching a conclusion of sustainability when dealing with standards:

> "However, since sustainable developments and progress towards sustainability are heavily dependent on a multitude of variables, including social, environmental, economic, geographic and technical conditions, it is important that standards writers do not reach overall conclusions that particular activities (including processes) or products (including services) are "sustainable""(ISO, 2014: Introduction page v).

The aim with this guide is to raise awareness on sustainability issues, providing a systematic approach, and aid consistency among those developing standards addressing sustainability. If sustainability is not part of an existing standard, this guide states that it encourage all revisions of existing standards as well as the development of new standards to promote sustainability and to take sustainability issues into account in the standards development process by involving experts on the area.

This emphasis from ISO points to the development of future and the revision of existing standards may have a more sustainable bend. Taking an example from the issues relating to building and civil engineering works, a technical committee ISO/TC 59/SC 17 have been devoted to developing standards in this area (ISO, 2014, ISO no date). According to the ISO catalogue on their website, deliverables of this technical committee are currently listed as 6 standards, shown in the table below

Table 1. Published standards under ISO TC59/SC17 - Sustainability in buildings and civil engineering works

Standard and/or project
ISO/TS 12720:2014 Sustainability in buildings and civil engineering works -- Guidelines on the application of the general principles in ISO 15392
ISO 15392:2008 Sustainability in building construction -- General principles
ISO 21929-1:2011 Sustainability in building construction -- Sustainability indicators -- Part 1: Framework for the development of indicators and a core set of indicators for buildings
ISO 21930:2007 Sustainability in building construction -- Environmental declaration of building products
ISO 21931-1:2010 Sustainability in building construction -- Framework for methods of assessment of the environmental performance of construction works -- Part 1: Buildings
ISO/TR 21932:2013 Sustainability in buildings and civil engineering works -- A review of terminology

Table 1 shows the published standards under ISO Technical Committee 59, Subcommittee 17 (ISO/TC 59/SC 17 – Sustainability in buildings and civil engineering works. Under the same committee, the following standards are under development:

Table 2. Unpublished standards under ISO TC59/SC17 – Sustainability in buildings and civil engineering works

Standard and/or project
ISO/DIS 16745 Environmental performance of buildings -- Carbon Metric of a building -- Use stage
ISO/NP TR 18791 Analysis of sustainability performance assessment methods used for civil engineering works
ISO/DTS 21929-2 Draft on sustainability in buildings and civil engineering works - Sustainability indicators -- Part 2: Framework for the development of indicators for civil engineering works
ISO/CD 21930 Sustainability in buildings and civil engineering works -- Environmental declaration of building products

These standards developed for sustainability in construction works aims at assessing the sustainability of buildings, both projected and existing buildings (standards Norway, no date) According to Standards Norway (ibid) “sustainable constructions” means the knowing of how buildings have influence on the outer environment as well as the social and societal considerations that need to be considered and economical evaluations in this regard. All these standards build upon a life-cycle assessment perspective.

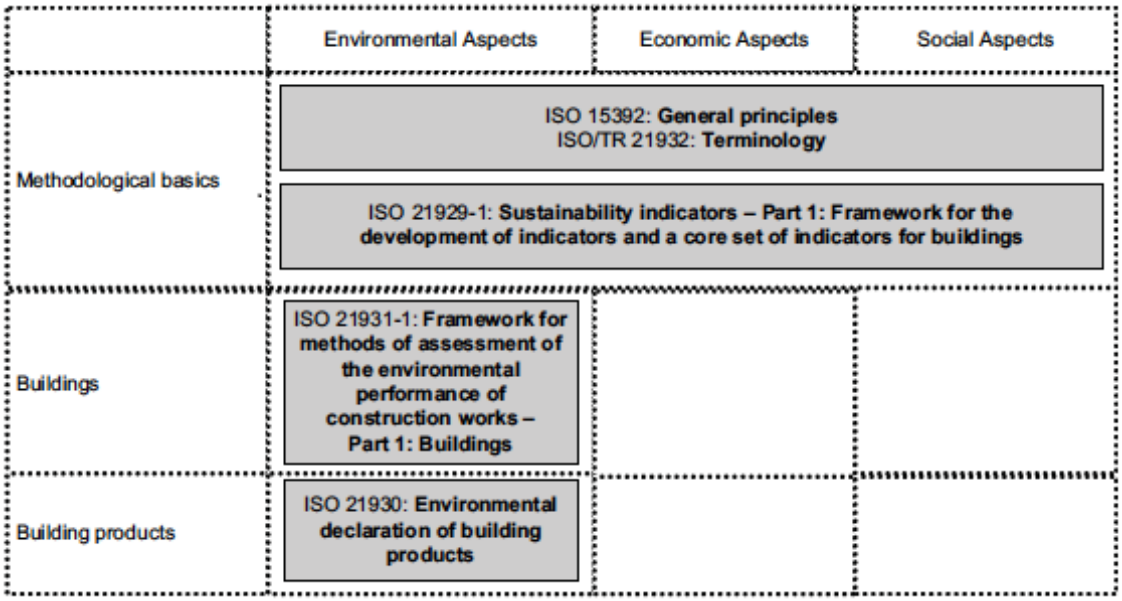

Figure 4. Suite of related International Standards for sustainability in buildings and civil engineering works

How the different standards relate to the three aspects of sustainability as well as to the methodological basics, building and building products is shown in the Figure 4 (ISO: 2011). Remembering the holistic integrated approach, that the new forthcoming ISO standards for sustainable and resilient communities pointed to above by Bernard Leservoisier, it is still uncertain how all various standards that aims at sustainable society development will function. But as we shall see, later in this paper, this will be pointed to, through presenting the work of a coordination group on smart sustainable cities and communities that is making the effort of getting an overview of the need for an overall framework where standards will fit into such an integrated approach for the sustainability of cities and communities standards, that this standardization coordination group is currently discussing.

3.1.4 Standards as a form of classification – a systems approach

> "Modern societies are characterized by very strong and complex mutual dependencies, integration, and interactions of many disciplines, functions, decisions, actions and services. The society itself is a very complex system" (Asbjørnsen 1992: I.1.1)

Understanding standards as a way of classifying information, there is a need to consider standards as a part of the larger social, technical and organizational systems (Millerand and Bowker 2009, Bowker and Star 1999). In fact, all classification schemes, like standards, can be understood as political and cultural productions.

Understanding standards in how they are part of systems (both social, technical and organizational) we will need to point to what systems are before we can begin to elaborate further on the connection between standardization and objectification.

3.1.3 Understanding systems – an endeavor to include all aspects of sustainability for realizing sustainable outcomes

> "Systems thinking has been used to categorize complex, interactive phenomena and behaviors across a wide range of fields from cybernetics to resource management" (Davidson and Venning 2011:277).

A well-known definition of a system is provided by Asbjørnsen (1992, Chapter 1 page 2):

> "A system is a structured assemblage of elements and subsystems, which interacts through interfaces. The interaction occurs between system elements and between the system and the environment. The elements and their interactions constitute a total system, which satisfies functional, operational and physical characteristics, as defined by the user and customer needs and requirements, over a defined total system life cycle of the system existence, including the life cycle of bringing the system into being".

What elements that are making up the system are decided by the purpose of the system, which means that the element is included because it enables the achievement of the system´s purpose as a whole throughout the life time of the system (the system´s life cycle) (Fet 2013, Haskins 2006).

According to Fet (2013:44) the most important characteristics of a system are:

- "- a system constitutes a complex combination of resources, elements and subsystem which interact through interfaces,
- a system is contained within some form of hierarchy,
- a system may be broken down into subsystems,
- a system must have a purpose, it must be functional and able to respond to some identified needs and requirements over a defined total system life cycle".

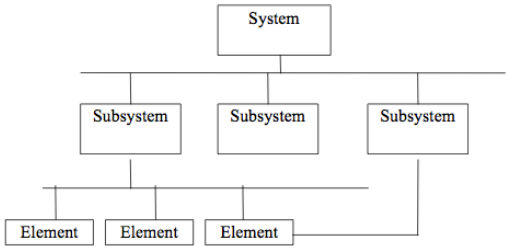

Figure 5. Hierarchy of a system with subsystems and system elements

Figure 5 shows how a system contains a hierarchy of subsystems and system elements (Fet, 2013). It shows that a system can be broken down into smaller parts, where the simplest of these are the elements. "System theory can help us see how complex systems can be modeled and analyzed in order to obtain insight into their behavior or performance, and possible improvements" (Brattebø and Kjelstrup, 2011).

Such an approach needs to be holistic to see how the systems elements that make up the total system interact with each other inside the system and with the surroundings outside the system. The outside of the system is generally called the environment. The border between

the system and the environment is called the system´s boundary. This understanding can give important insight for improving the sustainability of cities, since cities are described as resource intensive and that the ways cities functions today are far from sustainable. Understanding the relationships between the system elements through the messages, feedback and response mechanisms that influence these relationships are a prerequisite for understanding how to regulate a system (Brattebø and Kjelstrup, 2011). Brattebø and Kjelstrup (2011:4) describes the feedback mechanisms of a production-consumption system as follows:

> "Imagine a system with material inputs and outputs and with elements that interact with the system and with the surrounding environment. The output flows are products sent to market and waste emissions. Factors such as market demand, prices and consumer preferences would result in feedback to the choices made concerning design and efficiency in the production system. The environmental impact and waste emissions might result in feedback that would lead to the use of environmental technology and management in the system. In some cases the system will reorganize itself; in other cases the feedback may take the form of enforcement by others such as governmental agencies".

Revisiting the ISO standards for sustainability of buildings and civil engineering works, a building can be understood through systems thinking by applying systems theory, can be understood as follows. The systems approach makes it possible to consider any physical system consisting of physical parts and the attributes of the system (Hattis and Becker, 2001). Understanding a building as a system by using systems engineering approach, the users of the buildings, through the users' needs will be need to be understood in order to decide what attributes a building must have. Physical parts for a building may be: the materials, elements, components, systems and networks that together makes the physical fabric of the building. In addition a building is made up of spaces like bathroom and living room. The structural elements may be columns, beams, slabs and foundations. Further you may have exterior elements like roofing, external walls, doors and windows as well as interior elements like for dividing space like partions, doors and floors. Electrical systems, plumbing systems, mechanical systems and others are also fundamental parts of a building. The users' needs can set the requirements for the building:

> "the attributes are categories of what the occupants or users of the building experience and interact with in fulfilling their physiological, psychological, and social needs while using or occupying the building" (Hattis and Becker, 2001:415).

In addition overall society may demand that the buildings do not pollute their environment or waste energy. Construction companies will necessarily have to respond to market demands. The demand from society when it comes to building's sustainability performance may have an impact on the construction business operations. Such demands may contribute to the use of standards like standards developed for sustainability in construction works with the aim of assessing the sustainability of buildings.

Millard and Bowker (2009: 165) point to the need to consider standards as part of social and organizational systems of practices in order to fully understand them, how they develop and function: "both standards and ontologies (the one apparently technical and in the realm of machines, the other apparently philosophical and in the realm of ideas) need to be socially and organizationally bundled- not as a perpetual afterthought but as an integral necessity" (Millerand and Bowker, 2009:165). To operationalize sustainability, Davidson and Venning, in their paper from 2011 states that the literature on sustainable development points to the importance of systems. Some research literature exists on applying systems thinking to a sustainable cities development, but they are not many (Davidson and Venning, 2011). The use of such an approach is not being used to a great extent yet. The authors argue that a systems thinking can enable a decision-making process to be more effective because system thinking functions as a framework for knowing and ensuring that the systems elements of importance are included in the decision making process. When planning and developing such a framework the emphasis is to ensure that all environmental, social and economic aspects of sustainability in planning are related when aiming for realizing sustainable outcomes. Still, the authors point to that research literature often fails in this endeavor. Further, Davidson and Venning (2011) emphasizes that the sustainability principles must be translated into criteria as well as being included into the stakeholder engagement processes. This will have enable action through, as the authors put it, "ownership and empowerment". Further, they make an example that

> " if goals and objectives are not underpinned by clearly articulated sustainability principles, values clarification will be unclear during the decision-making process. Values clarification shapes criteria and is critical to epistemologically embed assessment and reporting tools into the decision-making process. If these components and interconnections are absent, the validity of the capacity of the decision-making process to report on sustainable outcomes is rendered doubtful" (Davidson and Venning, 2011: 280).

We understand from this that planning and making sustainable cities in practice, will need to deal with all three aspects of sustainability; we can understand them as three different systems, namely a social, economic and environmental, which need to be integrated into one. How to categorize or classify the containment of a city into these systems are not directly understandable at first. We need to draw upon research on systems theory. The following section will draw from the works of Jackson (2009) with reference to Boulding (1956) as well as Krieger (1998 in Brattebø and Kjelstrup, 2011) and finally Porter and Córdoba (2009). Further, for enabling sustainable practices, understanding of organizational systems to know how such practices can come about through management as part of organizational cybernetics (Ríos, 2012).

3.1.5 Categorizing systems – complexity level, type and perspective

Boulding argues that all real world phenomena can be arranged into a hierarchy with nine levels of complexity; a hierarchy of complexity ranging from level one, where systems are simple, to level nine, where systems are the most complex (Boulding 1956 in Jackson, 2009). For the different levels of this hierarchy, different knowledge would be relevant. Also, for the higher system´s level all the levels below apply. Different levels of this hierarchy can be seen

as different types of systems to be studied, or as Boulding argues; different models are applied. The hierarchy of complexity is shown in Table 3. (from Jackson, 2009: 25):

Table 3. A summary of Boulding's (1956) hierarchy of complexity

1. At level 1 are structures and frameworks which exhibit static behaviour and are studied by verbal or pictorial description in any discipline; an example being crystal structures
2. At level 2 are clockworks which exhibit predetermined motion and are studied by classical natural science; an example being the solar system
3. At level 3 are control mechanisms which exhibit closed-loop control and are studied by cybernetics; an example being a thermostat
4. At level 4 are open systems which exhibit structural self-maintenance and are studied by theories of metabolism; an example being a biological cell
5. At level 5 are lower organisms which have functional parts, exhibit blue-printed growth and reproduction, and are studied by botany; an example being a plant
6. At level 6 are animals which have a brain to guide behaviour, are capable of learning, and are studied by zoology; an example being an elephant
7. At level 7 are people who possess self-consciousness, know that they know, employ symbolic language, and are studied by biology and psychology; an example being any human being
8. At level 8 are socio-cultural systems which are typified by the existence of roles, communications and the transmission of values, and are studied by history, sociology, anthropology and behavioural science; an example being a nation
9. At level 9 are transcendental systems, the home of 'inescapable unknowables', and which no scientific discipline can capture; an example being the idea of God

To understand the containment of levels 1-3 mechanistic models are often applied, while level 4-6 may apply organismic models, when relating Boulding's hierarchy of complexity to Krieger's characteristics and order of cybernetics for different kinds of systems (in Brattebø and Kjelstrup, 2011:7, see below). Understanding of systems on the different levels of complexity, as shown in Table 3, are in need of different perspectives.

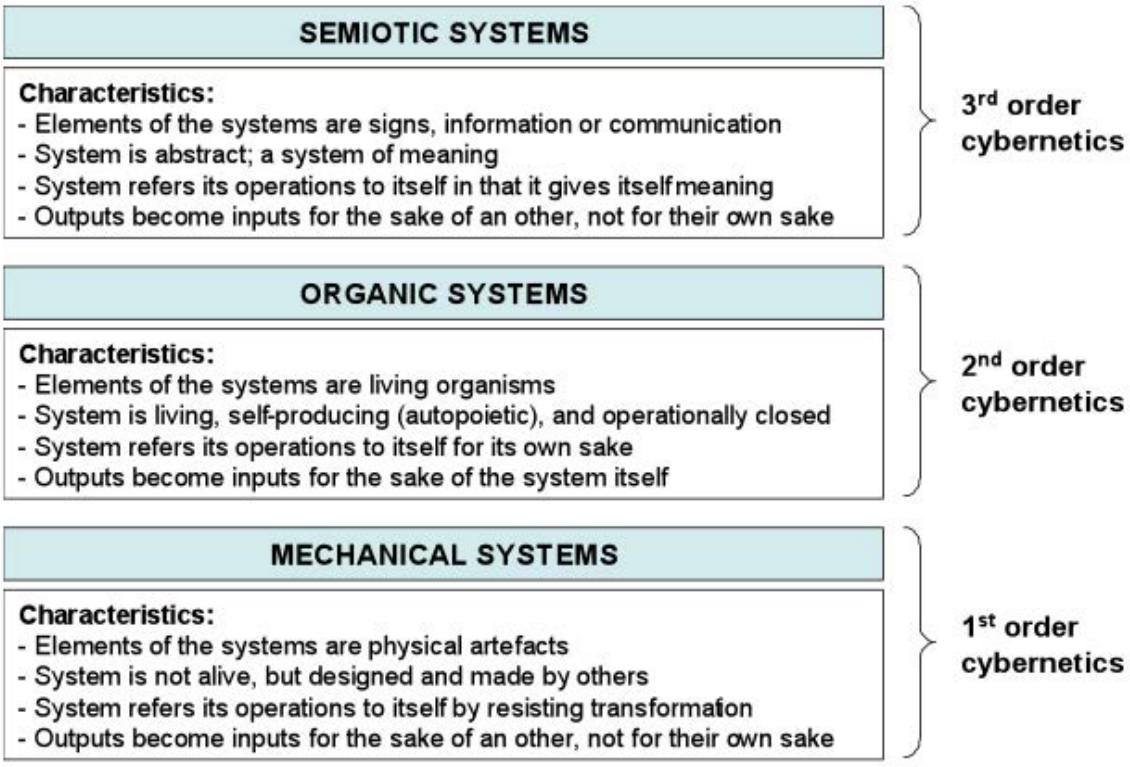

Figure 6. Characteristics and order of cybernetics for different kinds of systems

Figure 6 was drawn in the basis of information from Krieger (1998) by Brattebø and Kjelstrup (2011: 7).The cybernetics described by Krieger, are information flows that relate to the different kind of systems (mechanical, organic or semiotic with the corresponding order of cybernetics (1^{st}, 2^{nd}, and 3^{rd}).

Porter and Córdoba (2009) distinguish between three types of perspectives on systems: the functionalist perspective, the interpretive perspective, and the complex adaptive systems perspective. An outline of the three follows.

In the functionalist perspective, all of the systems aspects are self-evident and knowable. The interrelationships between the system elements are understood as having a linear cause and effect. Also all the inputs, processes and outputs can be both quantified and optimized. Theories proposed by Porter and Córdoba are scientific management, hard systems theory, general system theory and structural functionalism. The methodologies used in the functionalist perspective are such that quantify all elements of the system, also including intangibles. Determining the mathematical linkages, cause and effect as well as optimize the functioning of the system is also part of the methodology. The authors suggest that the functionalist perspective has its strength when it comes to the precise quantification of problems and that it allows the chosen parameters to be optimized. Still, oversimplification of social and human factors and the underplaying of the actors subjectivity are seen as limitations for this approach.

For the *interpretive perspective,* principles and assumptions made are that meaning is subjective and socially constructed and thereby not self-evident as in the functionalist perspective. The systems and boundaries are seen as in conflict, in which needs a critical inquiry. Theories that apply are symbolic interactionism, the Frankfurt School, soft systems theory and critical systems thinking. The methodologies that apply are self-inquiry, self-awareness and appreciative inquiry. Further, dialogue and democratic debate are used. To make assumptions clear and known and exploring the tensions between conflicting interpretations are also part of the interpretive perspective. This perspective will enable a nuanced and layered perspective of the various stakeholders´ views. Further this perspective assumes that it will lead to consensus as well as improvement of sustainability results.

The *Complex Adaptive Systems* is a particular type of a complex system that is complex because they are made up of many interconnected elements, making the system diverse. Adaptive, means that it is able to learn from experience and adapt. This perspective assumes agents are closely connected in networks; they are self-organized, and emergent. Further, ongoing learning and evolution from bottom-up is assumed. The theories that apply are complexity theory, non-linear systems and complex adaptive systems. Methodologies are to support the building and empowerment of learning networks and bottom up processes. Further it aims to ensure that appropriate incentives are provided as well as for the result to be monitored and to make adaptations when they are needed. The authors claim this perspective´s strength to be that the turbulent marketplace of today makes it well suited. It also enables a stewardship type of leadership. Its limitation is that it is not useable in all systems and situations.

We can understand from the presentation of the three perspectives above that for the level 1-3 of Boulding's hierarchy of complexity where the mechanistic models are applied, and as well as for the level 4-6 where organic models may apply. Mechanistic and organic models can be understood through the functionalist perspective. When systems become the most complex, at the human's socio-cultural levels of systems, systems of meaning are applicable. Such systems are often called semiotic systems, which are systems of meaning. Applying the interpretive perspective can assess such systems. Here, "emphasis is placed on the complex 'images' which structure information and enable individuals to attribute meaning to their actions and interactions" (Jackson, 2009).

From the presentation above, the different levels of complexity drawn from Boulding (1956 in Jackson, 2009), is associated with the different systems described by Krieger (1998 in Brattebø and Kjelstrup, 2011) as well as the three perspectives of Porter and Córdoba (2009) is shown in Table 4.

Table 4. Types of systems and associated complexity level and perspective

System Type	Complexity level	perspective
Mechanistic	1-3: Non-living, physical	Functionalist
Organic	4-6: living organisms,cell,animals	Functionalist
Semiotic	7-9 people, ideas	Interpretive

Relating standards to the systems thinking approach

We can make a division here between those who create the standards, those who apply the standards and what the standards themselves address (standards for products of things (sustainable building standards) or standards for people (e.g. environmental management standards, like ISO 14001)). Those who create standards can be understood as a knowledge accumulative process. It is often initiated from marked actors, these along with scientists and other professional experts contribute with their knowledge in the making of standards. We can study and understand the process of making a standard done by these experts through the application of semiotic model for systems thinking, and the interpretive perspective. Those who apply the standards must use systems of meaning in order to be able to understand and apply the standards because the content through the written text in the standards must be understood in relation to real life practices.

Understanding a physical/mechanistic system in itself will be in need to considering it through a functionalist perspective. Standards like these are applied in order to bringing the systems into being. Along the lifecycle of a product, other standards may be applied to the same system (e.g. maintenance related standards, audits). The management of something may have physical representations in the form of documents/text, though the management as a practice is a semiotic system.

standards organizations involvement of experts through collaborative processes of information sharing where the different experts bring their expertise from their specific fields into the development of the standard, and will thereby be influenced by the current issues and needs as they are perceived to be in the real world these actors are part of. We can understand that viewing a standard, those who make them, and further those apply them in practice, as well as what the standard themselves create; physical or textual objects (Bowker and Star, 1999), can be understood as a whole by applying the systems theory of different types of systems (Krieger, 1998 in Brattebø and Kjelstrup, 2011) depending on the level of complexity with systems that fits for describing that level, and further knowing how this system on that particular level of complexity (Boulding, 1956 in Jackson, 2009) can be studied through applying the fitted perspective (Porter and Córdoba, 2009). As we understand, the different perspectives apply different methods for understanding what is to be studied.

3.1.6 Understanding the sustainability of man-made systems - a systems thinking approach to sustainable city planning and development

Before we attend to developing a systems thinking approach to sustainable city planning and development, we need to understand the relation between the three aspects of sustainability. Making a city sustainable will need to take into account all three aspects of sustainability. If we are able to improve social conditions, reduce environmental degradation and solve for economic inequality, our world will be more sustainable.

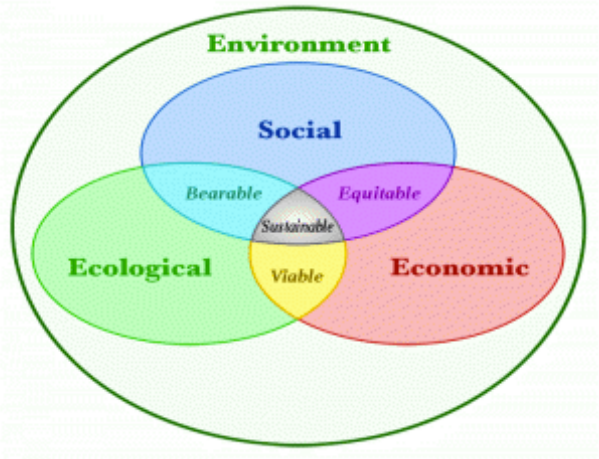

Figure 7. Three aspects of sustainability

The three aspects of sustainability is shown in Figure 7. Interface between the social and ecological has to be bearable (livable) representing the quality of life or well-being of people with the corresponding needs of the ecological and social aspects. According to Ríos (2012:12) “By viability we understand the capacity of a system (organization, company, etc.) to maintain a separate existence (that is, to survive) over time, and to do this despite ongoing changes in the environment (even if these have not been foreseen)”. Translating this into the sustainable system, Viable, the interface between ecological and economic aspects, can be understood as where economic development must be in accordance with the carrying capacity

of the ecosystems as well as to avoid the depletion of non-renewable resources. We can further understand the economic system as the driver for the production and consumption of resources drawn from nature (the ecological system). In order for the simultaneously existence of both systems independently, the extraction of resources from nature and the disposal of waste back to nature must not exceed the ecological capacity to maintain its own existence. The intersection between the social and economic dimensions should be equitable, to be understood as a fair distribution of wealth. Knowing the interaction between these aspects and how they make an impact on each other is a systems thinking endeavor. Each of the three can be analyzed as separate systems, but in order to know how to plan for a sustainable future, the interactions between the different aspects are important and in need for analysis. Both detailed knowledge of the three separate systems as well as how they influence each other through interaction, would be the in need of a methodological systems enquiry approach enabling seeing the system as a whole. A framework for sustainable urban development will need to clearly define how these different aspects are connected in the context of the city.

An industrial ecology systems thinking approach for designing, making and evaluating man-made systems

For industrial ecologists, understanding of all three systems is necessary in order to be able to fully understand the behavior of production-consumption systems for aiming at making them more sustainable. When taking a systems inquiry that is a part of a systems methodology this is according to Kjelstrup and Brattebø (2011:7) “the process of careful examination of a system’s structure, organization and performance”. Under follows a suggested approach based on industrial ecology systems thinking that can be used in the designing, making and evaluation of man-made systems.

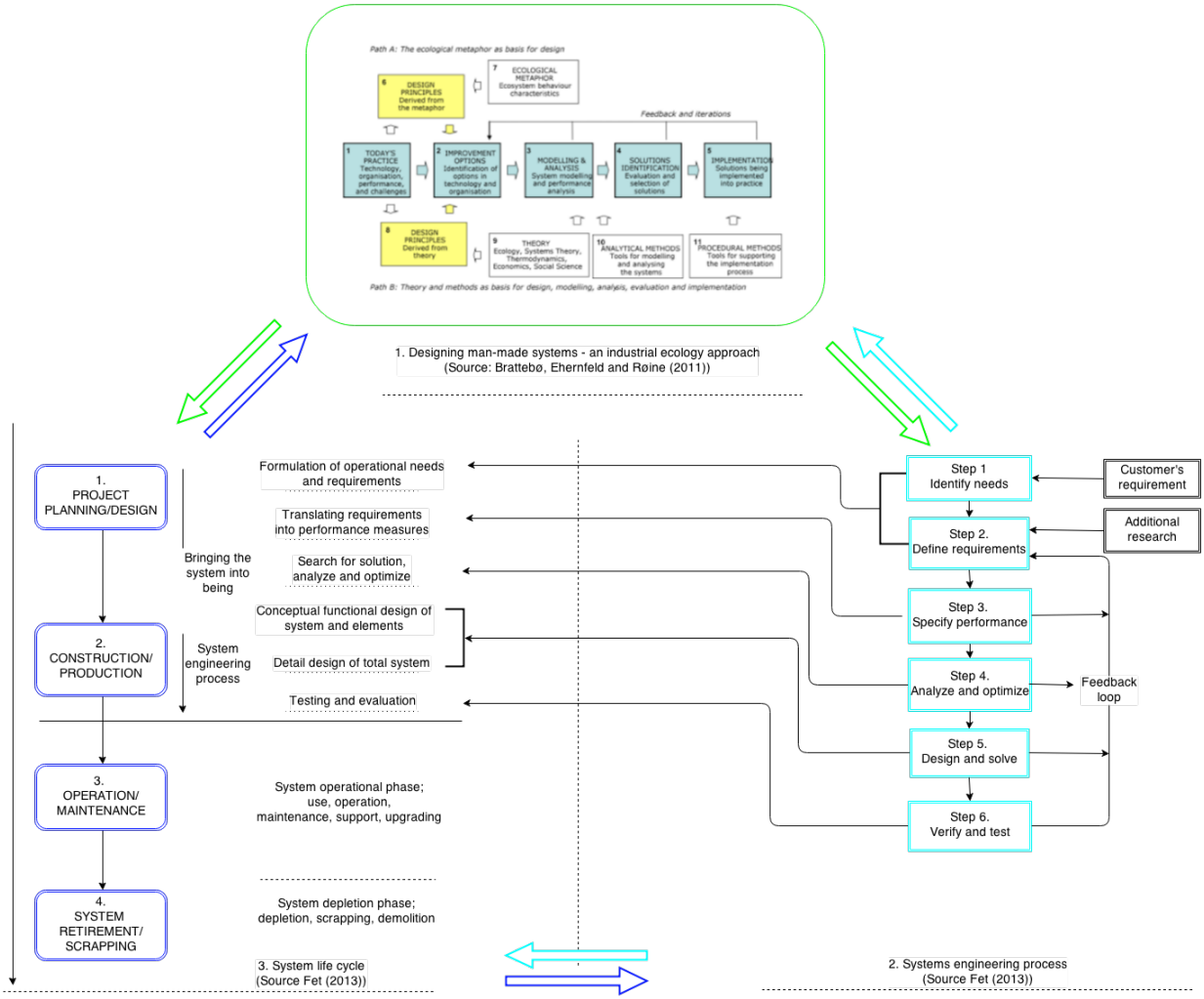

Figure 8. An industrial ecology systems thinking approach for designing, making and evaluating man-made systems

The Figure 8 shows an industrial ecology systems thinking approach for designing, making and evaluating man-made systems. It consists of three separate sub-systems, while the interactions between them are shown by arrows. The arrows represent the understanding of that these systems can be understood as having influence on each other. The arrows going from sub-system 2. And 3. As we see, are giving input to system one. This is represented by the blue arrow from system three, and the light blue arrow from system 2. This means that the industrial ecology ecological metaphor for influencing design, must also take into account the needs of the two other systems in order to be able to address the issues of production systems that are not sustainable. Still, with the aim of sustainability in mind, the purpose of the IE ecological metaphor is to make contributions for better the environmental performance of the processes making the system (the system engineering process), as well as the system in itself over the whole system's life time. As such the whole system must primarily be understood as IE ecological metaphor as a guide when aiming to making systems sustainable.

Systems engineering is concerned with making improvement in a technical system through standardized procedures (Brattebø and Kjelstrup, 2011). The process of systems engineering is shown above in "2. Systems engineering process". For the industrial ecologists, the task at

hand is to making production-consumption systems more environmentally sound, by making environmental improvements in the system and thereby enhancing its environmental performance. The above presentation can be seen firstly as a conceptual knowledge system, serving as like Asbjørnsen puts it "a frame of reference for the thinking process", as to be used in the process of creating a framework for the thinking process concerning a system for sustainable urban development. One intended use of such a framework may be to pursue the aims improving (enhance) management practice. Through this process of applying systems thinking into the proposed integrated decision making framework; goals and objectives will be examined carefully, and attention is paid to evaluate the relationships between inputs, throughputs and outputs, processes for evaluation, feedback and review.

The Figure 8 shows an integration of three systems: "1. Designing man-made systems", an industrial ecology approach, "2. The systems engineering process" and "3. System life cycle". Taking inspiration form industrial ecology, man-made systems, like a city can be made to become more sustainable, and that this approach will need to consider the whole lifetime of the sustainable city system, from project planning and design, construction and production, operation and maintenance as well as system retirement/scrapping. The integration of the three systems was made in order to understand how as systems thinking approach based on industrial ecology can inspire the process of making man-made systems, with the aim of making such systems more sustainable, throughout the whole system's life cycle. In the IE approach to the designing of man-made systems, industrial ecology systems thinking perspective is used as an input for knowing the needs to be addressed through the systems engineering process as well as through the whole life time of the system. Sub system "1. Designing man-made systems – an industrial ecology approach" (Brattebø, Ehrnfeld and Røine, 2011), describes how industrial ecology applies understandings of relationships in nature as an inspiration for making man-made systems that are more sustainable. This understanding can be taken as the basis for the"2. System engineering process" where needs of users are used as basis for understanding the systems purpose in such way that enables the system to functionally respond to the identified needs throughout the lifetime of the system (Fet, 2013), in subsystem "3. System life cycle". As an example, from "1. Designing man-made systems – an industrial ecology approach", starting from part 1., path A with the ecological metaphor as basis for designing a system: In picture, 7, with the ecological metaphor, this can be seeing nature with waste in closed loops where the waste from one organism is used by another organism. This is something design can try to mimic. By then looking at design principles from theory, in picture 8 (from path B) derived from theory in picture nine; waste prevention and minimization through dematerialization, eco-efficiency and recycling, can be used as inspiration. Analytical methods (in picture 10) like Life Cycle Assessment (LCA) or Material Flow Analysis (MFA), through modeling and analyzing (as in picture three) production-consumption systems can be used for solution identification (in picture 4) and then implementation (in picture 5). According to Brattebø, Ehrenfeld and Røine (2011) the ecological metaphor involves taking inspiration from ecosystems and its characteristics when designing man-made systems. In practice this would mean to use ecology as inspiration for finding the relevant theories tools that can help designers in the making of more environmentally friendly products or systems. In Figure 8, this has been used as input to

the “2. System engineering process” where it can be translated and applied to understanding the functions the system must have in order to meet the users’ needs. The systems engineering process is the process of bringing a system into being including project planning and design, construction and production” (Fet, 2013). The sub system “2. System engineering process”, shows a simplified model that can be applied when working on optimizing environmental performance of industrial systems. By making use of the inspiration from industrial ecology in order to describe the steps done in the engineering process in the planning and managing for e.g. a building project to become more sustainable.

Still, we remember industrial ecology’s emphasis in an holistic approach often understood as a life-cycle perspective, this will need to deal with not only considerations of bringing a system into being, but also later processes in the life of the system; the operation and maintenance phase (operation of a building) and the scrapping/retirement of the system (demolition of the building). When taking a broader view of creating sustainable cites, the assessment of the total sustainability of cities, the system certainly becomes complex consisting of different types of systems that has to be connected into an overall system, that is the city consisting of sub-systems (e.g. infrastructures of roads and buildings, telecommunication, energy), people (e.g. social systems and networks) and the economy (money flows, market mechanisms etc.).

Assessing the environmental performance of a city – the UM example

As an example of an analytical method that can be applied (remembering picture 10 above) starting to assess the environmental performance of a city, Kennedy, Baker and Brattebø (2013) have in a draft started on a proposal for an Urban Metabolism (UM) systems approach, they point to as a requirement for assessing the sustainability of cities that when finished is intended to provide a practical guidance for city managers and academics. This involves the quantification of materials and substances in a city, along with energy, water and important nutrients like nitrogen, phosphorous and salts. Methods like Material flow analysis, substance flow analysis and Life cycle assessment are methods proposed to be used in the urban metabolism, in which a system-wide perspective is.

This can be understood as a functionalist example through the application of these analytical methods used for assessing the stocks and flows of matter and energy and associated environmental impact. Such a model depicts the inflows of energy and materials, and outflows of waste and heat. In a city materials and biomass will be used in production of e.g. buildings and roads.

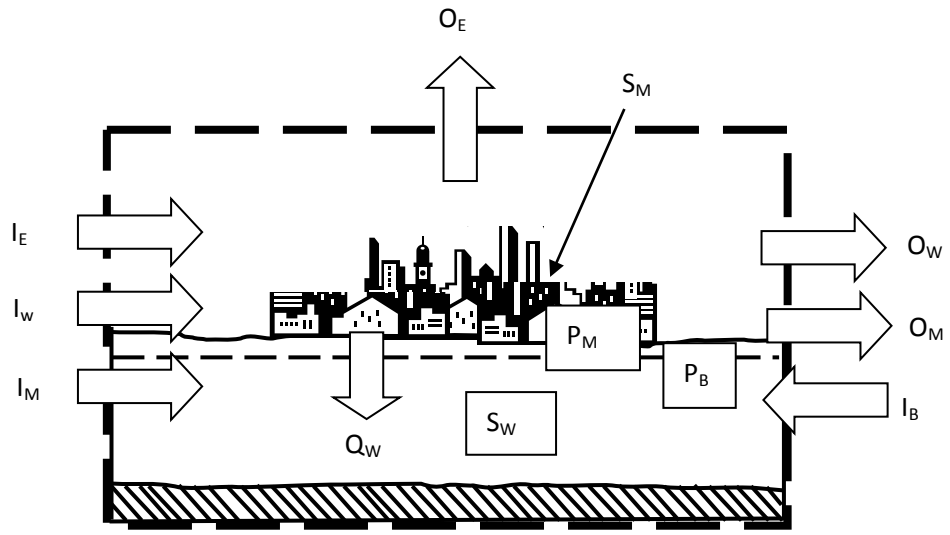

Figure 9. A generic framework for assessing UM

The figure (Kennedy, Baker and Brattebø, 2013) shows the UM classification system with inflows (I), outflows (o), internal flows (Q), storgage (S) and production (P) of biomass (B), minerals (M), water (W) and energy (E).

Kennedy, Baker and Brattebø describe the figure as follows:

> "The figure provides a generic framework for assessing the UM, broadly including inflows, outflows, internal flows, storage and production of biomass, energy, minerals, and water. This is a comprehensive framework that integrates methods of water, energy and substance flow analysis with EUROSTAT system of material flow analysis. The framework captures all bio-physical stocks and flows within the system boundary, including natural components (e.g., solar radiation, groundwater flows), peri-urban activities (e.g., food production, forestry), as well as a broad range of anthropogenic stocks and flows" (Kennedy et al. 2013:2).

Not only the physical world of stocks and flows of matter and energy are important for the making a framework for sustainable cities, an understanding that applies the functionalist perspective as an approach to systems thinking. Both the interpretive and complex adaptive systems are applicable here, but for different purposes: Social and economic aspect of sustainability will need to be included, are typically provided by the interpretive and CAS perspectives. As argued by Porter and Córdoba (2009), that the functionalist perspective has its strength when it comes to the precise quantification of problems and that it allows the chosen parameters to be optimized. Still, oversimplification of social and human factors and the underplaying of the actors subjectivity are seen as limitations for this approach. Assessing sustainability, measurements are needed, but the functionalist perspective is not well suited for the purpose of measuring all aspects of social sustainability.

3.2 Objectification – systematization of knowledge production

Concerns related to the environment and ecology has created the need to make evaluations based on knowledge while considering values (Hermansen, 2013). Increasingly these evaluations are in need of monitoring through public environmental management systems, and political goal oriented management. Communication of knowledge and reporting are needed on all levels for showing progress in accordance with national and international environmental agreements.

Further Hermansen (2013:2) argues

> ”The concept (conception), objectification indicates that something is transformed from being understood as subjective to becoming something to be considered as objective and neutral. What now has become objectified has then been transformed to a manifestation or a physical representation. Objectification can be both a manifestation and a process that leads to something being objectified. Objectification is the process that gathers and sorts out relevant information making a new object out of it. In many circumstances, this can be considered to be a standardization process”.

We can understand from this, that objectification is a process where something abstract and random, becomes commonly understood, agreed upon and concrete to the process of objectification. This process is also related to knowledge development and sharing of information on a subject through communication. As such it will need to involve more than one individual with one perspective on what is perceived to be real in a specific context. It will need to take into account various perspectives that need to be agreed upon through sharing of knowledge on the subject at hand. This might seem a bit fuzzy. To make this understanding more comprehendible, now follows description of how knowledge spread, accumulation and communication relates to objectification, by drawing on the works of Latour (1987), Desoires (1998) and Beck (2009) Where Latour is interested in how to make sense of the works and knowledge development of scientists in society through networks of knowledge, Desoires is concerned with how statistics have made comparability of measures needed for monitoring and steering societal progress. Beck (2009) points to the justifications of risks in the contemporary world and how knowledge contributing to understanding of risks like climate change, and the difference of “proof” provided by ‘realists’ versus ‘constructivists’.

Objectification can be understood through understanding the process of how scientific evidence or knowledge comes to be. I would like to make a connection between the work of Bruno Latour (1987) and Objectification in the following.
Drawing form the works of Latour (1987), objectification can be understood as related to the understanding of how we distinguish between different categories like knowledge versus belief, considerations of the rational and the irrational all related to the proof or scientific evidence. Still Latour, points out that these considerations do not make sense unless we see them as part of the work of scientists and the movement of their development of knowledge through their scientific network throughout the world. Altogether Latour points to the need for caution in the use of these words because they easily distort our understanding. What is to be

studied in order to understand the creation of scientific knowledge is what Latour refers to as the 'cycle of accumulation' – which he further describes as the 'cumulative character of science', a character that cuts across the division between the different sciences (economy, history, history of science, history of technology, politics, administration and law) – in which he calls a "movement that makes all these domains conspire towards the same goal: a cycle of accumulation that allows a point to become a center by acting at a distance on many other points" (Latour, 1987:222). This makes them, according to Latour, Immutable Mobiles. What Latour means is that the work of scientists has the common feature of working methods and sharing of information where a common knowledge is created in the process, which in turn makes the specific 'facts' proven in a study, to act at a distance, by i.e. generalizations. In this process it makes no sense to question rationality, because no one in the process will make decisions that they believe to be irrational. Knowledge, makes no sense without the understanding of what knowledge means, and further, according to Latour, belief or ignorance are not merely the opposite of knowledge, but might only have some substance of relevance if considered in the context of the 'whole cycle of accumulation': "how to bring things back to a place for someone to see it for the first time so that others might be sent again to bring other things back. How to be familiar with things, people and events, which are distant" (Latour, 1987:220). In order to accumulate knowledge, each piece of proof will need to have the ability to be combined, be able to move across time and space, increase reliability and the ability to be combined with one another.

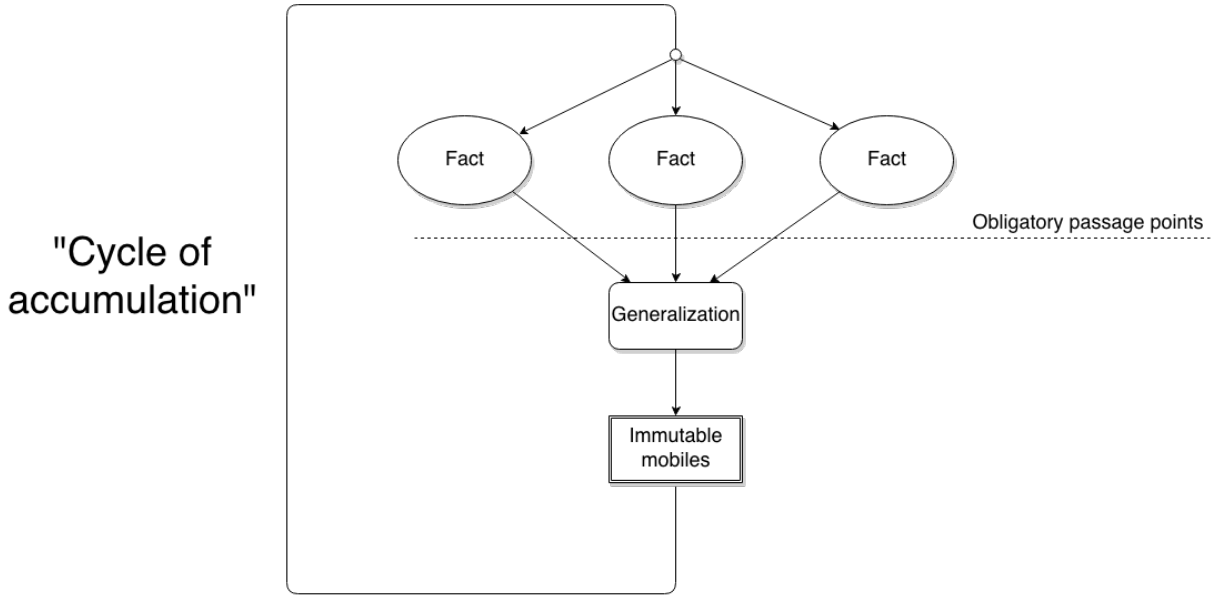

Figure 10. Cycle of accumulation

Desoires, points to objectification in relation to the governance of states, that objectification is part of measurements for control of state, and this relates to the process of knowledge in making things that hold:

> " It is because the moment of objectification can be made autonomous that the moment of action can be based on firmly established objects. The bond linking the two worlds of science and practice is thus the task of objectifying, of making *things that hold*, either because they are

> predictable or because, if unpredictable, their unpredictability can be mastered to some extent, thanks to the calculation of probability. This trail makes it clear the relationship between probabilities and the way they reflect the play of chance and wagers, and the macro-social descriptions of state-controlled statistics"(Desorires 1998:9)

Beck (2009) on the other hand, discussing the risks of society relating to challenges of climate change, points to the differences between scientific disciplines. The point he wants to make clear is that within science, and particularly social science, risks posed by climate change and the consequences to people, planet and profit, is a debate between the realists and the constructivists.

For the realists hard facts of natural phenomena are captured and calculated and made understood as real through the proof they show through these calculations and numbers. For a social constructivist, there may not be anything like hard facts without us perceiving it through the process of our social world making it perceivingly real.

Ulrich Beck (2009:86), taking the constructivist position argues:

> "Yet even superficial examination of such realist justifications of world risk society reveals how untenable they are. In the first place, the reflected risk viewpoint forgets or suppresses the fact that 'realism' is nothing other than sediment, fragmented, mass-mediated collective consciousness. (…) nevertheless ecological images and symbols are by no means scientifically confirmed as intrinsically certain knowledge. They are culturally perceived, constructed and mediatized; they are part of the social knowledge 'fabric', with all its contradictions and conflicts. The catastrophic consequences of climate change, must, as we have seen, be *made visible*, that is, they must be effectively staged in order to generate pressure for action. The explanatory power of realism is a function of the exclusion of all considerations that support the interpretative superiority of constructivist approaches. How, for example, is the borrowed self-evidence of 'realistic' dangers actually *produced*? Which actors, institutions, strategies and resources are key to its *fabrication*? These questions can only be meaningfully posed from a constructivist perspective."

The more abstract the evidence is the more applicable or transferable it is in time and space (Latour, 1987), and according to Latour points to the reason why mathematics is so powerful. It seems such evidence should be far away from application. But, Latour states that they may become the strongest:

> "they may become the strongest by the same token as the centres end up controlling space and time: they design networks that are tied together in a few obligatory passage points. Once every trace has been not only written on paper, but rewritten in a geometrical form, and rewritten in an equation form, then there is no wonder that those who control geometry and mathematics will be able to intervene almost anywhere. (…)The more 'abstract' their theory is, the better it will be able to occupy centres inside the centres"(…) "Giving up a classical representation of the space-time is not too high a price if the pay-off is a fantastic acceleration of the traces and an enhancement of their stability, faithfulness and combinability" (Latour, 1987: 245).

What science does is linking facts that are proven somehow in a context, such connections, pointed to by Latour as associations, does not always make justice to choosing one association over another. The assumed logical chains made by scientists, to map these associations may enable us, according to Latour to be free from

> "the belief in the irrationality of certain claims, and also from the symmetric belief that all claims are equally credible. We can go on following people striving to make their claims more credible than other"(Latour, 1987: 202).

In order to follow the claims through chains of associations that is part of the scientific practice of dividing, classifying or ranking – that is distinguishing between what the observer believe to be heterogeneous categories. Often, these classifications tend to take the form of 'knowledge' versus 'context', 'primitive' versus 'modern', or ranking them from 'more reasonable' to 'most absurd'. But, Latour (1987: 202) points to that these classifications do not point to that these associations are both unpredictable and heterogeneous in their nature:

> "The only thing we can do is to follow whatever is tied to the claims. To simplify, we can study:
>
> a) How causes and effects are attributed,
> b) What points are linked to which other
> c) What size and strengths these links have
> d) Who the most legitimate spokespersons are
> e) And how all these elements are modified during the controversy".

What Latour points to here is the need to understand the rationales and evaluations done by scientists along the way in producing knowledge and thereby establishing some "proven fact". If we do not know how such knowledge comes to be, there is the challenge of making the path towards the agreement of these facts getting black-boxed (Bowker and Star, 1999). Standards also falls into the threat of black-boxing, and this may pose challenges when it comes to the understanding of what it means to be sustainable, or more specifically a sustainable city. This issue is particularly pressing since the definition and thereby the handling of sustainability is still evolving. Objectification, related to standardization can be both a good and a bad thing, in this regard. Good because it may enable more easily reaching the agreement of how to handle the challenges related to the making of a sustainable city, but at the same time, if we do not pay attention to the accumulative nature of science, or knowledge production in general, we may easily give one explanation and then also the related preferred solution emphasis at the expense of other solutions that even might have been better explanatory factor, but that this was not evident, because the path to the production of knowledge and the claims or assumption made along the way in the knowledge accumulation was not clear.

Relating the standard creation process (Figure 2) to knowledge development and spread drawn from Latour, understood as the "cycle of accumulation" (Figure 10) we may suggest the following (Figure 11).

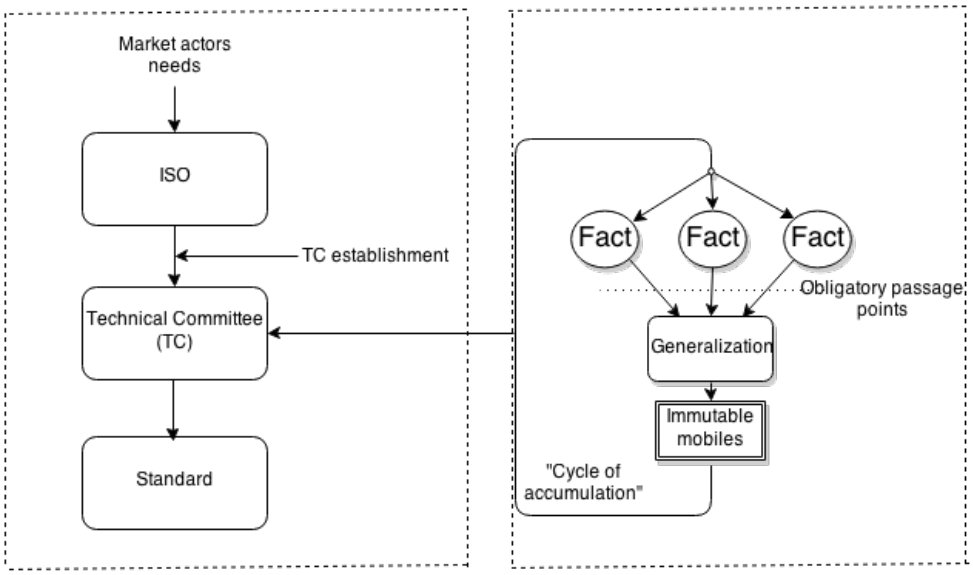

Figure 11. Standard creation process related to knowledge development and spread

The figure describes how we may understand the development of a standard. The "cycle of accumulation" where facts from the real world, as part of the expertise of the TC members will be combined with the aim of making a standard. The left part of the figure is a simplified model of Figure 2. We may understand that the TC members bring their knowledge to the table and through the standardization development process in the left part of the figure produce a standard. Along this path the knowledge drawn from the facts will need to be combined by going though "obligatory passage points" that may be described in the standard development process as the requirements from the standardization organization that have to be met when making a standard. Remembering form Bowker and Star (1999) understanding what standards are, and what they do; standards can be understood as having six different dimensions. Dimension 1-4 can point to the outcome of the standardization process that requirements will need to be part. Generalization understood in the standards development process, may be the process of enabling the standard to be applied across time and space to the necessary degree in accordance with what type of standard the TC are making. Standards can be understood as "immutable mobiles" because they enable and understanding of the project it is applied to, may it be e.g. building of a house, to be understood in the similar way across time and space. We may understand the standard development process as an objectification process by making something abstract and random, becomes commonly understood, agreed upon.

3.3 Discussing the objectification- standards- relation

From the evaluations above drawn from Latour (1987), Millard and Bowker (2009), we can contend form the process of objectification through the production and spreading of knowledge, that this process may have the challenge of getting black-boxed (Bowker and Star, 1999) so that the accumulation cycle as described by Latour (1987), by scientists through the application of preferred methods and scientific field specific practices, making the knowledge become immutable mobiles that can be moved regardless of time and space, that the reasoning behind the preferred classifications may become invisible.

Taking form Millard and Bowker (2009) that there is a need of standards to be tied both socially and organizationally in an integrated way, but still we know standards are made through experts' inputs, and that these experts are being part of the production of standards based on their expertise in a specific filed of research or practice. From the guide 82, ISO emphasizes future standards to take into account sustainability when developing and revising standards. This we can understand may be of an imminent necessity in order to reach societal goals of sustainability, both nationally and internationally (Hermansen, 2013). Standards, though voluntarily based, are used as tools for monitoring and evaluating progress, for bettering performance more than what is required through e.g. TEK 10) (Direktoratet for byggkvalitet, no date). Need for making evaluation of knowledge while considering values like Hermansen (2013) points to, we know form the process of objectification that the establishment of agreed upon knowledge in a process of objectification, making something random and diffuse into something concrete an agreed upon, if these values and the bases for them are not made clear and discussed, we might see, like Davidson and Venning (2011) that both the validity and the capacity of the assessment and reporting tools applied in a decision making process, such as those provided by various standards , where the goals and objectives are not founded on 'clearly articulated principles', that values clarification will be absent under the decision making process. And further, when the criteria that shapes the clarification of the values that is to be seen as critical to epistemologically making the reporting tools and assessment part of the decision-making process, this in turn will make any such effort of decision- making to report on sustainable outcomes doubtful.

We may understand form the presentation of the systems thinking and systems theory approach, that such way of thinking, when as Bernard Leservoisier the secretary of the technical committee working on the forthcoming sustainable resilient cities and communities standard (in Lazarte, 2014) points to the need for integration between all different aspects of a city (may they be elements, sub-systems and systems or even systems of systems) that this process of getting such an overview that is needed in order to be able to take into account both social, economic and environmental aspects of sustainability, making them assessable for monitoring progress towards the goal of sustainability, this would benefit for a through systems thinking approach. We can understand that the classification process in such an endeavor can benefit from understanding the process of objectification in the development and dissemination of knowledge. We can understand this as some type of transparency in the clarification of values. If we do not know the values that make the basis for evaluating societal practices, and further, the knowledge of what makes society unsustainable in the first place, how can we make efforts for sustainable outcomes? It seems that both in knowledge development, accumulation and dissemination today do not specifically make such efforts become transparent enough, or at least, the focus on values, may be both difficult and seen as something taken for granted. E.g. taking the broad definition of the Brundtland definition of sustainability and then see any effort that tries to make some type of scheme to assess e.g. environmental sustainability as at least better than nothing. But, still, the integration across sectors of state and business in society, is just at its infancy, as will be pointed to later. Maybe standards with the whole city sustainability as its scope might make contributions to how to

go about such integration, if we are to believe Bernard Leservoisier. But we will need to see in the future, how this is to go about.

Making the associations between the reasoning made when developing theories, constructs or systems, we can contend form Latour (1987), does not suffice form taking a specific scientific stand in a sustainability context. Through the understanding of how the different science come to view separate parts sustainability and how different perspectives are suitable for specific ends and the combination of the various perspectives, e.g. interpretive, functionalist or complex adaptive (Porter and Córdoba, 2009) or understood through realist or social constructivist stance (Beck, 2009), when combined and integrated for the purpose of and understanding of both social, economic and environmental aspects of sustainability, understood as a sustainable city system, we might go long way in making sustainable transitions. Or as we have seen, different systems; mechanistic, organic, semiotic(Krieger, 1998 in Brattebø and Kjelstrup, 2011) that are best described through applying the suited scientific perspective (functionalistic, interpretive) in accordance with the level of complexity (Boulding, 1956 in Jackson, 2009).

Discussing classifications - objectification in standards-systems relations

Remembering Millard and Bowker (2009) that standards are part of social and organizational systems of practices, we can apply the different systems and perspectives in accordance with the level of complexity (Boulding). We can make a division here between

- those who create the standards,
- those who apply the standards and
- what the standards themselves address (standards for products of things (sustainable building standards) or standards for people (e.g. environmental management standards, like ISO 14001).

Those who create standards can be understood as a knowledge accumulative process (Latour. 1987). Creation of standards It is often initiated from marked actors, these along with scientists and other professional experts contribute with their knowledge in the making of standards. The process of creating a standard can be seen as a part of the standardization organizational system. We can study and understand the process of making a standard done by these experts through the application of semiotic model for systems thinking, and the interpretive perspective. Those who apply the standards must use systems of meaning in order to be able to understand and apply the standards because the content through the written text in the standards must be understood in relation to real life practices. We can understand that standards aiming to function as a management standard are part of complex-adaptive systems. Taking technical standards may adhere to lower levels of complexity and may be understood as a mechanistic system, to be assessed by functionalist perspectives.

Any real world phenomenon understood as a system one can apply the understanding a physical/mechanistic system, will be in need to considering it through a functionalist perspective. Here various standards may apply in the process of bringing the systems into being. Along the lifecycle of a product, other standards may be applied to the same system

(e.g. maintenance related standards, audits). The management that is in charge of creating a system will in this process apply the system of meaning. The outcomes of the management process will in addition to the physical system created, produce of something may have physical representations in the form of documents/text, though the management, as a practice in itself is a semiotic system.

Because we may have standards for the making and function of mechanistic systems, we may make the connection an example could be that e.g a house through the ISO standards for sustainable construction are developed through the standards organization involvement of experts through collaborative processes of information sharing where the different experts bring their expertise from their specific fields into the development of the standard, and will thereby be influenced by the current issues and needs as they are perceived to be in the real world these actors are part of. As such the mere process of making a standard done by these experts may be understood as a complex adaptive system, understood through an interpretive perspective. But the standard itself is concerned at being applied for making a house, and can be understood as a mechanistic type of system. We can understand that viewing a standard, those who make them, and further those apply them in practice, as well as what the standard themselves create; physical or textual objects (Bowker and Star, 1999), can be understood as a whole by applying the systems theory of different types of systems (Krieger, 1998 in Brattebø and Kjelstrup, 2011) depending on the level of complexity with systems that fits for describing that level, and further knowing how this system on that particular level of complexity (Boulding, 1956 in Jackson, 2009) can be studied through applying the fitted perspective (Porter and Córdoba, 2009). As we understand, the different perspectives apply different methods for understanding what is to be studied. E.g. may it be methods for determining the mathematical linkages e.g. CO2 emissions from buildings over its lifetime (from resource extraction to the demolition of the building) may be assessed through applying the Life cycle assessment (LCA) method, in the functionalist perspective. Or as another example, making use of interview as a method for exploring the tensions between conflicting interpretations, e.g. of those creating a standard, in the interpretive perspective. How organizations learn and evolve over time can be studied by applying the CAS perspective.

3.4 Sustainability – city planning and development

Planning in the context of this study is concerned with sustainable city development, that is, the compact/dense city, not the suburbs or the periphery outside the city. Understanding how to plan a sustainable city, issues of current city development will need to be understood. This chapter will attend to understanding issues of sustainable city development initiatives in general pointed to in research. As a starting point, this relates to the fuzziness of defining sustainability. This may be worrisome since the definition of sustainability makes premises for the measurement and monitoring and assessment in a process that aims for sustainable outcomes. Further sustainability in planning will be attended to, and generally on the spread and development of sustainable cities initiatives, and the need pointed to in research for a new type of governance for sustainability of cities to develop and spread.

The issues drawn from this chapter will try to shed some light on the basis for understanding some real life cases of sustainable city development in Norway: the Framtidens Byer initiative, as well as Brøset, a plan for a sustainable city community in Trondheim, Norway in Chapter 4.'

3.4.1 Understanding planning – the nature of planning, planning as a process and the act of planning

In Norway "plan og bygningsloven" is an important framework for planning and development (Aarsæther, Falleth, Nyseth and Kristiansen 2012). It was established in 1965 as "bygningsloven" and further revised in 1985 and 2008. The interest in the area of planning and development has grown from the 1990s due to the ongoing debate of environmental and climate problems. Further, there is a recognized need for governance, (styring..) and city, community, as well as regional development. The "plan og bygningsloven" of 2008 is ambitious, stating it shall "promote a sustainable development in the best possible way, for the individual, the society and future generations" (pbl. "paragraph"1-1 in (Aarsæther, Falleth, Nyseth and Kristiansen 2012:18).

Also research in the field of planning, reveal that sustainable development is an important topic also in other countries in Europe and other parts of the western world. Reviewing research literature from four European countries (Belgium, Germany, Sweden and Switzerland), Austria, New Zealand and the USA, Carmona and Sieh (2004:298), concludes "the sustainable development paradigm is viewed increasingly as the guiding rationale underpinning the practice of spatial planning". The "product" of the planning, is seen as a contributor to sustainable development, and thus tested in accordance with if this has been achieved through the planning process. Still, the authors point out, that due to the complexity of the sustainability agenda, it is difficult to assess in particular how each planning project contributes in this context. According to Næss (2012: 147) planning of cities in rich countries like Norway currently faces the following challenges

- To reduce those contributions to climate change from cities that cannot be avoided
- Reduction of energy consumption
- Reduction of emissions
- Protection of natural areas and agricultural resources
- To reduce the use of environmentally harmful building materials
- To ensure the meeting of need for dwellings and to ensure that occupational, educational, leisure activities and service functions are met
- To provide for a safe and healthy environment for the inhabitants, especially for the most vulnerable section of the population.

In order to understand how planning can make contributions to sustainable cities development, we need to understand what planning is concerned with. This chapter presents and understanding of planning as described by three different authors. Figure 12 shows the

understanding of planning presented in this chapter.

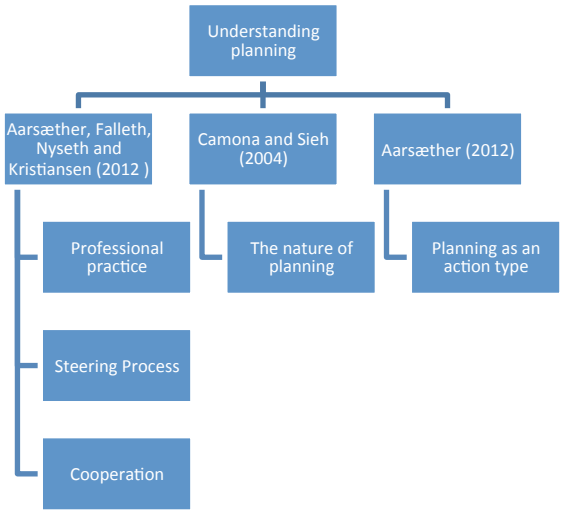

Figure 12. Understanding planning drawn from three authors

Planning can be understood in three different ways (Aarsæther, Falleth, Nyseth and Kristiansen 2012):

- As a professional practice
- As a steering process
- Cooperation between different public and private actors.

Planning can be defined as "an organized activity where actors formulate future goals and uses the knowledge of professional working methods in order to analyze, prioritize and collate measures enabling these goals being met" (Aarsæther, Falleth, Nyseth and Kristiansen 2012:15, my translation). This makes up the understanding of planning as a professional practice. Another definition of planning is "a steering process imbedded in a formal set of rules" (Aarsæther, Falleth, Nyseth and Kristiansen 2012:17, my translation). In the latter, different actors will have different roles, interests and tasks within this framework of rules. The initiatives and goals are present in a document or a map in which is made formal through constitutional resolutions. Yet, another sort of planning activity, planning is done both by governmental bodies or authorities and actors operation in the marked as well as actors from the civil society. As such, planning is done through complex processes, frameworks and relations. Here, a lot of different interests will be present, thus the need for cooperation to solve common challenges. This makes up the understanding of planning as a cooperation as shown above. From this, we understand that planning is broad, involving various professions where "planning is concerned with the complex management of change in the built and natural environment and is both multi-dimensional and multi-objective" Camona and Sieh 2004:21)

Below, the *nature of planning* is described. It can be understood as one, but at the same time having various features (Camona and Sieh 2004:21):

1. "A 'regulatory' process enshrined in a statutory planning system, but also a 'visionary' process through which future visions are developed and implemented for the built and natural environment.

2. Both a ‘political’ arena and a ‘legally defined ‘entity, the former through the operation of the system by democratically accountable local (and national) government, and the latter through the national legislative framework arbitrated through the courts.
3. Concerned with protecting both the ‘public interest’ and the ‘private interest’, in large part through balancing (or reconciling) the objectives of each against the other to optimize outcomes for both.
4. A ‘long-term’ process concerned with defining ten- to twenty-year visions for localities and a ‘short term’ process concerned with day-to-day decision making about development and the management of areas.
5. Similarly a ‘large-scale’ process concerned with urban areas and their regions, and a ‘small scale’ process concerned with individual developments and their impacts on localities.
6. Concerned with the ‘physical and environmental’ consequences of development, and also with the ‘socio-economic’ outcomes that development gives rise to.
7. Both a ‘generalist’ discipline concerned with the operation of the statutory process and a discipline concerned with a range of deep ‘specialisms’ including design, conservation, environmental assessment, sectorial planning (i.e. retail, residential, commercial), transport, minerals and so on.
8. Defined by a ‘process’ which is both iterative and cyclical and analytical an conceptual, but also a ‘product’-oriented discipline concerned with the types of places created through successive development episodes.
9. A discipline operated through ‘public sector’ intervention, but also with a large (and increasing) ‘private sector’ consultant base working for both private and public sector clients.
10. An ‘action-oriented discipline’ concerned with promoting specific policy and development scenarios, and a ‘communicative discipline’ concerned with negotiation and articulating shared visions with a broad range of stakeholders”.

We can understand how authors like Aarsæther (2012) points to that there is no clear and consistent common definition of planning. Aarsæther (2012), presents and ideal type presentation of nine steps involved in this process that builds on a formal rational action type:

1. The planning actor and the planning task at hand; who is the planning actor, and what is the planning task
2. Clarification of goals; establish the goals that are to be achieved in the future
3. Analysis of the situation: what is the current situation and what is envisioned to be changed for the better?
4. Overview of the means to pursue the wanted ends: what are the possible scenarios of various roads to meet the wanted ends (goals)?
5. Scenario testing: test through applying knowledge the different means for meeting the goals, as well as to disregard the assumed unwanted alternatives.
6. Presentation of the plan: After the scenario testing and evaluations of the means, the actors will draft and present the plan. This plan is made available for the concerned parties, opening for a debate on the proposal.
7. Plan decision: if the plan is not faced with critique in need for amendments, the actor will approve the plan, if not; the plan will be revised in in order to meet the critique.
8. Execution: the planning actor will start putting the plan into practice, in cooperation with other actors.
9. Evaluation and learning phase: throughout the process and until the finalizing of the plans put to practice, evaluations will be made to ensure whether the goals are being met. Mistakes will be evaluated as part of the learning process.

We can understand from this presentation that viewing planning as an action type that is goal-, future and knowledge oriented, planning is related to those who materialize planning, through agency, by being the planning actor. Further, in principle, the actor can be understood in many ways, such as an individual, a family, a public institution, a municipality, a private company or a voluntary organization. Still, the act of planning will always be oriented towards some specific task where the objective is to realize goals. The act of planning as an action types involves a series of individual acts that is connected over a certain period of time. At the end of the planning process, the actor strives to achieve some set of goals.

Still, planning for the future will always involve uncertainties with unknown innovations and solutions ways (Aarsæther, Falleth, Nyseth and Kristiansen 2012). Planning many years ahead is not enough in solving future problems. The authors believe that the future will be much more a planning through cooperation between different actors than it will be public authoritarian governance top-down.

3.4.2 Defining sustainability

The problem when it comes to the meaning of sustainability when you read about the term is the lack of consensus. Bell and Morse (2008:10) notes that

> "Almost every article, paper or book on sustainability bemoans the fact that the concept is broad and lacks a broad consensus; this is usually followed by the authors´ own preferred definitions, which in turn adds to the lack of consensus!".

And consequently making the authors pose the question " how can something be so vague and so popular" (Bell and Morse, 2008:11), answering their own question with that different people have different conceptions and thereby the definition will vary according to what might be perceived as the truth or what is just. There is no agreed upon definition of sustainable cities and what they should contain. This is because of the complexity of the term and thus a need for a discourse among researches, policy makers and those who seek to make the concept into practice (Joss 2013**).**

One definition that resembles the Brundtland definition of the WSSD 1987 is proposed by Hamilton et al (2002): "Urban sustainability is the process of developing a built environment that meets people's needs whilst avoiding unacceptable social or environmental impacts" (in Morse and Bell 2008: 78). Another definition, by Camagni,(1998):

> "Sustainable urban development may be defined as a process of synergic integration and co-evaluation among the great subsystems making up a city (economic, social, physical and environmental), which guarantees the local population a non-decreasing level of well-being in the long term, without compromising the possibilities of development of surrounding areas and contributing by this towards reducing the harmful effects of development on the biosphere" (in Morse and Bell 2008:79).

"While one can sympathize with the view that a simple, concise definition may not be possible, surely some idea of where one is trying to go is an absolute necessity"(Bell and Morse 2008:11). But still, it even might be the case, that the reason for the popularity of the term sustainability could be that it has the capability of be tailored to in accordance with the

need, making it possible to keep it mainstream and up to date which might increase its popularity. Another important question then, is that this so far implies that we don't know how to do or make sustainability because we do not know what it is in the first place. Further, how can we aim for sustainable development, society, city or what it may be, if we don't know what we are doing? This depends on how we perceive and evaluate sustainability.

Often one encounters the two different ways of viewing sustainability – strong sustainability and weak sustainability (Bell and Morse, 2008). In the former, any harm to the environment is bad because it will harm people and other living and non-living things. The latter, sustainability can be measured in monetary terms, often through cost-benefit analysis, which enables making trade-offs between social, economic and environmental benefits. Ultimately this understanding of sustainability is mainly economical, where it is possible to allocate resources in accordance with what is economically beneficial, or to substitute economical gain and environmental quality, or where the quality of the system is measured through resource allocation, the value of finance or consumption level. Currently, according to Bell and Morse (2008), the weak sustainability is the most dominating of the two.

Sustainability can also be evaluated in relation to how it is connected to three dimensions (Bell and Morse (2008): space, time and quality.
Borrowing systems thinking, where a city can be viewed as made up by many different elements (or components), and where the total city system will be the aggregates of these elements. Where to set the system boundary is important but difficult to endeavor. This can be understood as the space dimension. If the element to be changed or improved is the built infrastructure, to make a city more sustainable, where do you draw the line between the border of the city and the nearby community? And since a city, even though with its geographically defined city borders, is not a self-supplied entity; how then does one include its interdependency with areas outside its borders when measuring sustainability?

Different systems may have needs for different time scales. Taking personal values of the inhabitant of the city as an example, values changes with different trends over time as may the perception of the quality of life may vary between individuals and over time. If people's perceived quality of life and well-being is approximately the same, does it mean and that quality is improved correlate to improved wealth or income? Or in other words, will people be happier proportionally with increased wealth? If so, will this mean that increased wealth equals higher well-being, without any environmental concern? Or can even the quality or well-being be traded for environmental concerns?
More generally, sustainability will be evaluated as to what has been achieved, and therefore it will need a starting point to be used as a reference. Still such a reference point will influence the results in the way that if the quality goes down in regards to the reference starting point, then the development between to starting point and the new measure at another point is viewed as unsustainable. This is why, as Morse and Bell (2008: 17) puts it, "spatial and time scales are key component of achieving sustainability; (…) they are problematic in the sense

that careful selection of scale and reference point can be used to prove almost anything". Sustainability in practice, then, will have to do with judgments of value and ethics.

Cooperation between private and public actors is often pointed to as necessary in order to plan for sustainable outcomes. In the case of business, traditionally, economic return and growth was the key goal, simply put. Still, in recent times, businesses have started to acknowledge the need for being more responsive to the overall society in socially and environmental terms, often called, the triple bottom line of business (namely social, ecological and economic). More generally this perspective is often called Corporate Social Responsibility (CSR). Adopting voluntary standards like the ISO14001 Environmental management standard or ISO26000 Guide on social responsibility can be viewed as part of such a CSR commitment by business. Some researchers even claim that businesses can be more effective in the cooperation for setting strategies, goals and frameworks that aim for sustainability because such a process will for businesses be less "bureaucratic" compared to national, regional and international governmental processes with the same aim (Kirton and Trebilcock, 2004).

We understand that sustainability has both ideological and practical implications. The general definition of sustainability (i.e. Brudntland report) will need to be made more specific in order to be monitored and operationalized in practice. In this sense, sustainability must be seen as a concept closely related to assessment and measurement (Poveda 2011). At the same time, as Poveda (2011) argues, assessment and measurements are concepts that involve different types of processes. The measurement process involves identifying variables related to sustainability and collecting data that will further be analyzed with the appropriate methods. In the assessment process, criterion (or number of criteria) or standards are used in order to compare the performance. Assessments will then be used in an overall evaluation and decision making, usually involving stakeholders. The importance of assessment and measurement processes to be meaningful for those involved is understandably key in order for meeting goals of sustainability.

3.4.3 Measuring sustainability

> "Policy-makers and built environment stakeholders underline the importance of the built environment for national carbon reduction targets and for sustainable development (e.g. Department for Environment, Food and Rural Affairs (DEFRA), 2005; Intergovern- mental Panel on Climate Change (IPCC), 2007); they also consistently insist on the role of assessment and certification to meet those goals" (Schweber 2013:130).

The blurriness of the definition of sustainability, some researchers encourages common measurements through indicators applied that should make comparability possible across time and space. Common frameworks and standards for sustainable city development have been suggested as a need, or even a prerequisite for the various sustainable cities initiatives to scale up. For the purpose of sustainable development, a variation of standards may apply. Making these fit together in a systematic purposeful way, development of a framework for sustainable development with the inclusion of indicators have been suggested both by the EU and researchers

According to the Bellangio Report (Joss ed., 2012:6), the following definitions applies:

> *"Frameworks* are schemes combining sets of common targets and indicators under an overarching programme. Their purpose is: (1) defining urban sustainability coherently and comprehensively; (2) providing a more standardized approach to implementing urban sustainability across initiatives; and (3) offering integrated management packages, in the form of either open-source or certification-based step-by-step guides."

Further, indicators and standards are defined:

> *"Indicators* are tools for (1) specifying urban sustainability, (2) defining related targets in measurable (quantifiable) ways, and (3) monitoring performance. They typically have a temporal dimension, with reference to past/present base values and targets for specified future periods. Individual indicators necessarily involve the reduction of complex information to singular dimensions."
>
> *"Standards* are commonly agreed norms, based on the aggregate assessment and integration of various indicator measures. Designed to be applicable across initiatives and sites, they are typically negotiated through formal consensus processes."

In the context of sustainability in the construction sector, research on sustainable construction can be divided into three (Schweber and Haroglu 2014):

- goals and approaches in general
- technical problems and solutions
- challenges that construction professionals face in meeting these goals and implementing these solutions

the first and the third of these relate to the use of the environmental assessment methods (EAMs).

'Environmental Assessment Methods' indicates performance of environmental quality of a building relative to the market, publicly or property wise (Schweber and Haroglu 2014). Literature in this field often focus on either refining existing methods or deals with comparison between these methods. Often researchers studying this tend to focus on the technical. This is often done without any reference to the context of the organization or of the market where these methods are used (cole 2005 in Schweber and Haroglu 2014:303). Research on methods, tools and instruments often has the formal features as a focus. As a result such endeavors will lead into focus on uniformity across different cases of study, because technical features prescribe both use and effect.

Most of the research within sustainable construction literature on assessment methods focuses on the building, the tool and the ideal that is set or assumed of sustainability (Schweber 2013). Here the tools formal features are analyzed or against the buildings where they are applied to design and for assessment. This points to that a lot of researchers prefer outcomes that are clearly measurable. Still the challenge here is to make tools that have the ability to inform decisions. Such ability depends on taking the actors and the processes involved in producing the buildings into account.

Within the theme of building assessment methods, there have been many studies conducted concerning the relation between sustainable construction and project team integration. 'integration' is a well-used phrase when it comes to the literature on sustainable construction. Schweber and Harlough (2014) contend that this word can be both useful and distractive. Useful because of challenge and the conditions for sustainable construction that it points to are in general well-established and consensual. Integration also is linked to 'improvement' with the promise to solve all concerns of the sector. Integration can also be distractive in that it is part of "a wide variety of different organizational and project-level characteristics and types of processes" (Schweber and Harlough 2014:302).

Today, most agree that indicators for sustainability are needed, still what these indicators should be composed is not clear (Morse and Bell 2008, Joss et al. 2010, Elgert and Krueger 2012). In urban sustainability, indicators are used in a framework and are seen as interdependent. The indicators are used for definition and to evaluate performance relative to what has been defined as targets criteria for a specific area of sustainability. "(...) The definition of urban sustainable indicators is usually derived from a mixture of scientific technical analysis, national and local policies and place specific urban conditions" (Joss et al 2012: 110). Following this understanding, urban sustainability indicators depend on the context in which they should function. The indicators will thereof vary: between policy contexts and the nature of urban areas and the involvement of stakeholders. Most often, experts have developed sustainability indicators without involving the stakeholders (Morse and Bell 2008). Involving stakeholders like different interest groups and citizens, will be democratically viable, but may lead to difficulties of replication and standardization. There is an increase in international and non-governmental actors that develop and use frameworks for urban sustainability (for example the World bank´s Eco2 Cities, the United Nations Urban Indicators Guidelines, and Ecocity Builders´Internationa Ecocity Framework and Standards). These typically cooperate with private developers and cities. The increase of public-private governance agreements has furthered the need for indicators. This is especially the case when initiatives for urban sustainability operate outside the existing policy frameworks of governments. Based on this, Joss et al (2012) argues that the use of urban sustainability indicators should not only be seen as pure technical and scientific evidence based, but should also and equally, consider governance and the question of whom are participating in making such indicators; as a strategic policy influence instrument, as well as how these indicators are used in making policies and how they through a social process contribute to social learning (Joss et al 2012: 111). Under governance, indicators are part of process where mapping, steering and communication are evaluated. "They constitute an institutional process of identifying policy, generating knowledge and applying that knowledge in practice" (Joss et al 2012: 111).

Measuring sustainability will be, at some point connected to expectations (Morse and Bell 2008: 88).

> "Governments across the world have caught onto this notion of inclusion and a number have embarked on´conversations with the notion` on key policy points. Unfortunately these conversations seem to have been strong on rhetoric and weak on evidence that the voice of the

> public has really been incorporated within, or instrumental in, actual policy change". (Morse and Bell 2008: 198).

Different stakeholders may have different expectations of what might be upper and lower level of measurements when it comes to sustainability. Is it possible to manage such different expectations and agree on the right measure of sustainability? Such approach resembles those of discourses, where the meaning of sustainability is extensively interlinked with our perceptions of what exists, what we perceive as the reality we live in. Different meanings or discourses may exist at the same time and will evolve through time as we gain knowledge through being part of the context we live in (Dryzek 2005).

Following such an understanding, that we cannot study ecosystems in the same way we study sustainability since the understanding of sustainability will be a part of the mindsets of people (Morse and Bell 2008). Such differences of how to measure and monitor the development towards sustainable city development and planning can, according to Dryzek (2005) be understood as how visions and goals come are made, understood through a discursive information flows in society, where knowledge makes basis for decisions, and where decisions are discussed among different actors that are part of an historical context. Or more specifically this relates to perceptions of what is true, that makes basis for different approaches to sustainable development. In this understanding, sustainability can be take a weak or a strong approach (Bell and Morse 2008). According to Dryzek (2005), along such a continuum from a weak to a strong approach to sustainability, a number of different directions exists. A weak approach to sustainability, those who believe that challenges to sustainability can be amended though technical solutions, and where the strong approach proclaims the need for a fundamental change in the production and consumption in society and even a change from etno-centric world view to a eco-centric world view…

3.5 Understanding Sustainable cities initiatives through issues pointed to by research

Due to the various initiatives, projects and frameworks that gives sustainable cities development different technologies emphasized, different overlapping meanings and goals as to what they want to achieve, Joss (2013:2) gives them a common umbrella term: Eco-cities, and provides the following definition:

> "´Eco-cities' is an umbrella term that covers various approaches to, sustainable urbanism, rather than a uniform phenomenon. In practice it typically covers ´the triple bottom line `of sustainability (environmental, economic, social); and it applies to new build, in-fill and retro-fit developments at different urban scales. Sister terms include ´climate-neutral city, ´low-carbon city, smart city, transition towns, among others"

Such practical eco-cites initiatives are growing globally as a response to, as Joss (et al 2012:119) puts it "climate change and urbanization concerns has turned the quest for urban sustainability indicators and standards from a predominantly theoretical undertaking by

academic researchers into an increasingly urgent priority for policy-makers, planners and developers".

3.5.1 General understanding of the spread and development of sustainable cities initiatives

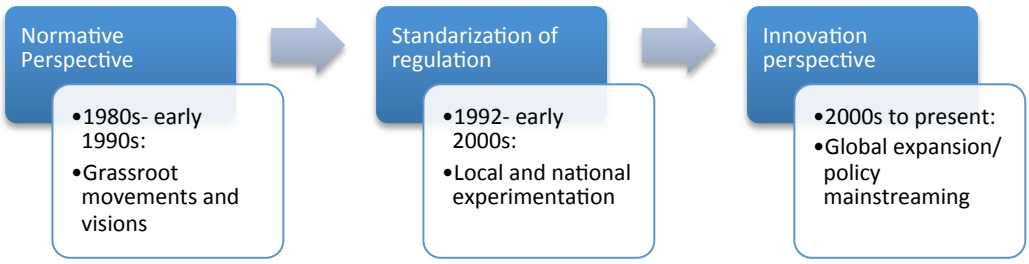

Figure 13. Historical development of sustainable cities and dominant conception perspectives

Figure 13 shows the development of sustainable cities and the dominant conception perspectives of each of the three eras based on Joss (2011). Under follows and elaboration of what these perspectives contain.

The "normative' perspective, which is informed by conceptually, ideologically and politically driven, normatively prescriptive ideas and demands" which is based on different theories and concepts "including social ecology, community economic development, the green movement, bio-regionalism, technology studies and sustainable development" (Joss 2011:270). This perspective was most prominent during the first development phase in which aimed to propose "grassroots-based alternatives to urban development, politics and life" (Joss 2011:270).

For the second phase, regulation became more standardized as a result of the adaption of the agenda for sustainability proposed by the Brundtland report, *Our commom future* of 1987 and the Rio 1992 Earth summit with the Agenda 21.

The third phase, the present day developments, Joss (2011: 270) describes as "innovation perspective". Here eco-city development is seen as part of innovation processes; "The perceived opportunity to stimulate socio-technological innovation, business development and cultural branding"(ibid). Seeing cities as important contributor to greenhouse gas emissions, here central points are to make the world economies decarbonized as well as reducing cities carbon footprints. Flowingly, this aspect, initiatives have the common feature of focusing on CO2 reduction measures.

These developments through the past 30-40 years, the different eco-cites initiatives and policies have become to be more alike. As a result, Joss S., Cowley R. and Tomozeiu D (2013) argues the present there is an emergent "paradigmic shift" when it comes to how sustainability is understood as a concept as well as how its practiced. This transition consists of some main characteristics that distinguish todays understanding of eco-cities from previous

periods: the growth of "international knowledge transfer", the frequent use of the "carbon discourse", and the prevalence of "green and smart technology solutions".

Another study by Joss, Tomozeiu and Cowley (2012) of nine urban development projects of different types, concludes with pointing to the lack of a coherent methodology and conceptual understanding of what should be considered as the most important elements and functions of sustainability indicators. Initiatives that aim to be within the sustainable cities framework today are abundant. Still,

> "there is currently no overall agreement on what exactly constitutes an eco-city – despite various attempts to define it conceptually in terms of specific norms and dimensions, quantitatively and qualitatively in terms of evaluative measurement, or in terms of practical guidance for eco-city planning and implementation" (Joss et al. 2013:55).

As eco-cites initiatives increases, spreads to become more global, there will be an increase in the need for comparability. With increase in cooperation across different national and urban contexts to improve the sustainability practice, policy learning and transfer will increase (international knowledge transfer). Resulting from sustainability issues, which are perceived as global in scope, still, different indicators for sustainability are chosen by different policy developers. There is a lack of standardization. Joss, Tomozeiu and Cowley (2012) expects, due to a mainstreaming of global urban sustainability, that the need for comparable indicators will increase.

> "The challenge of global standardization is partly technical in that what is measured and the methods of measuring vary across contexts, and partly political in that there is a yet no umbrella organization or mechanism that provides a recognized an overarching framework" (Joss et al 2012: 111).

On the other hand analysis show that different initiatives have their own and different way of framework for eco-cities "where indicators are defined, targets and criteria are specified, and designing, developing and implementing procedures for urban sustainability initiatives are set" (ibid). There is a problem of global versus local indicators when it comes to developing indicators that can be used in frameworks across time and space (e.g between initiatives in different countries over time). Further, there may be different challenges that comes with unification of eco-city indicator frameworks in the future:

- When it comes to the triple bottom line of sustainability, it is much easier to define and specify environmental sustainability aspects of indicators than social aspects. It is also unclear how different indicators for sustainability are inter-related.
- In relation to the development life cycle, indicators are more often used in the design phase of the urban sustainability development, leaving less emphasis on the later life cycle of the city. For a eco-city indicator framework to be comprehensive it must also include later life phases.

Indeed, Joss 2013, in the article *governing for eco-city innovation. Policy brief,* states that the reason for that there is no agreed upon definition of sustainable cities and what they should

contain is because of the complexity of the term and thus a need for a discourse among researches, policy makers and those who seek to make the concept into practice. Following, Joss (2013:2) calls this ”an ongoing process of innovation”. The issue at hand is to through practice be able to share knowledge of what may be the key features of eco-cities and how these should be governed. Also Joss points to the need for more knowledge on the social dimensions of eco-cities, in other words, how people can influence the content of environmental goals, and that also the built environment through technical intervention can influence social change.

Because of the lack of a recognized overarching framework for setting eco-city development into practice, Joss and his fellow researchers think it to be unrealistic that international eco-city standards will be developed in the near future. Especially the tension that exists between local and global indicators may be difficult to resolve. Still the authors encourage further development and understanding the functional role of indicators in order to meet challenges of “their conceptual and practical implementation“. To this end the authors’ point to the need for “more international, comparative analysis of the use of urban sustainability indicators in diverse ‘eco-city’ contexts”. The authors expect that this will "help inform and facilitate policy transfer, practical co-operation and social learning at global level” (Joss et al 2012:119).

3.5.2 Meeting goals for sustainable cities initiatives through governance

In the context of planning for sustainable cities development, research literature point out the need for renewed types of governance in order to meet the goals for sustainable development (Bukeley and Bestill 2005, Fitzgerald and Motta 2012, Joss 2013, McGrew 2005). Still a lot of work remains in the making of sustainable urban development practices. Progression has been made, but still a lot of normative questions have not been answered. Barriers for setting community goals are policy operationalization, implementation and measurement. Many researchers believe that a common understanding of governance can do solving such disputes. Governance – is to study how and how well policy is formulated and implemented. It “allows us to examine how policy barriers can be overcome and progress towards sustainability best can be realized” (Fitzgerald and Motta 2012: 1). Still Bukeley and Bestill (2005) argue that the traditional distinctions that are made between local, national and the global environmental politics are no longer enough in renewed governance for the planning for sustainable cities. Governance and measurement are closely connected. The usefulness of good measurement is that it allows policy makers to understand how effective policies are and thus what makes up good governance. Measurements make policy makers operationalize their goals, something that is especially important when it comes to the ambiguity of the term sustainable development. Bulkeley and Betsill (2005:48) state in relation of the scale of framing sustainable cities that “suggested measures to improve urban sustainability are frequently bounded by the idea of being ´local` solutions, and the role and influence of policy and politics taking place outside the urban area are largely ignored”.

Further, they suggest that

> "(…) it is necessary to step beyond the local as a frame of reference and to engage with the process which shapes the local capacity and political will for sustainable development at multiple sites and scales of governance in order to explain why moves towards sustainability are, and are not, taking place".

Through the Brundtland report, sustainable development reached the political and societal agenda, and this report was a criticism of existing policies and thereby also a criticism of governance. The Earth Summit goals called for better governance for these to be reached. Problematic is then, the definition of sustainable development because it does not inform policy. Such goals will need to address all three parts of sustainable development, namely, economic, ecological (environmental) and equity (social) goals, which all are in conflict with one another. Solving such conflicts in turn creates political and ideological conflicts, making governance and measurement especially difficult. Governance as sustainable development is an elusive term, with many definitions and frameworks to guide research. Literature on sustainable development governance is diverse. In addition Joss (2013:4) points to the problem is that

> " 'Good governance' is in itself a contested concept, with critics claiming that it risks depoliticizing decision-making by suggesting universal principles ('transparency', 'participation' etc) devoid of political substance. Empirical observations have shown that in practice the concept can produce 'thin' forms of governance that fail to engage properly with the complex reality of decision-making and public discourse."

According to Joss (2013) the governance of eco-cities should be focusing on integration. First, system thinking and environmental science is today influencing the understanding of integration. Mostly, this focus is on understanding cities through analyzing material flows understood through a circular metabolism where inefficiencies are detected. Further, these should be solved "by improving existing infrastructure and innovating in new socio-technical systems" (joss 2013: 2). Second, but no less important, is to understand how governance can contribute to integration: "how coordination between multiple actors is achieved through organizational and political steering, facilitating and networking" (joss 2013:2). The third issue of integration is that of scale. E.g. there need to be integration between the levels inside the city borders as well as between the city and the rural areas or between the city and the region. Further, Joss points to the need to move from today's institutions towards a new ways of governance and new partnerships for a more efficient integration. Here there will need to be cooperation and coordination "between and across professions, organizations, political authorities and socio-technical systems" which further "calls for new ways of social learning and strategic development and management. As such, current eco-city innovation is as much a social and organizational process, as it is a technical one" (Joss 2013: 2). Also the different ways of governance needed, must correspond to the particular needs on national and regional levels. Governance on a national level should be flexible enough to aid innovation of eco-cities on the sub national level. To govern development on a regional level, creation zones may yield development. On the local level, there is a need for involving the community to aid

engagement and social acceptance for sustainable cities. Finally, relating to integration and governance, Joss (2013) stresses the need for partnerships between the public and the private sector in financing projects.

Joss also points to the need for and importance of "national frameworks as coherent mechanisms for steering and facilitating innovation in urban sustainability (..)" and he adds: "one of the challenges involved is to retain sufficient flexibility in lasting strategic plans, to allow for adaptive change in response to evolving social and material conditions" (Joss 2013:3). Some autonomy of the cities from national regulations might be beneficial for the growth of innovative solutions, which in turn can inform policy on national and international levels. Between such cities initiatives, networks for learning and distribution of knowledge are important leadership facets of cities.

Lastly, Joss points to the benefits to get from engaging the community in eco-city initiatives "the social dimension of sustainability is critical to the potential effectiveness of eco-cities initiatives" (Joss 2013:4). Reason for this is the effectiveness of eco-cities initiatives for e.g. yielding environmental benefit will depend on the users of the city; the people. Challenge here is to engage people in a way in which is relevant, accessible and understandable. Also it might be beneficial bearing in mind that a community or a public is not one coherent group but rather there might be many different communities and publics. "(..)in turn, this calls for tailor made engagement processes to take into account the types of participants to be involved" (Joss 2013:3). Therefore, there should be different ways of engaging in accordance with the characteristics of the group in question. Still how public should participate in eco-city governance should be made clear and specific. Formal decision-making and discursive channels of participation should be held apart. Formal decision-making through the process of formal consulting can be beneficial in the context where there is a need for input to the designers and other city planners. Public discourse on eco-governance is important to making politicians and planners accountable and also to foster informed debate on the sustainability of cities.

Though, good governance is a contested concept, the distribution of knowledge of eco-city innovation through networks may lead to "good governance practice and even international indicators and standards for eco-innovation" (Joss 2013:4). Still joss, concludes that the local context of the eco-cities must be taken into account in such processes.

3.5.3 Summing up Chapter 3.4-3.5

Perceiving the meaning of planning through the presentation of three authors, an understanding was made that, like Camona and Sieh (2004) pointed to, that planning is concerned about management of the change of both the built and the natural environment, that such a management is complex involving many dimensions and objectives. It is concerned about envisioning the future of how the outcome of the planning will influence both the physical environment and the social and economic changes the planning might impose. Thereby setting of goals will be related to the envisioned outcomes of the planning, that in the

process is tested through understanding of scenarios with depiction of the outcomes of specific solutions. But, still it is important to bear in mind, that there will always be uncertainties when planning for the future (Aarsæther, 2012). All these aspects of planning points to the reason for why planning is in need of involving various actors across public and private sectors with different expertise and professional backgrounds.

Lack of consensus, broad concept, where different authors propose their own definitions (Bell and Morse, 2008), and further the proposal of definitions will try to make it justifiable, through pointing to what may be perceived as right (truth) or just.
Additionally, the research point to the lack of an agreed upon definition and containment of sustainable cities, which will be in need of a discourse among researchers and practicians of sustainable planning and development (Joss 2013). The prerequisite will anyways be to have an idea of where the development should be heading (Bell and Morse, 2008).
Sustainability could be strong or weak in its form, and can be evaluated in relation to time, space and quality (ibid). Evaluation of sustainability is generally in need of a reference point enabling evaluations of whether improvements have been made in relation to the goals of what sustainable city planning aims to achieve. Still, spatial and time scales can be problematic, because the selection of these can be amended in such a way that it depicts, or prove wanted developments. Putting sustainability into practice will have to do with evaluations of values and ethics. Cooperation between public and private actors has been pointed to as a need when pursuing the goal of sustainability. Some authors even claim that business may be able to make more effective contributions in the planning for sustainable development since they are not slowed down by bureaucratic processes that often are part of the public sector (Kirton and Trebilcock, 2004). Sustainability is closely related to measurements, where there is a need for the measurement process to be meaningful for those involved in order to enable the meeting of sustainability goals (Poveda, 2011).

Research on sustainable construction assessment methods where measures are clearly defined is often pointed to as a preference. At the same time, there is a challenge of making tools that have the ability to inform decisions. Often the formal features of the assessment methods are in focus with the technical features describing both case and effect. Still, not that thoroughly attended to is knowledge of processes taking the actors producing the buildings into account (Shweber, 2013). Also pointed to in the research literature on sustainable construction is ‘integration’, with the promise of improvements and solving the challenges of the sector. Integration can useful when it comes to viewing the challenges of sustainable construction as consensual, but distractive because of organizational differences when it comes to characteristics at process level and the different types of processes involved.

Indicators are pointed to as a need in research, but how they should be composed for the sake of sustainability monitoring and evaluations and performance relative to the criteria set is usually not a standardized practice (Morse and Bell, 2008). They are often tailored to fit a specific context and will consequently vary between policy circumstances, the nature of the urban area and the involvement of stakeholders. Usually the indicators are developed by without involving stakeholders that poses challenges when it comes to democratic viability.

There is a need of considering governance when making indicators, like e.g. who are participating in this process, how the indicators are used to inform policies and how they contribute to social learning (Joss et al 2011). Measuring sustainability will be connected to expectations, will be part of mindsets of people, making it difficult to study phenomenon in nature (e.g. ecosystems) the same way as we study sustainability (since sustainability involves both environmental, economic and social aspects) (Bell and Morse, 2008). This, drawing form Dryzek (2005) can also be related to knowledge production as a discursive entity through being part of a context and understandings that evolve by being present at specific points through time.

Sustainable city development projects and initiatives are growing globally as a response to climate change and urbanization concerns and they varies when it comes to goals and technology emphasized. Joss 2013 calls them 'Eco-cities'. These have evolved form 1980s taking on a normative dimension through grassroots movements and visions to the focus of today of innovation, more global in scope with the common focus of greenhouse gas emission reduction. Initiatives of today are influenced by international knowledge transfer, are participating in the carbon discourse and focusing on green and smart technology solutions (Joss et al 2013). This is something that distinguishes sustainable city initiatives from previous periods. At the same time, research point to the lack of a coherent methodology and conceptual understanding of what should be the most important elements and functions of sustainability indicators (Joss et al 2012). Further, such a spread of sustainable cities initiatives will create a need for comparability in general and of indicators in particular (ibid). The challenges of making common indicators for sustainable city development are that indicators to assess the social aspect of sustainability is difficult compared to environmental (ecological) or economic indicators. In addition there is a challenge of making indicators that enables the assessment of the whole life cycle of the city, not only the design or construction phase. Today, only including indicators of the design phase, is the most common practice. Solving the tension between local and global indicators and the role of indicators in implementation both practical and conceptually are in need of further research (Joss et al 2012).

Researchers' further point to the need for new types of governance in order to solve the barriers for setting community goals. Governance and measurements are closely connected. Measurements make policy makers operationalize their goals, something that is important when it comes to the ambiguity of the term sustainable development. The making of Governance and measurements may be difficult when related to sustainable development since the three aspects of sustainability (economic, environmental and social) are in conflict, creating ideological and political conflicts in turn in the effort of solving them. Joss (2013) points to that governance should focus on integration. System thinking is useful for understanding integration, understanding the city as a whole, detecting inefficiencies and improving and renewing the infrastructure of socio-technical systems. Integration is necessary when it comes to solving issues of scale (e.g. between the various levels inside the city border as well as between the city and the and the surrounding region). New types of governance| and partnerships (e.g. between the public and the private sector) will make integration more

efficient and effective. Additionally involving the community may create social acceptance for sustainable cities.

3.6 Discussing standardization and objectification for knowing the sustainability of city planning and development – a systems thinking approach

Seeing standards and sustainable city planning and development as systems and systems of learning and systems of meaning (semiotic system) has been the main endeavor of chapter three in addition to review literature on sustainable cities initiatives and making an understanding of what planning involves. The proposed conceptual knowledge system intended to function as a frame of reference for the thinking process. Figure 14 describes how IE systems thinking approach can be understood as a guide for designing, making and evaluating the sustainability of man-made systems, as we remember from chapter 3.1.6. Further, as the big green arrow indicates, the IE systems thinking approach can be used as impute to the knowledge accumulative process of the standards technical committee members when developing a standard, as we remember in chapter 3.2.

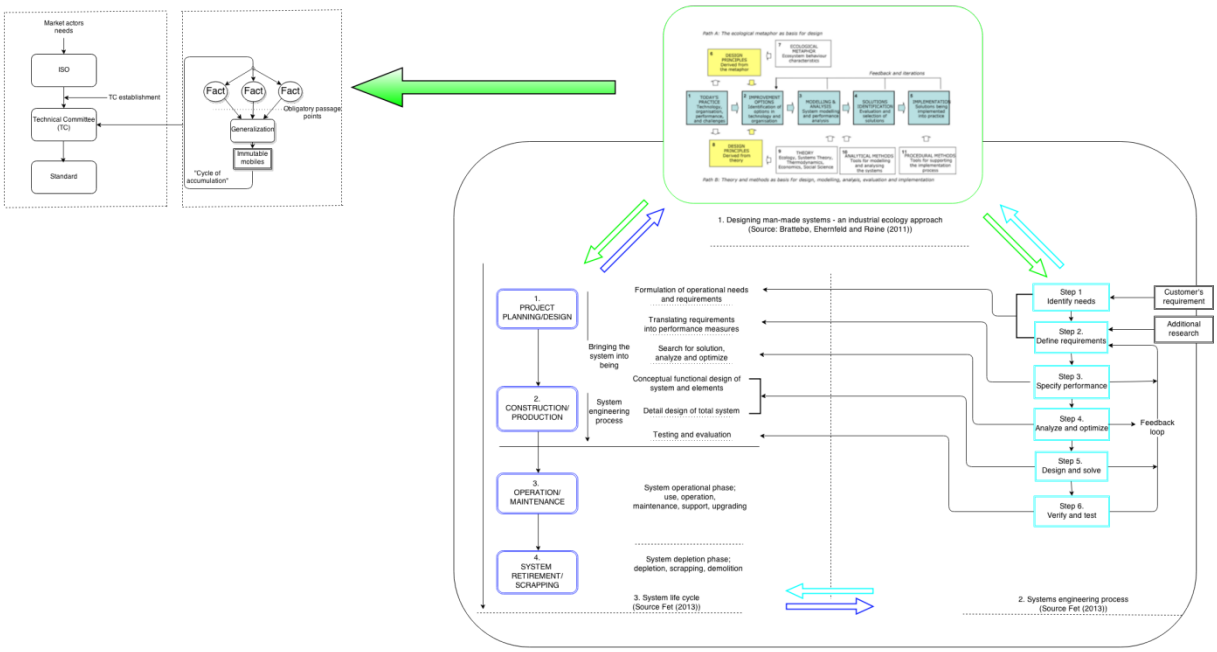

Figure 14. IE informing knowledge production in standards making

Understanding the process of objectification , can be argued as a way of meeting the issues of sustainable city development initiatives. Keeping in mind the remarks from Latour (1987) that classifications are made in knowledge development process, that there is a need to understand the rationales and evaluations done by scientists on the path to establish "proven facts", to prevent the reasoning behind an establish classification becoming invisible. We remember from chapter 3.3 discussing objectification and standards-relations, that this can be viewed as a systems thinking endeavor. Relating the systems approach as a part of a way of classifying the world, we can understand that the classification process in such an endeavor can benefit from understanding the process of objectification in the development and dissemination of

knowledge. We can understand this as some type of transparency in the clarification of values. If we do not know the values that make the basis for evaluating societal practices, and further, the knowledge of what makes society unsustainable in the first place, how can we make efforts for sustainable outcomes? It seems that both in knowledge development, accumulation and dissemination today do not specifically make such efforts become transparent enough, or at least, the focus on values, may be both difficult and seen as something taken for granted.

4. Case examples

Today, there are many certification schemes for sustainable building and spatial planning provided by standardization organs in many countries. Some examples of environmental assessment tools are LEED (Leadership in Energy and Environmental Design, USA), CASBEE (Comprehensive Assessment System for Building Environment Efficiency, Japan), HK-BEAM (Hong Kong Building Environment Assessment Method, Hong Kong) BCA-GM (Building and Construction Authority Green Mark, Singapore), Green Star (UK), NABERS (National Australian Olympic Building Assessment System, China), SBtool (Sustainable Building Tool, international) (Abdella, Maas, Huyghe and Oostra 2011). BREEAM is the first environmental assessment tool applied world wide and other assessment tools have been developed based on BREEAM, like LEED and SBtool (Abdella, Maas and Huyghe: 2011). On this background, this chapter would like to take a brief look at BREEAM. Further, as we remember from chapter three, ISO is currently working on standards on sustainable city development. On this background a European standardization organization group consisting of three standardization organizations have been established in order to evaluate the European need for sustainable city standards. This will be presented in chapter 4.2. Chapter 4.3 will present the example of a national sustainable city initiative in Norway named Framtidens Byer.

4.1 Breeam

Breeam was the first comprehensive assessment method that directly and explicit aimed at buildings (Cole 2005 in Schweber 2013:130). BRE Global Ltd. the owner of BREEAM was initially a scientific research institute under the UK Government. Through the 1990 it gradually became privatized and is today owned by the BRE Trust (formerly the foundation for the Built Environment, a non-profit distributing company, created explicitly to bid for the BRE) (Courtney 1997 in Schweber 2013:130).

In 2010 the Green Buildings Alliance in Norway decided to make BREEAM a an area of emphasis. The Green Buildings Alliance is an environmental network constituting of the biggest real estate actors in Norway. The Norwegian Green Building Council (NGBC) is the publisher of BREEAM in Norway (BREEAM-NOR), by permission of BRE Global Ltd. (BREEAM no date). The purpose is to be an arena for big and active developers aiming for becoming more environmentally sound in their practices and thereof becoming more environmentally efficient. The network has a secretary to function as a center for information and competence for their members. The goal is that the participation in this network, the members will become the leading actors of environmental focus in the Norwegian building construction sector.

According to BRE Global (2013), since BREEAM was launched in 1990, over 15 000 buildings have been certified with BREEAM, and nearly half of these since 2008. Since the interdiction the use of BREEAM and similar building environmental assessment has increased considerably (Cole and Valdebenito, 2013)

Presentation of the BREEAM method

BREEAM is an environmental classification has sustainability as a goal and is applicable both to existing and new buildings. The methods for ranking are usually based on environmental status indicators and a chosen standard for environmental performance. The indicators are often displayed as a sum of points. The size of the maximal optainable sum of points and how these are weighted in the final indicator, varies. The methodology is based on LCA, but also share commonalities with the environmental management systems. Often it includes evalutions of energy use, water use, indoor climate, material usage and waste management.

The ranging methodology in BREEAM has three phases

1. Classification

inputs (resource use) and outputs (waste and emissions) adhere to different categories in accordance with the type of influence they have on the environment.

2. Characterization

The relative contribution from each input and output of each category are compared while the contributions are aggregaded in the categories of influence.

3. Evaluation

Weighting, where the svereness of each category are given a value in realtion to the other categories.

In the BREEAM classification scheme 10 factors are evaluated as shown in figure 15 (BREEAM-NOR, 2012).

Management • Commissioning • Construction site impacts • Security	**Waste** • Construction waste • Recycled aggregates • Recycling facilities
Health and Wellbeing • Daylight • Occupant thermal comfort • Acoustics • Indoor air and water quality • Lighting	**Pollution** • Refrigerant use and leakage • Flood risk • NO_x emissions • Watercourse pollution • External light and noise pollution
Energy • CO_2 emissions • Low or zero carbon technologies • Energy sub metering • Energy efficient building systems	**Land Use and Ecology** • Site selection • Protection of ecological features • Mitigation/enhancement of ecological value
Transport • Public transport network connectivity • Pedestrian and Cyclist facilities • Access to amenities • Travel plans and information	**Materials** • Embodied life cycle impact of materials • Materials re-use • Responsible sourcing • Robustness
Water • Water consumption • Leak detection • Water re-use and recycling	**Innovation** • Exemplary performance levels • Use of BREEAM Accredited Professionals • New technologies and building processes

Figure 15. Factors evaluated in the BREEAM classification

The technique for estimation used in BREEAM is by giving the building an actual score out of a maximum total score for each individual factor. See in Figure 16. (BREEAM-NOR, 2012)

BREEAM Section	Credits Achieved	Credits Available	% of Credits Achieved	Section Weighting	Section score
Management	7	10	70%	0.12	8.40%
Health & Wellbeing	11	14	79%	0.15	11.79 %
Energy	10	21	48%	0.19	9.05%
Transport	5	10	50%	0.08	4.00%
Water	4	6	67%	0.06	4.00%
Materials	6	12	50%	0.125	6.25%
Waste	3	7	43%	0.075	3.21%
Land Use & Ecology	4	10	40%	0.10	4.00%
Pollution	5	12	42%	0.10	4.17%
Innovation	1	10	10%	0.10	1%
Final BREEAM score					**55.87%**
BREEAM Rating					**VERY GOOD**

Minimum Standards for BREEAM 'Very Good' rating	Achieved?
Man 1 - Commissioning	✓
Hea 4 - High frequency lighting	✓
Hea 12 - Microbial contamination	✓
Ene 2 Sub-metering of substantial energy uses	✓
Wat 1 - Water consumption	✓
Wat 2 - Water meter	✓
LE 4 - Mitigating ecological impact	✓

Figur 16. Estimation of BREEAM score, example

The value given, or the score, will be weighted through application of a standard weighting mechanism. The weighted result will then be summed up to the BREEAM rating in accordance with a scale ranging from 0-100%. There will also be controlled wether individual factors fulfill the minimum standard for the given ranking. An example from the Figure 16, the building was classified to a end score of 55,87% and given the grade “very good”.

A lot of the purpose of the BREEAM system is to mobilize for a market driven mechanisms for improvements, in other words create a “market pull” towards better environmental solutions. This also involves that the politicians are left with the responsibility of top-down spending limits, while the market are left responsible for the detailed plans of how to make their operations more environmentally friendly, though, for instance, developing standards and motivate the user to apply these, while ensuring that the work done is if good quality.

Weighting of BREEAM example is shown in Figure 17(BREEAM-NOR, 2012) .

BREEAM Section	Weighting %	
	New builds, extensions and major refurbishments	Building fit out only (where applicable to scheme)
Management	12	13
Health & Wellbeing	15	17
Energy	19	21
Transport	8	9
Water	6	7
Materials	12.5	14
Waste	7.5	8
Land Use & Ecology	10	N/A
Pollution	10	11

Figure 17. Weighting of BREEAM, example

Ranging of BREEAM, Example is shown in Figure 18(BREEAM-NOR, 2012).

BREEAM Rating	% Score
Unclassified	< 30
Pass	≥ 30
Good	≥ 45
Very Good	≥ 55
Excellent	≥ 70
Outstanding*	≥ 85

Figure 18. Ranging of BREEAM, example

Challenges of BREEAM pointed to in research

Still, the research literature of the application of BREEAM is not abundant, but point to the challenges of the fuzziness of the understanding of sustainability. In general, research on building assessment methods in practice are few, and even less is written about the experience and understandings of the professional involved using the methods (Schweber 2013). Studies concerning the effect on BREEAM on the design and construction processes has just been started to be investigated by researchers, and most of these focus on the general effects (Schweber and Haroglu 2014). Schweber and Haroglu (2014) notes that there has been little systematic research on which effect the method of BREEAM has on the core building processes and practices.

A tool such as BREEAM must balance between different aims, especially that of being a comprehensive method against that of providing a attractive tool for the market that is practical and simple (Shweber 2013). . As a method it involves number of steps and numbers of performace scores on different categories as well as certification. Still, during the past 10 years it has both by BRE and policy makers been promoted as a tool for design(Schweber and Haroglu 2014). There has been little attention given to the people and processes responsible for using BREEAM as a tool, even in the UK where the tool is the best established method when it comes to both uptake and recognition (Schweber 2013).

"(…) the challenge is to disentangle the impact of BREEAM form the myriad of other processes at play in the production of a building" Schweber 2013:131)

The author poses the question wether BREEAM deserves to serve as a standard for green

building during the design and building process (Shweber 2013). Breeam is the assessment of buildings and building designs, not the project team or their efforts. Still, the project teams effort do matter since they are the ones conducting the assessment (Schweber and Haroglu 2014).

Generally, the literature on Breeam focuses on 3 effects (Schweber and Haroglu 2014) :

1). Methods of formal contracting

2). Coordination and communication¨

3). Previous experience with BREEAM.

The authors studying eight cases in accordance with how they fit in relation to the assessment process and the construction process, found that in the cases where BREEAM was present throughout the design and building process, previous experience with bream was the one that mattered (Schweber and Haroglu 2014) . Here previous experience with BREEAM was seen as part of the team´s experience with sustainable construction along with strong personal commitments. In this process, key individuals brought into the process their own set of sustainability goals that was defined independent of BREEAM. Still, BREEAM was only one of many different frameworks used to in guiding and implementing this approach to sustainable construction in these cases.

For cases where BREEAM was present at important points in time, but not continuously on the agenda, project experience mattered when it was applied in combination with ownership of the assessment method.

For the last group of cases where the assessment process had little effect on the everyday design and construction decisions, experience with BREEAM had weak impact.

One challenge may be, related to the assessment process, may be that "as construction professionals know and research has begun to show, the assessors does not own or implement the assessment process, at least not usually (Schweber and Harlough 2014:314)

"Sustainable professionals used BREEAM judiciously to develop and support their designs (along with a number of other frameworks), while less committed professionals tended to treat it purely as an assessment method (…) can be partly explained by the additional functions associated with a high-end BREEAM score. For sustainable professionals, targets such as Excellent and more recently Outstanding have the additional function of communicating green value to clients and thus delivering reputational value" (Schweber and Harlough 2014:315)

4.2 The joint CEN-CENELEC-ETSI coordination group on Smart Sustainable Cities and Communities

4.2.1 Background of the SSCC-CG

Recently, the European Union has started to emphasize that standardization organizations can play a role in contributing to the policy goals of the union. The European Commission and the High Level Group of the European Innovation Partnership (EIP) for Smart Cities and Communities gives special attention to the creation of sustainable cities in the Strategic implementation plan (SIP) of the European Innovation partnership on Smart Cities and Communities of 14th of October 2013, where cities will be an integral part of the sustainability targets and the EUs 20/20/20 energy and climate targets (European Commission 2013). Special focus areas of Smart Cities and Communities are energy use, distribution and production, transportation and mobility, as well as communication and information technologies. Also this involves connecting infrastructure assets in order to improve the efficiency and sustainability of cities.

Though, it recognizes that there are many more areas that are important for making cities sustainable, the main focus for now being energy. In the beginning of 2014 an Operational Plan will be launched in order to set the SIP into practice. In the SIP, actions are proposed to create 'Lighthouse project" for smart cities solutions; to apply new models for business and finance and public-private partnerships; to develop a platform for information infrastructure of common architectures for smart cities; that data should be made available the general public and the private sector; a common framework to be developed and share citizen insight between EU cities; that tools should be developed for enabling multi-stakeholder analysis for e.i. environmental assessments and performance; that information between cities should be shared by exchanging 100 persons form staffs of relevant industries and NGOs; and to implement a smart city planning and operation that is collaborative. Further, standardization has been made part of these activities, proposed to "Advance Smart City open standards through the CEN-CENELEC-ETSI Smart, Sustainable City coordination group in the form of a common technical committee to develop a common landscape and strategic programme for smart city standards" (European Commission 2013:4). Finally the SIP has proposed to "Agree a common Smart City indicator framework to help cities self-evaluate, monitor progress, and more reliably compare themselves with other cities and to provide certainty for long-term industry investments in innovation" (European Commission 2013:4).

The implementation plan is part of the means for meeting the EU' 20/20/20 climate goals, as stated in the overall goal of the SIP:

"This partnership strives at a triple bottom line gain for Europe: a significant improvement of citizens' quality of life, an increased competitiveness of Europe's industry and innovative SMEs together with a strong contribution to sustainability and the EU's 20/20/20 energy and climate targets. This will be achieved through the wide-reaching roll out of integrated, scalable, sustainable Smart City solutions – specifically in areas where energy production, distribution and use; mobility and transport; and information and communication technologies are intimately linked.

4.2.2 Introducing the SSCC-CG - Purpose and Goals

This chapter is concerned with the current work of the joint CEN-CENELEC-ETSI coordination group on Smart Sustainable Cities and Communities[1]. It will outline the main purposes of this work; especially it is interested in the forthcoming framework to be developed for standards within the scope of the SSCC-CG. The SSCC-CG is a coordination group made out of standardization bodies in Europe, CEN, CENELEC, and ETSI. *The purpose* of the SSCC-CG is to advise and coordinate the activities that encompass the topic of smart sustainable cities and communities within standardization. The coordination group themselves will not make a standard. The work of the coordination group will result in a roadmap and a list of recommendations for further work within this area.

A draft report form the second SSCC-CG meeting, states that *standardization has a rol*e in making cities smarter and sustainable (SSCC-CG, 2013a) . Still it is acknowledged that making cities and communities sustainable is an ambitious target. The initiatives are to be both smart and sustainable, which means that one is to consider this as a 'smart and sustainable systems of systems'. Standardization with such a target will need cooperation of standardization at three levels, where the National Standardization Bodies (NSBs) at the national level will identify the needs and priorities, and where a common EU strategy for smart cities will be made at European level through the alignment for CEN-CENELEC-ETSI strategies. On the international level the SSCC-CG will collaborate with ISO/IEC and ITU in order to avoid that the work will be duplicated and to gain benefits from a global perspectives. The SSCC-CG will also to be to becoming a platform to where Technical bodies (TCs) and Coordination and Strategic Advisory groups' needs and inputs are considered. Involvement of the current activities of the European Commission and of the relevant stakeholders will be the external interface of SSCC-CG.

As of the third of December 2013, the three European Standardization Organizations (ESOs) were invited to agree upon setting up a Joint Presidents´Group (JPG) of CEN/CENELEC/ETSI making the Coordination Group on Smart and Sustainable Cities and Communities (SSCC-CG) a CEN, CENELEC and ETSI collaboration (SSCC-CG, 2013b). This Collaboration, with approval of the groups final Terms of Reference (ToR) was officially approved, with proposed changes, on the groups plenary meeting on March 11th , 2014. According to the groups Revised Terms of Reference (ToR) of 3rd December 2013, the *status* of the group is described as follows:

" The SSCC-CG is a Coordination Group established to coordinate standardization activities and foster collaboration around standardization work. It will advise the CEN and CENELEC (technical) and ETSI Boards on standardization in the field of Smart and Sustainable Cites and Communities (..) The SSCC-CG is set up and reports directly to the CEN and CENELEC

[1] Because of ongoing work, with no finished standards published either by SSCC or ISO, the information provided here might differ from the final standards that are to be published on sustainable cities.

(Technical) and ETSI Boards" (ibid).

The *scope* of the SSCC-CG is to consider the needs for standardization on Smart and Sustainable cities and communities that is particularly within European interests (ibid). The group will see to that the SSCC-CG works will be consistent with current deliverables of ISO/IEC/ITU standardization on the international level. Further, the group will be given inputs from the European Commission, especially through the Smart Cities and Communities Innovation Partnership. Other relevant work of other standardization organizations in relation to smart and sustainable cities and communities will be considered. Though, the focus of the group is smart and sustainable cities and communities, the group might also consider interests and needs relating to resilient cities and communities standardization.

The work of the SSCC-CG

The Smart and Sustainable Cities and Communities Coordination Group (SSCC-CG) was established after a CEN-CENELEC workshop in 2012, as a result of interest in this topic (Standards Norway, 2013b) To work on this topic, the group established three Task Groups:

- TG 1 'Mapping of relevant International, European and national standardization initiatives';
- TG 2 'Mapping of stakeholders and interested parties in Europe', with the objective to define the categories of interested parties
- TG 3 'Mapping of topics and issues to be dealt with under the scope of the SSCC'

The SSCC-CG will according to the ToR coordinate three main tasks:

- Coordination of strategic and technical tasks, mobilization and support of stakeholders
- The deliverables, consisting of recommendation and follow up actions, and a road map presenting the outcome of the work done by the task groups
- Mapping of standardization initiatives (Task Group 1), mapping of stakeholders (Task Group 2) and mapping of topic and issues to be dealt with (Task Group 3).

The work of the SSCC-CG will result in a draft road map of the outcome of the tasks mentioned above with recommendation and actions to be followed up. And will also draft a recommendation for creating Technical Committee(s) in the future.

Technical group 1, will deal with mapping of the relevant International, European and national standardization initiatives. Four different standardization organs are contributing: BSI, SFEM, AFNOR, ICLEI, TC 268 and ETSI (Standards Norway, 2013b).

Technical group 2, responsible for mapping of stakeholder and interested parties in Europe, will define the categories of interests to be dealt with. The tasks will be to map the needs of the interested parties and to know what will need further examination. Local governments are important in this work. Participating are for the contribution submitted 20th of September 2013 are M. Muliquin (BSI), Eurocités (functionalities of the cities), ICLEI, DKE/DIN, AFNOR and the liaise with GCIF+EFA (European energy award).

The strategic coordination involves ensuring that existing standardization work is not duplicated and to ensure that existing national, European and international initiatives are complementary. The work of the SSCC-CG must also ensure technical coordination between standards activities. In order to involve relevant stakeholders in Europe, an Interested Parties Platform will be established. This is to create awareness of the benefits of standardization, to involve the relevant users and stakeholders in the standardization work, as well as to give the standardization process feedback and research inputs.
Members of the SSCC-CG are national standards organizations, interest partners associations, interested Technical Committees and others. These will act as advisers for the work done for smart sustainable cities and communities' standardization. In addition observers from international standardization (ISO, IEC and ITU) will participate.

Time frame for completion of these tasks is set to 30 June 2014, if possible, or at the end of 2014, unless it is advised that the group will need more time to complete its tasks. Four meetings have been decided:

- First meeting, Brussels 2013-06.11.
- Second meeting, Brussels, 2013-10-16.
- Third meeting, 2013-12-05
- Forth meeting, 2013-03-11

The first progress report of the SSCC-CG dated 16th of December 2013 gives an overview of the work to be done, the preliminary report structure (SSCC-CG, 2013e:3-7):

Introduction

- Deliverables mentioned in the Term of Reference

1.Susainable, smart cities and communities: General background, definition and European specifics'

> 1.1 The international institutional background for sustainable development; the meaning of cities, communities, smart, resilience and sustainable?
>
> 1.2 Form sustainable development to sustainable cities: European specifies and their place in EU strategy
>
> 1.3 CEN work with sustainable and smart cities
>
> 1.4 European innovation partnership of the European Commission and the work done by European Union for example with China.

2. Objectives of sustainable and smart cities and communities to be considered

> 2.1 the model for mapping, screening, initiatives and issues to be considered
>
> 2.2 Strengthen European business and level playing fields
>
> 2.3 strengthen attractiveness, livability and resilience
>
> 2.4 strengthen creativity and innovation

2.5 Strengthen population consensus, inclusivity (participation of all)

3. Stakeholders and interest parties involved in the development of smart and sustainable cities.

4. Ongoing major international initiatives and European ones

4.1 Categories of initiatives

- structure of documents

- means

5. Issues to be considered developing a set of European standards

4.2.3 The SSCC-CG's proposals for a future smart and sustainable city and communities standards framework

Background and purpose

Today, many different models and framework exists that relates to smart and sustainable cities and communities. Therefore, in a document of CEN ,"requirements of smart and sustainable city and communities standards framework", some requirement criteria are proposed in order to make a framework for smart city standards enabling the users of this framework to find the standards that enables them to realize smart city projects (CEN, 2013). Development of such a framework was also discussed in a SSCC-CG meeting of task group one and three on the 29th of November 2013. Now follows a description of the smart cities and communities standards framework including:

- The standards framework or model´s purpose and audience
- The scope – i.e. what interests areas the framework need to cover as well as the type of standards on what levels are relevant
- Criteria to use for mapping in order to make it applicable to the audience

The purpose and the audience of the Smart and Sustainable Cities and communities standards framework

The audiences of the standards framework model are the key stakeholders of the development of smart and sustainable cities and communities like city administrators and industry actors, and European and international standardization bodies. Firstly, the main purpose is to make a framework model that enables the end user of smart city standards to find the standards that they need. A smart sustainable cities and communities framework should make it easy for cities and industry actors to find the standards that are relevant to their activities, enabling implementation of a standardized approach to smart city initiatives. Making a framework where the different standards bodies work are classified in a logical and consistent way will better the ability to keep focus and consistency on a global level. Also such a framework will make it possible for the different standardization bodies to identify the standards that will need to be taken into account in the development of a new smart city standard, as well as identifying gaps in existing standards.

The requirements for a smart city standards framework

In order to make a smart cities standards framework or model consisting of the most useful standards for smart cities, the model will need to address and sort out many different issues.

The requirements for a smart city standards framework will need to consider issues relating to questions of what is meant by "city", "community", "smart cities" and "sustainable".

What is meant by "city" will need to consider what should be the core of the city, in relation to the area surround the city. Here a suggestion made in the "requirement for Smart City Standards framework" document, that one might want to consider including the urban surroundings, called the Functional Urban Area (FUA) "is because many major investments, and the potential value as a result of a 'smart' approach, affects infrastructure and services that go beyond core city boundaries" (CEN 2013:2). Further, it is suggested that also smaller cities can be important, since they can enable testing solutions that can be applied to cities of larger scales in and outside of Europe. On the meeting between TG1 and TG 2, the agreed definition of Smart City and Sustainable Community will consider the ISO/TC 268 'Sustainable development in communities' definitions.

On the first meeting of the SSCC-CG meeting, the group agreed: "on the concept of city/community it was agreed by the group that in order to stay operational and pragmatic, communities should be treated by exception linked to the territory" (CEN, 2013: 3). Communities of rural areas should be included only through considering how these impacts the city life. Still, it is recognized that many of the principles that apply to smart city standards, can be applied to rural communities, a further suggestion is that the relevance of smart city standards for rural communities can be treated separately. Yet another evaluation relating to understanding what is meant by "community", the document suggests that there is a possibility to consider a city as consisting of various communities. Lastly, considerations will need to be made about the relevance of inter-city matters should be part of the scope, that is the relation between cities.

The meaning of "smart cities" can be drawn from the communalities of the many definitions of the term, that smart cities are integrated, cross domain, and systems and ICT enabled:

"Integrated approaches across functions; between departments within organizations; as well as across the broader city stakeholder community

Cross-Domain"–extracting synergies between various infrastructures and services

ICT-enabled – exploiting the potential that emerges through better use of growing volumes of data and information; and the potential that new technologies offer"

The document suggests the following definition of smart cities (ibid):

"In general, a smart city can be considered as one where every person (as well as every device that helps manage life in the city such as traffic lights etc.) is provided with the information they need to make smart decisions about what they need to do now, and what plans they need to make for the future, in a way that enables the city as a whole to work as well". ¨

Drawing from this definition, the document suggests that infrastructure design and effective democratic systems might be considered (ibid).

- ”Infrastructure design that helps people easily navigate through the city and makes it easy for people to interact with other people who can help them achieve their goals”
- ”Effective democratic systems that make it easy for the city to find out what the citizen wants and for the citizen to find out what the city is planning”

Which of the smart cities characteristics that should be included in the final requirements for the Smart Cities Standards Framework, an evaluation of these should be made in relation to the scope of the framework .In relation to what is meant by sustainability, the document refers to the definition of ISO 26000 sustainable development and applies it to the context of Smart Cities as follows:

“In the context of Smart Cities this could be held to mean that all actors in the city are provided with data and information that allows them to make good decisions about the present without compromising the future life of the city. In other words, it can be taken as a further clarification to the definition of Smart City” (CEN, 2013:4).

Still, the document points to the need to evaluate whether this definition is sufficient enough, or if it needs to give more emphasis on the aspect of sustainability. Coordination of the standardization work among the different European Standards bodies on smart sustainable cities and communities might have slightly different definitions. Additionally, the future framework should be flexible to include different conceptions and agendas. It will also need to consider the levels and types of standards that are needed in the development of a smart city.

Levels and types of standards in developing a smart city

Types and levels of standards needed to address the issues mentioned above, the document suggests that the framework will need to address good practice and standards on the three levels: strategic, process and technical levels. Different standards and guides are made to meet different needs. Since a smart city is characterized by rapid changes, rather than the case of stable markets where detailed standards can be made for products and services, it is suggested that standards might need to be made based on current best practices and will need to be revised and updated in accordance with changes and learning that will occur. Some changes might be context specific, not relevant across different cities, so that there should be support of experience exchange of good practices within the framework. The document suggests that the common needs of cities “can best be addressed by a portfolio of strategic, process or technical standards and guides and various levels”. When it comes to the city-specific needs, of the individual city, the document suggests that these “are perhaps best addressed through knowledge and experience sharing and the provision of a library of good practice examples” (CEN, 2013:5).

The smart city framework should make it easy for the users to find the standards that are relevant to what they are doing. Standards should in this framework be mapped in such a way

that the key characteristics of the potential smart city initiatives are evident. Users of the standards' framework then can find the standards they can use by looking to such key characteristics. The document suggests some criteria to be used in creation of the smart city standards framework (CEN, 2013: 6):

""

- The domains that are involved – eg health, transport, energy, etc
- The infrastructure systems that are involved – eg roads, buildings, electricity distribution systems, telecommunications systems etc
- The scale – building, block, neighbourhood, district, core city, wider metro area
- ICT aspects - hardware, software, platform, data, data integration, data management, data security
- The type of stakeholders that are involved in implementing the particular smart city initiative – citizen, mayor and other strategic decision makers, manager, public sector, private sector
- The type of stakeholders that are the intended beneficiaries of that initiative - citizen, mayor and other strategic decision makers, manager, public sector, private sector
- The stage of the project – scoping out, planning, implementation
- The level of guidance needed – strategic, process or technical
- The type of guidance needed – guide, specification etc""

Technical group 1 and 3, have been meeting to agree upon steps needed to be taken in developing a future model to be used in order to map existing and future required standards and how this work should be carried out to be ready for the meeting of SSCC-CG on March 11th 2014 (SSCC-CG, 2013c). In this process, the groups will agree upon the requirements for such a model/framework and its criteria. The requirements for this model discussed were

- That it should facilitate the potential end user (the target audience) of Smart Cities' standards
- That it should enable the coordination of national/European initiatives so that any inconsistencies are avoided
- That it should make it possible for NBS's to identify the scope and gaps
- It should allow that those existing standards needed to be accounted for are identified when developing a smart city

This model, called the "architectural model for smart cities" are potentially targeted both at the end-users as well as the different standardization organizations (NBS's), the SSCC-CG, the mayors of smart cities (SSCC-CG, 2013d). At the time when this paper is in the writing, the final purpose and use of such a model is still under discussion. Though, the meeting aimed at agreeing upon the steps to be taken in order to make such a model, it has been suggested that such a model can function as a global management system approach, a framework that will mapping, identify focus areas and for the selection of measurement tools. Further, it has been suggested that it should be an open model that enables it to be developed in accordance with the working process. Stakeholders should be part of this development process in order to meet users' needs and requests from the market.

Deliverables, prepared by the groups before the forth SSCC-CG meeting

TG2: mapping of stakeholders, meeting 16th January in Paris.

In their meeting they pointed to that TG1 and TG3 groups merged (SSCC-CG, 2014a). They have been working on an architecture model for the mapping and they have planned to meet in the 28th-29th of January for the continuation of this issue.

- Experience from other initiatives
    - The European Energy Awards
    - The convenant of mayors

In the mapping EEA and Concentant of mayors are mentioned. The EEA I quite big in Europe, 1200 cities are participating. The convenant of mayors have developed a Sustainable Energy Action Plan (SEAP). In the report from the meeting it is mentioned that "The EEA could also be used as a reporting tool for the Sustainable Energy Action Plan (SEAP)(..)"(SSCC-CG, 2014a: 5) Mapping of stakeholders (preliminary as of 16th January), stating that the involved interested parties should be (SSCC-CG, 2014a):

Involved in a decision making process :

• European Union

• National governments, state authorities and bodies

• Regional and local governments and related public authorities

• Municipalities and communities management and associations representing them

• Municipal council

Lots of "decision makers", a top management should probably be defined.

- Public and private developers, promoters, traders
- Investors
- Industry
- Municipal service operators
- Public interest groups
- Residents (as individuals and represented by associations), trade, consumers or other types of associations
- Inhabitant
- Banks and international Financial institutions (IFI)
- Insurer

Minutes from the TG1/Tg3 workshop (28-29 January 2014 Brussels) went through the FIDIC/EFCA white paper for an holistic approach to urban development through cooperation, systems and synergies (sept 2013) and "a practical road map towards sustainable settlements, WWF/Lafarge (Nov 2013). The aim of the meeting was to discuss the stated need for a model, or framework as reference architecture for smart city standards (SSCC-CG, 2014b).

"The aim of this workshop is develop a first draft of a conceptual reference model for Smart and Sustainable Cities and Communities, providing us with a common language to talk about standards for Smart Cities"(ibid).

The need and the function of the model were stated as follows (SSCC-CG, 2014b: 2):

"A model is needed:

1. To make it easier for people implementing smart city projects to find useful standards that already exist and identify more precisely what other standards they need

2. To allow standards bodies to identify the precise scope of the gaps where further standards work is needed

3. To help in the co-ordination of global smart city standards work, in order to ensure greater consistency and the ability to better focus effort

4. This model will have two functions: to classify smart city standards in a useful way and to display those classifications in a way that it makes it easy to see how different standards fit together and to show other standards that might be relevant".

During the TG1/TG3 workshop a framework model was discussed in order to get an overview of the context the SSCC-CG will need to take into account in the development of a future framework for smart sustainable cities and communities. During this meeting definitions of smart cities and communities, city systems and infrastructure was proposed (SSCC-CG, 2014c: 1-3):

""Smart City" – no agreed upon definition, but will involve:

- Each of the individual city systems will be exploiting the best and most appropriate technologies and best practices to enable them to function effectively
- These individual systems also will be increasingly well integrated and working together effectively so that they can deliver seamlessly on the common purposes that the City stakeholders have agreed on. This integration will be supported by technology, most importantly by communications technologies, but also potentially by other forms of technology. However, the foundation will be integration on an organizational and management systems level.
- Both the individual city systems, as well as the city as a whole, will be exploiting the potential of big data effectively. This means finding ways to increase the amount of useful data generated and ways to provide that data in the appropriate format to every person or technology system that can use it effectively to help the city as a whole work better

Clearly, while technology is an enabler here, it is part of a wider picture that relates to the strategic, business and communications issues within the city and so for a city to move towards becoming smarter, all of these different levels need to be tackled together.

The term: "Smart and Sustainable" is used to make it clear that this is an holistic approach, rather than simply a technical one. While technology is a key enabler for Smart Cities, it is

only an enabler. The implementation of smart city products and services requires not just technological developments, but also the integration of city strategies, business process and communications, around clear and sustainable purposes for the city that are owned by key stakeholders.

The phrase: "Cities and Communities" is used, rather than just "Cities", because "Cities" is not a clearly defined term and is used in different countries to describe different ranges of size of urban area.

By "city systems" is meant the systems that enable the city to function, such as energy, mobility, security, education, health, water and sewerage, city governance and so on, as well as, most importantly, citizen involvement/action.

"Infrastructures" are the (largely) physical networks and structures that are used by these systems and include; communications infrastructure, both wired and wireless, sensor networks, roads, buildings, electricity and gas distribution networks, water and sewerage infrastructures, district heating, and so on**"**.

"A Smart and Sustainable City or Community can be understood as one where the city systems and stakeholders are working together seamlessly and effectively to meet the key objectives that the city or community has set itself"(SSCC-CG, 2014c: 2).

"The Smart and Sustainable Cities and Communities proposition is that the more interoperable and integrated city systems are, the more easily will the city or community be able to achieve its long term aims. This, in turn, requires the planning and building of smart and sustainable infrastructure to support the integration of these systems and thus enable a wide range of effective solutions to deliver on those objectives" (SSCC-CG, 2014c: 3).

Further, the paper points to why standards are important: the value of standards, their role and classifying standards.

"The key value of standards is the consistency in requirements it will provide. Well-drafted standards support the development of common models, thus allowing industry to develop quality solutions quickly and economically" (ibid)

The role of standards in helping a city or community in becoming smarter and more sustainable (SSCC-CG, 2014c: 3-4):

" 1. Provide best practice guidance and toolkits to help city leadership understand the various ways in which city systems could be integrated together to deliver on their objectives, and help with evaluating the best options for their city

2. Underpin useful metrics that would enable progress towards those objectives to be measured

3. Help solve issues that impede the effective integration and interoperability of city systems to deliver on those objectives

4.Enable cities to procure smart city products and services using common and consistent criteria and requirements, and therefore make it easier for those products and services to be more commoditized,

thus bringing down costs and reducing risk ”

4.3 Sustainable city development in Norway – the Framtidens Byer initiative

Framtidens Byer is a cooperation program between 13 municipalities, business and the state in order to develop city areas with the lowest level of ghg emissions as possible as well as to provide for a good city environment (Framtidens Byer, 2011). Framtidens Byer originate from Klimaforliket at Stortinget. Klimaforliket involves a political agreement on reducing the ghg-emission in Norway between 16-17 million tons CO2-equivalents before 2020. The program can be categorized as a network model for cooperation and knowledge and experience sharing. It is assumed that this will yield added value through developing new perspectives and solutions that are beneficial for all the involved parties (Rambøll, 2013).

This chapter is concerned with describing the background of the program, its aims and involved parties as well as how it has been able to meet its initial goals thus far.

4.3.1 Background of Framtidens byer

- NOU 2006:18; elaboration/estimations on greenhouse gas emissions and possible counter measures *Et klimavennlig Norge* (Miljøverndepartementet, 2006). A commission on low emissions (Lavutslippsutvalget) followed up this paper in St.meld.nr 34 (2006-2007) on Norwegian climate policy (Norsk klimapolitikk), form June 2007.
- The St.Meld.nr. 34, made the foundation for the “klimaforliket” at Stortinget in January 2008 where all political parties, except Fremskrittspartiet, made the groundwork for a cross-party collaboration to reduce ghg emissions.
- The Norwegian goal was to cut the global emissions of ghg with 30-40% of Norway’s emissions of 1990 level. According to the “Klimaforliket”, Norway is to reduce the ghg emissions by 15.17 million tonnes CO2-equivalents compared to the point of reference in the national budget for 2007, when forest are accounted for.
- In the white paper nr 34 (79-85), the government (Regjeringen) proposed a number of measures within the different governmental sector and at the municipal level for limiting the ghg emissions.
- At the municipal level, it was stated on page 142 of the st.meld. 34 (2006-2007) that they were to establish a program for “Framtidens byer”. The biggest cities were invited to initiate a cooperation to agree on measures needed to be put through. The government suggested that an efficient area and transport policy alone could reduce the emissions from transport with 12-13% through concentration, good public transportation capacity, more use of bicycles as well as to reduce the car traffic.
- At this time, it was acknowledged that the current policies were not enough in order for the government to reach its climate goals. A decision was made to set up a group called Klimakur 2020 in 2008.

- White paper nr 26 (2006-2007) *Regjeringens miljøpolitikk og rikets miljøtilstand* points to the importance of area and transportation policy's importance in regard to the environment of the cities.

The Framtidens Byer cooperation agreement

The cooperation agreement between the State, KS and the municipalities, signed 19th of May 2009 in Oslo, agrees on cooperation is how they will meet these goals (Kommunal og regionaldepartementet, 2104). The outcome of the cooperation in Framtidens Byer should yield results that are measureable as well as to show practical examples useful to other cities as well as policy development on all levels. At the same time, Framtidens Byer initiated a intention agreement (intensjonsavtale) between the State, KS and representatives from business stating that it is important to involve the private sector in order to meet the goals of Framtidens Byer. Better cooperation between the public and private sector was stated as a need, where the state will contribute to good framework conditions for the private sector to invest in sustainable and innovative solutions. According to this agreement, business want to contribute to reduction in ghg-emissions, develop a greener economy and thereby strengthen its own competitiveness (ibid).

Parties signed up for Framtidens byer are (Ramøll 2013):

- 13 cities or city areas (Bergen, Bærum, Drammen, Drammen, Fredrikstad, Kristiansand, Oslo, Porsgrunn, Sandnes, Sarpsborg, Skien, Stavanger, Tromsø, Trondheim)
- Finansnæringens fellesorganisasjon
- KS
- Kommunal- og regionaldepartementet
- Klima- og miljødepartementet
- NHO
- Olje- og energidepartementet

Framtidens Byer is lead by the minister of environment and development through a summit consisting of the political leaders of the cities, KS, the departments and trade(business) organizations

4.3.2 Goals and strategies of Framtidens Byer

The three overall goals

- To reduce greenhouse gas emissions
- To improve the city environment
- To better the climate change adaptability of the cities

The main goal is to reduce the total ghg emissions from road transport, stationary energy use in buildings, consumption and waste in the city area, and at the same time develop strategies

to meet future climate change (resilience/ climate adaption). Also to create a good city environment is one of the main goals. Framtidens Byer is divided into four areas with specific priority areas. The four areas of emphasis are in accordance with this cooperation agreement (Kommunal og Regionaldepartementet, 2014):

> **“** 1 Land use and transport:
> - Develop a land use and a localization pattern that reduces land use and transportation needs and facilitate sustainable transportation .
> - Enhance public transit, bicycle use, walking and accessibility and encourage more efficient freight transport and good common solutions .
> - Strengthen the use of measures that restrict car use .
> - Strengthen coordination and cooperation on land use and transport measures for the entire functional , regional city-area or establish such cooperation where this does not exist.
> - Integrate the work of land use and transport measures within the Framtiden byer with ongoing or planned city-packages for transport , environment and urban development.
>
> 2 Stationary energy use in buildings:
> - Help to reduce energy consumption in existing and new residential buildings , commercial and public buildings through energy efficiency and energy conversion , better construction and insulation solutions etc.
> - Help to develop and deploy low-emission and zero-emission solutions for new construction .
> - Increase the use of renewable energy sources , utilizing waste heat energy recovery and developing district heating plants, with a view to phasing out fossil fuels .
>
> 3 consumption patterns and waste:
> - Buy goods and services that provide low greenhouse gas emissions. This will also help increase manufacturers and suppliers responsibility.
> - Contribute towards that publicly owned enterprises , industry and population through procurement, operation and consumption, helps reduce greenhouse gas emissions.
> - Reduce waste through changes in consumption patterns , reuse , improved waste sorting , recycling and improved material and energy .
>
> 4 Adapting to climate change:
> - Make arrangements for a society that reduces vulnerability to the effects caused by long-term climate changes and periods of extreme weather.
> - Work to ensure that climate change integrated into land management and projects for infrastructure , industry , environment and urban development.
> - Implement climate change adaptation measures within the framework of sustainable development
> - Help develop methods and tools to implement climate change adaptation strategies in the municipality and the region.
> - Help develop new initiatives and solutions to adapt to climate change**”**.

The four areas mentioned above are dealt with in four respective networks. These networks meet several times a year and are lead by the responsible department:

- Cooperation on the governmental level. The Miljøverndepartementet is the main responsible body of the program. The Samferdselsdepartementet is responsible for area (areal) and transport and the Oil and energy department responsible for the stationary use of energy in buildings (toghether with contributions from Kommunal and regionaldepartementet). In addition, exsternal governmental agencies like Miljødirektoratet (former Klif), Enova, Direktoratet for samfunssikkerhet og beredskap (DSB) and Vegdirektoratet.
- The agreement between the state and 13 city municipalities encompassing four areas should also include regional agencies and private companies since this is rendered reasonable and necessary.
- In addition to these four areas, emphasis on contributing to better city environment is done through cooperation between the four individual networks.
- The state and the municipality should all have their own environmental perspectives in their procurement policies, operations and localization of own activities.

In addition to these responsible departments, a professional coordinator for each focus network have been appointed for following up projects and tasks of focus that are emphasized in each network.

This cooperation between the networks is intended to making the contributing parties better able to accommodate issues of climate-and city environment through *enhanced execution* and *improved cooperation* (Rambøll 2013). Knowledge development, more focus on climate and environmental issues and economical support is intended to enable the enhanced execution of the program activities.
The program/project of Framtidens Byer is small, with a yearly budget of 30-35 million Norwegian Kroners. This covers participation in some projects, contributions of the consultants, seminars and meetings.
All of the cities developed action plans (fall 2008-2009). Some made an independent plan while others made the new plans part of old plans of their (existing) climate en energyplan. The challenges for the municipalities is big part due to restricted economical means.

4.3.3 Evaluation of the Framtidens Byer initiative

Miljøverndepartementet has given the consultancy company Rambøll the task to make annual reports on the progress of Brøset project (Kommunal og moderniseringsdepartementet, 2011). These study reports of issued 2011-2013, aims at:

- How the program has developed during the past year.
- Framtidens Byer's goal achievements – To what extent the programme contributes in making the cities more climate friendly and whether they enhance the climate change adaptability, or whether they contribute to enhanced physical city environment.
- The inheritance after Framtidens Byer – what the heritage of Framtidens Byer after the ending of the program in 2014, and what needs to be in place for this to be realized in the greatest possible extent?

Framtidens Byer development during the past year

Rambøll points the following development characteristics that enhance the programs impact between 2012-2013 (Rambøll, 2013). Framtidens Byer developed an example database with the purpose to be used as a tool for spreading knowledge of good examples, as well as knowledge and enthusiasm of good means and work areas. Last part of the program will need to make good grounds for this to function as a tool for actors outside the Framtidens Byer network. Compared to the previous two years, the network of Framtidens Byer have had more focus on knowledge to be used in practice, for instance the spread of knowledge in regards to applicable tools and instruments for analyses. The program has become more strengthened in the sense that it has become more known outside the participating parties of the program. The report also points to that the professional networks among the participants are gaining momentum, where the participants are in contact outside the events and meetings of Framtidens Byer. Since 2012 area projects have started to be developed, where two projects have been approved as pilot projects of framtidens bygg. In june 2013 a new national transport plan was adopted with emphasis on transportation taking a more environmentally friendly direction, which has been one of the focus areas of Framtidens Byer.

Goal achievements

Rambøll's (2013) evaluation of the goal achievements of Framtides Byer states that Framtidens Byer must be viewed as one of many means for reaching national goal of reducing climate emissions. The goal of achieving a better city environment and to better adapt to climate change of cities as well as the reduction of climate emissions will first be evident after the program of Framtidens Byer has ended. To identify indicators to measure the development in accordance with the goals is thereby challenging. In addition, the lack of the existence of indicators on a national level does not allow direct connection with Framtidens Byer goal areas. The evaluation made by Rambøll, thereby, was concerned with evaluating how or if Framtidens Byer contribute towards meeting the overall national goals of ghg reduction relative to what can be expected due to the specific boundaries and scope of the initiative. This evaluation was done through considereing how cooperation together with achievement ability together contributes to making the involved actors able to (meeting the overall goals of) reduce ghg-emissions, to improve the city environment, and to better the adaption to climate change. The report (Rambøll, 2013) describes the overall ability of the program in meeting the overall goals. It states that in 2012 Framtidens Byer has contributed to better cooperation and achievement ability. The main contributor to this has been the increase of knowledge and engagement of the actors. That "kommunene" get financial support from the state is seen as important since it enables the use of resources directed towards climate- and city-environment – work. Additionally to program makes the parties more committed and focused, through this does not seem to influence the local politicians to a great degree when it comes to economic priorities. Further, internally in "kommunene", the initiative contributes to more cooperation. The initiative has contributed on a state-level specifically for the development of a new national transportation plan.

Still the Rambøll study points to some areas of improvements. The first is that the cooperation between public (kommunene) and the private sector could have been better. In addition,

feedback from some of the actors pointed to that the initiative has not contributed to development of specific cooperation projects between the cities. At the same time, representatives from the cities point to that they initially, in the start of the initiative had a hope for more concrete emphasis form the politicians at the state-level, something they experience have not taken place.

The inheritance after Framtidens byer

The program has from the start have focus on developing indicators to be used as tools in climate and city-environment work, a process that is still ongoing. Rambøll points to that finalizing these will be an important contributor of the program. The program have also contributed to a discussion of specific tools for the cities to use. Mentioned are the cooperation tool Business Improvement District (BID), the planning-tool "Grønn arealfaktor", and "Nudging"-tools. Experience from these discussion might be an advantage also after the Framtidens byer program is finished. The Framtidens byer have also contributed to political tools that will be useful after the program. Mentioned are the national transport plan and NOU about climate adaptability.

4.5 Brøset

Trondheim Kommune and the Ministry of Environment (Miljøverndepartementet) made Brøset part of the Framtidens Byer cooperation program on the 19th of May 2009 (Trondheim Kommune 2010a). The main goal was to reduce the total climate gas emissions from road transport, stationary energy use, consumption and waste while at the same time develop future strategies for meeting the challenges of climate change. Sub goals were to enhance the physical living environment related to ecological circulation, safety, health, experience, and business development. The wanted intention was to work towards the realization of an integrated and future-oriented development that encompasses all four focus areas of Framtidens byer. The ambition is to make Brøset a climate neutral urban area.

Main goals of Brøset are as follows (Trondheim kommune 2010a:9)

- "Reduction of climate gas emissions by 60-90% compared to current emissions from other city areas
- Develop an ecological sustainable city environment with high architectural quality. A good place to live
- Optimization of program – dense building mass with quality, functions and costs – in order to ensure a good and fundamental social economics
- To provide for processes that involve the population and that ensures desired development over time".

Instead of traditional competition for city plan program, a parallel mission was decided on (Trondheim kommune 2010a). Here the different actors were to make a plan for the area through an experience exchange process along the way. This way the individual processes can be amended along the way, and thereby seek to increase the knowledge decision base. In

addition, no winners should be appointed, but rather the different solutions should be used as input to the final single Brøset area plan. This approach, the parallel mission, intended to achieve well-grounded visualized solutions and ideas. In this approach the understanding of process that contributed to meet the teams envisioned ideas for the area. Through such a process, the goal was to contribute to skills development among the employees of the municipality, the teams and the land owner. When the parallel mission was complete, the answers drawn from this report were to make the foundational starting point when the final political decisional area plan for Brøset (ibid) in addition an evaluation of the climate gas emissions of the individual suggested area plans. The initial plan program developed by Trondheim Kommune (dated 11th march 2010) was to be taken into account during the parallel mission.The proposed area plan for Brøset was made public inspection on the 26th of June 2012. The area plan for Brøset was adopted on the 13th of June 2013 by the city council (Trondheim Kommune, 2013a). The plan is further described in the document *Brøset area plan – plan description* (my translation) (Tronheim Kommune, 2013b)

4.5.1 Background

The plan program of Brøst (Trondheim Kommune, 2010b) points to the struggle of the international society in reaching a vision of climate neutrality, and that this should be something to be pursued on a local level. " in a future oriented planning, in a cooperation with the research environment in Trondheim, Trondheim municipality wishes to develop 350 decare area of Brøset in order to contribute to national goals of reducing climate gas emissions" (ibid). The plan states its alignments to the four priority areas of Framtidens byer; area use and transport, energy use in buildings, consumption patterns and waste and climate change adaption. Good living conditions, making it easy for the inhabitants to choose environmentally friendly lifestyle are key areas of the Brøset program. Trondheim municipality cooperates with NTNU/SINTEF in a research project connected to the new urban area development on Brøset called "Towards carbon neutral settlements. Process, concept development and implementation". The aim is to uncover the climate challenge of every stage of the planning, construction and the use phase of Brøset, and to develop tools for the implementation of climate goals in a holistic way. Already in October 2008, the research team discussed the problems related to the definition and understanding of what carbon neutrality actually involves since this is such a new area of research. Further how carbon neutrality can or should be measured was in focus as well as which new opportunities that carbon neutrality might give in relation to planning. Making goals both measurable and achievable was perceived by the research group as a challenge (ibid)
Initially the purpose of the planning of the Brøset urban area was described as follows:

"At Brøset area, Trondheim municipality will plan and develop a comprehensive and progressive district. Through dialogue with the city's research institutions, local residents and businesses should be taken to ensure that Brøset can be developed into a new futuristic eco-district, with low energy and healthy building materials. This assumes that targets will be set in order to go beyond those of regulations. The development will also ensure good and varied housing quality with a dense residential development with a variety of living arrangements and housing types, which also includes

affordable housing . The planning and development of Brøset area to form the learning base for future urban development in Trondheim" (Trondheim Kommune 2010b: 7).

Vision of Brøset

In the plan program of Brøset (Tronheim Kommune 2010b:12) the following vision was proposed: "Brøset – a future oriented and attractive urban area. A climate neutral urban area with less than 3 tonns CO2-emmissions per capita per year". In comparison, the typical Norwegian carbon footprint per person compromises approximately 8-11 tons CO2-equivalents per year. Making Brøset a climate neutral urban area will involve to reduce the CO2 emission by 70-90% compared to conventional city planning projects. This is pointed out to be the main focus of the plan program, but also to reveal potential gains and qualities this will contribute to a good living and city environment (Trondheim Kommune, 2010b). Further, as part of the vision of Brøset, the plan program states:
"New technological and social perspective on energy- and resource use shall create new way of life and living. Brøset shall become an exhibition of climate neutral city development in Norway and an engine in the country's climate neutral city areas" (Trondheim Kommune, 2010b 12).

4.5.2 Goals of Brøset

In order to achieve the vision of becoming climate neutral with a good city environment, the following focus areas are basis for the specific goals of Brøset (Trondheim Kommune, 2010b:13):

" • Good housing and neighborhood environment
- Architectural quality of the overall plan to detail
- Varied living arrangements will facilitate a diverse and inclusive neighborhood
- Existing cultural interacting with new outdoor space will invite to stay and promoting activity, health and
  well-being
- Attractive service offers, cultural and recreational opportunities
- Healthy and environmentally-friendly materials
- Optimization of program features and costs shall ensure Economics
• Area and transport
- High and environmentally friendly land use
- Attractive public transport , walking and cycling routes
- Physical solutions that make it easy and inspiring to live without a car
• Energy use in buildings
- A pilot project for energy efficient buildings
- Future-oriented and energy -efficient solutions for the buildings infrastructure
- Climate-friendly energy supply
• Waste and Consumption
- Focus on lower consumption
- Environmentally friendly waste
- Physical design that facilitates and inspires a climate- friendly lifestyle
• Adapting to climate change
- Buildings , infrastructure and conservatories tailored to future climate change
- Particular focus on storm-water management"

In order to meet these overall goals, concrete and measureable indicators shall be developed. In cases where different goal areas are in conflict, goal conflict matrices shall uncover whether the goals are mutually enhancing or whether they are in conflict. Climate gas accounting should be used to show probable climate emissions in CO2-equivalences of future inhabitants. The impact of Brøset on surrounding area should also be accounted for. Has specific focus on the well-being and quality of life of the inhabitants that are to live in the city area. Making people consume less, less/no car use and more use of bikes and walking are pointed to as aims. Making people consume less is one of the biggest challenges with no easy answers.

5. Discussion

The elaboration in Chapter three has in addition to understanding general issues of sustainability, measurements and sustainable city initiatives, have been concerned with how to enable the making of an understanding of how objectification can be seen as part of knowledge production that is traceable in both the standard creation process as well as in how we plan for sustainable city development. More specifically, it attempted to explore if there do exist connection between the development of standards and indicators that enables the assessment of abstract concepts and systems that is enabled by an objectification process. For understanding these connections, models based on systems thinking have been developed throughout chapter three. This conceptual knowledge system will be used in this discussion chapter.

This discussion will try to gather the most important information derived from the theoretical chapter 3. Additionally, the presentation from chapter three will be used in order shed some light on the case examples of chapter 4.

As presented, chapter three was concerned about building the theoretical foundation for the purpose of general understanding of sustainable cities and to create a frame of understanding through applying systems thinking creating a system for perceiving the development and assessment of the sustainability of man-made systems. Further it introduced an understanding of the process of objectification that is both related to knowledge production and as part of standards making possible the perception of our surroundings through classification of knowledge into meaningful entities. This elaboration presented was then being applied in a discussion of objectification in relation to the sustainable city system. Ending chapter three was a presentation of the research literature on issues related to sustainable city initiatives.

To address general issues of sustainable city planning

In chapter three, research littereature points to the need of new types of govenance as a need for a sustainable city development (Bukeley and Bestill 2005, Fitzgerald and Motta 2012), Joss 2013, McGrew 2005). As a the Brundtland report was a criticism of current societal practices or policies, it was also a criticism of governance. In decision making and management, tools for steering, monitoring and evaluations are needed in order to steer towards an overall goal of sustainability. As pointed to in chapter three, this is challenging due to the definition of sustainability used, often the one of the Brundtland report is broad, and will need to be made more specific in order to enable practices with the aim of sustainability. Such a broad definition of sustainability in itself does not directly inform policy.

As there is no agreed upon definition of sustainability, sustainable city, no agreed upon indicators, standards or framework for monitoring, steering and controlling such development, the call for a discourse among researchers, professionals, politicians and others who seek to make sustainability in practice, like pointed to be researchers, is necessary if we intend to make society more sustainable. Climate change, is one example of a “proven fact”, that is

currently been made as the national and international policy goals of reduce ghg emissions. We do not experience political policies to a great extent that aim to reduce the general consumption level of citizens. We may make the connection that how far policies go, will be based on "facts" drawn from research. Thereby we might want to question the links between science/research and decisions and for the decisions to be democratically viable, we might want to question if this process of making decisions on behalf of all people in society, should be a process that engages the overall society in this discussion. As Davidson and Venning (2011) points to, those engaging stakeholders in the process of clarifying sustainability criteria may contribute to a feeling of ownership and empowerment that will enable action. Still, there is a need for such an involvement to be perceived as relevant, accessible and understandable (Joss, 2013).

Standards aiming at sustainable city development – form individual understandings and measurements to common understandings: a process of objectification

The chapter three was concerned with pointing to the process of making a standard, some standards aiming at sustainability in the construction industry and the forthcoming standard for sustainability of cities and communities. Additionally, chapter three pointed to the understanding of the objectification process, understood through the cycle of accumulation, can be applied to all processes of planning for a city; the planning itself, the civil engineering process or even in order to understand governance. A contribution of such an endeavor is to understand that the knowledge behind decisions, or any proven fact, is negotiated in across time and space, may it take a form of the general discourse of sustainable development in society, or as part of the process of making a standard by involving experts and key stakeholders for developing a standard behind closed doors. The process of making a standard is closed to the general public, as the reader easily know when viewing the websites of the standards organizations. What standards that get to be the dominating standard in a specific field, is not evident (Bowker and Star, 1999). A standard for sustainable city development will soon (2016) be released. We remember Bernard Leservoir point to why such a standard was to be developed. He pointed to the lack of cooperation across the various fields in society, dealing with sustainability in such a way that may not fully allow the meeting of overall societal goals for sustainability. Further he pointed to the need of more cooperation is seen as order to plan for a sustainable society, since this will need the involvement of the separate departments in such a way that enables them to deal with sustainable development more holistically than is typically done today. Standards for sustainability of buildings does already exist, so initially there was an assumption that if many actors start to apply such standard, the result would be a more sustainable city. But Leservoir pointed to that this has not been the case, and pointed to the need of more cooperation and integration across different sectors in society. How particularly such integration and cooperation should work and how standards may fit or may contribute to such cooperation and integration is not clear, however. To know something about such complex connections of information, one will need to know what types of classification of information standards may be, and further how this may relate to the overall production of knowledge. This can be viewed as part of an objectification process.

Such an investigation, may point to aspects that can reveal whether future standards for the development of sustainable cities and communities will work or not when it comes to classification of information as part of a way of making sense of complex knowledge, that is form different scientific disciplines and professions that are all needed to contribute to fully understand the issues involved in making society sustainable. This can be made clearer by applying systems thinking and systems theory. The point to be made here is to contributing to an understanding that Standards can be perceived as a way of ordering or classifying information or knowledge that may be done through a systems thinking approach.

Thereby one can make the connection that standards can be understood as a way of classifying the world. Classifying the world may also generally be seen in relation to systems and systems thinking. Systems thinking, classifications and standards can also be seen in relation to objectification. As we remember objectification as a process involves making something random and disconnected into something orderly and common or agreed upon. Such a process can be related both to the production of knowledge in society by researchers in their networks building understandings of "facts" or what is to be perceived as true in a context, through applying their preferred methods that are pertinent to their research field. Objectification can also be connected to cognition, that is what we through our own reasoning make rational and thereby establishing our own perceived truth as opposed to what is seem to be wrong or false in a given context. So how then does that relate to standards development and planning for sustainable city development? The point that is trying to be made here is that, the categories that are established, e.g. sustainable society as opposed to unsustainable society, has to do with what is perceived as right and just. Such a perception is built on our understanding of facts. Returning to Latour, facts in relation to categories like knowledge as opposed to belief, will need to make thorough elaboration in order to make such a conclusion that some type of conclusion of a process of reasoning does not hold. According to Latour we need to study what is tied to the claims.

Now follows an elaboration of how an IE systems thinking approach to sustainable city development may contribute to sustainable outcomes.

How an IE systems thinking approach to sustainable city development may contribute to sustainable outcomes

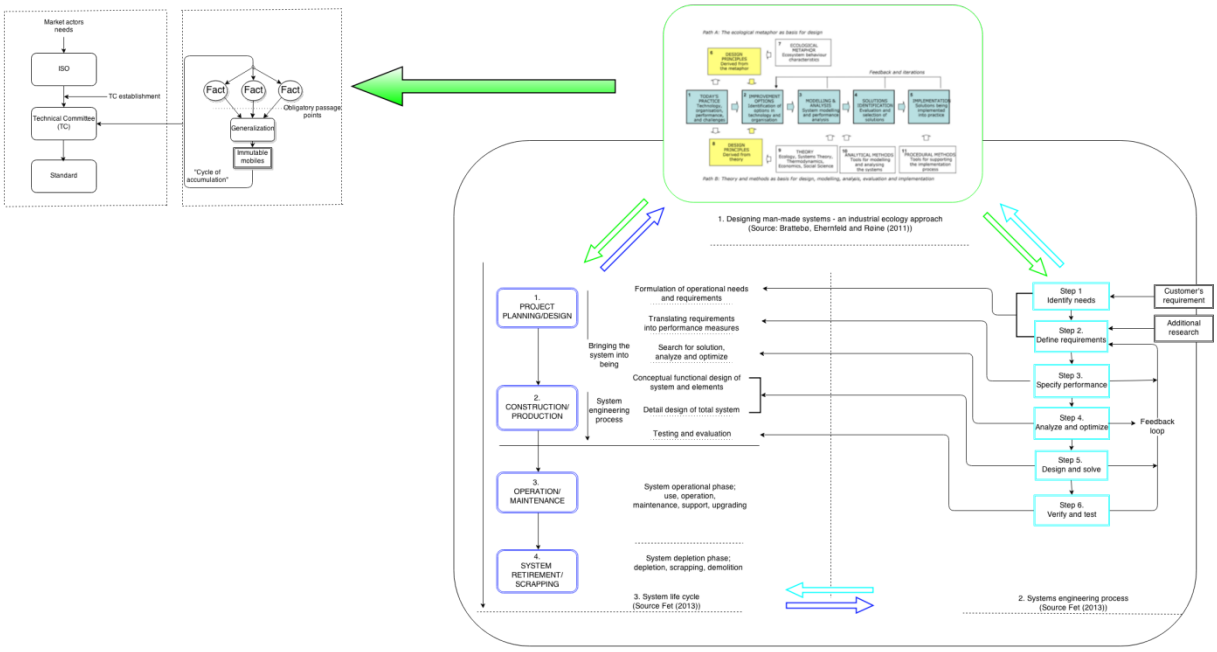

Figure 14. IE informing knowledge production in standards making

This study has attempted to explore how the development of (future) standards and indicators aiming at sustainable city development through a process of objectification enables the study and assessment of abstract concepts and systems. To make this connection, here first follows the IE systems thinking approach as inspiration for the designing, making and evaluating man-made systems. industrial ecology's emphasis in an holistic approach often understood as a life-cycle perspective, this will need to deal with not only considerations of bringing a system into being, but also later processes in the life of the system; the operation and maintenance phase (operation of a building) and the scrapping/retirement of the system (demolition of the building). When taking a broader view of creating sustainable cites, the assessment of the total sustainability of cities, the system certainly becomes complex consisting of different types of systems that has to be connected into an overall system, that is the city consisting of sub-systems (e.g. infrastructures of roads and buildings, telecommunication, energy), people (e.g. social systems and networks) and the economy (money flows, market mechanisms etc.).

Further, this approach can be used as input to those making a standard. In a process of decision making through a process of negotiation, discussion and agreement, a process of objectification here be argued as being part of such a process. Systems thinking and system theory have been attended to in chapter three, because they may give a holistic understanding of what a sustainable society may consist of. Or, in other words, an orderly understanding of all elements, making up subsystems, and again, where all subsystems together make up the whole city system. Since the society we live in is currently characterized as not sustainable, we cannot continue with the same practices (e.g. use of non-renewable resources, base our activities on extraction of virgin materials form nature as input to the city, while making

dispose of waste back to nature without recycling). The IE metaphor for influencing design (and also planning and making) of man-made systems is particularly interested in investigation such unsustainable resource flows, reduce these by recycling, or even emphasize ways to reduce such flows. Understanding the process of objectification, can be argued as a way of meeting the issues of sustainable city development initiatives. Keeping in mind the remarks from Latour (1987) that classifications are made in knowledge development process, that there is a need to understand the rationales and evaluations done by scientists on the path to establish "proven facts", to prevent the reasoning behind an establish classification becoming invisible (also referred to as black-boxed). We remember from chapter 3.3 discussing objectification and standards-relations, that this can be viewed as a systems thinking endeavor. Relating the systems approach as a part of a way of classifying the world, we can understand that the classification process in such an endeavor can benefit from understanding the process of objectification in the development and dissemination of knowledge. As pointed to, different scientific disciplines apply different types of perspectives and methods. Making the associations between the reasoning made when developing theories, constructs or systems, we can contend form Latour (1987), does not suffice form taking a specific scientific stand in a sustainability context. Through the understanding of how the different science come to view separate parts sustainability and how different perspectives are suitable for specific ends and the combination of the various perspectives, e.g. interpretive, functionalist or complex adaptive (Porter and Córdoba, 2009) or understood through realist or social constructivist stance (Beck, 2009), when combined and integrated for the purpose of and understanding of both social, economic and environmental aspects of sustainability, understood as a sustainable city system, we might go long way in making sustainable transitions. More specifically, that is if their process of reasoning are coming more clear to discuss the basis of their proven facts, aiming at some clarification of criteria and sustainability principles negotiated among the different disciplines. We remember how different systems; mechanistic, organic, semiotic(Krieger, 1998 in Brattebø and Kjelstrup, 2011) that are best described through applying the suited scientific perspective (functionalistic, interpretive) in accordance with the level of complexity (Boulding, 1956 in Jackson, 2009). Understanding this, would be that different scientific disciplines has their strength of explaining specific part of sustainability. Like argued in chapter 3.1.6, an example of a functionalist perspective, through a Urban Metabolism (UM) systems approach (Kennedy, Baker and Brattebø, 2013) where the physical world of stocks and flows of matter and energy of the city was quantified. But, in a sustainable city system, both the interpretive and complex adaptive systems are applicable, but for different purposes: Social and economic aspect of sustainability will need to be included, are typically provided by the interpretive and CAS perspectives. As argued by Porter and Córdoba (2009), that the functionalist perspective has its strength when it comes to the precise quantification of problems and that it allows the chosen parameters to be optimized. Still, oversimplification of social and human factors and the underplaying of the actors subjectivity are seen as limitations for this approach. Assessing sustainability, measurements are needed, but the functionalist perspective is not well suited for the purpose of measuring all aspects of social sustainability.

Further, understanding the process of objectification in the development and dissemination of knowledge may contribute to some type of transparency in the clarification of values. If we do not know the values that make the basis for evaluating societal practices, and further, the knowledge of what makes society unsustainable in the first place, how can we make efforts for sustainable outcomes? It seems that both in knowledge development, accumulation and dissemination today do not specifically make such efforts become transparent enough, or at least, the focus on values, may be both difficult and seen as something taken for granted. The point of including and understanding of the objectification process is to make the path to knowledge more clear, and resist the challenge of black-boxing, where e.g. we do have a definition of sustainable city development, but we do not dwell on the rationale behind it.

Further chapter three attempted to make the connection of relating standards to the systems thinking approach. Chapter three combined perspectives described by Millard and Bowker (2009) with the different system of Krieger (1998 in Brattebø and Kjedstrup 2011), for understanding those who create the standards, those who apply the standards, and what the standards themselves address. It argued that any real world phenomenon understood as a system, one can apply the understanding a physical/mechanistic system, will be in need to considering it through a functionalist perspective. Here various standards may apply in the process of bringing the systems into being. Along the lifecycle of a product, other standards may be applied to the same system (e.g. maintenance related standards, audits). The management that is in charge of creating a system will in this process apply the system of meaning. The outcome of the management process will in addition to the physical system created, produce of something that may have physical representations in the form of documents/text, though the management as a practice in itself is a semiotic system. We can understand that viewing a standard, those who make them, and further those apply them in practice, as well as what the standard themselves create; physical or textual objects (Bowker and Star, 1999), can be understood as a whole by applying the systems theory of different types of systems (Krieger, 1998 in Brattebø and Kjelstrup, 2011) depending on the level of complexity with systems that fits for describing that level, and further knowing how this system on that particular level of complexity (Boulding, 1956 in Jackson, 2009) can be studied through applying the fitted perspective (Porter and Córdoba, 2009). As we understand, the different perspectives apply different methods for understanding what is to be studied.

It seems from the review of literature (and case examples) that focus is easily laid on technical solutions like that of energy efficiency (e.g. green and smart technology), reduction of emissions and especially contributions to climate change. Still, like Carmona and Sieh (2004) points to, that the complexity of the sustainability agenda makes it difficult to assess how an individual sustainable planning project contributes to the overall sustainability agenda. How to meet the challenges of planning for sustainable cities in rich countries like Norway (challenges pointed to by Næss (2012), is not evident, but as the general language of planning and sustainability points to, it must somehow be related to needs that are to be met. Here the Brundtland definition and the system engineering process correspond – that is, the meeting of needs. We can argue that bringing inspiration from an IE systems thinking approach into planning through the system engineering process, can make evaluations of needs correspond

to more sustainable city management. This is because the IE metaphor can make contributions for better environmental performance of the systems engineering process making the system, as well as the system itself over the whole system's lifetime, as already pointed to.

Revisiting the SSCC-CG

On the background of the new forthcoming ISO standards for sustainable and resilient communities pointed to above by Bernard Leservoisier, it is still uncertain how all various standards that aim at sustainable society development will function. Chapter four presented the preliminary the work of a coordination group on smart sustainable cities and communities that is making the effort of getting an overview of the need for an overall framework where standards will fit into such an integrated approach for the sustainability of cities and communities standards, which this standardization coordination group is currently discussing. Viewing the work of the SSCC-CG may give important insights for how future sustainable city standards might function. Thereby this section sums up the preliminary work of the SSCC-CG.

The joint CEN-CENELEC-ETSI coordination group on Smart Sustainable Cities and Communities must be seen in the context of the broader European policy agenda. Sustainable cities are currently a focus of the EUs 20/20/20 targets on energy and climate change (European commission 2013) and have recently started to emphasize that standardization organizations and the development of standards can play a role in contributing to the goals of the union. There is a focus of "light house" sustainable city projects, emphasizing information infrastructure with data available for both the public and the private sector, that there should be developed an information infrastructure that enables the sharing of insights form the citizen between the cities of the EU. A smart city planning and operation should be implemented in order to make these processes more collaborative. Further, standardization has been made part of these activities, proposed to "Advance Smart City open standards through the CEN-CENELEC-ETSI Smart City coordination group in the form of a common technical committee to develop a common landscape and strategic programme for smart city standards" (European Commission 2013:4). Finally the SIP has proposed to "Agree a common Smart City indicator framework to help cities self-evaluate, monitor progress, and more reliably compare themselves with other cities and to provide certainty for long-term industry investments in innovation" (European Commission 2013:4). This point to the integration between EU policies and standardization organizations of Europe with the goal of meeting EU policies of energy and climate change through focusing of enhancing the sustainability of European cities. The light house projects are used as learning opportunities along this path. The integration aspect of the smart city solutions is envisioned integrate energy production, distribution and use; mobility and transport; and information and communication technologies. This is in envisioned to contribute to EU' 20/20/20 climate goals.

The purpose of the SSCC-CG is to advise and coordinate the activities that encompass the topic of smart sustainable cities and communities within standardization. The coordination

group themselves will not make a standard. The work of the coordination group will result in a roadmap and a list of recommendations for further work within this area. The *scope* of the SSCC-CG is to consider the needs for standardization on Smart and Sustainable cities and communities that is particularly within European interests. The work of the SSCC-CG will result in a draft road map of the outcome of the tasks mentioned above with recommendation and actions to be followed up. And will also draft a recommendation for creating Technical Committee(s) in the future.

The SSCC-CG will not make a standard, but is interested in getting an overview of the European need of standards that fit the context of making cities smart and sustainable. Discussing the content of what "smart and sustainable", "smart city", "cities and communities" "city systems" and "infrastructure" means have been a task attended to by this group. Further a conceptual model for smart sustainable cities and communities has been stated as needed. The contents of the discussions of this group throughout their meeting activities points to the lack of a common language of what a sustainable city contain and thereby the group has been attended to reaching agreements of these definitions. Getting an overview of the areas where standards are needed in the context of sustainable city development, there was stated to be a need of a model. This model was envisioned to be used in order to make it easier to find the right standards that fit specific areas of smart city projects. Additionally the model will help standardization bodies to knowing where there is a need for more standards in an area. Further, the model will help the coordination of the global standards work on smart city standards and that these are consistent with national standards. In this model the standard will be classified in order to see how the different standards fit together as well as showing other standards that may be relevant. Developing such a model will be in need to deal with that different European standardization organization may have different definitions of sustainability. The framework may need to be flexible to include different conceptions and agendas. There will be a need to consider standards on different levels needed for the developing a smart sustainable city. : Strategic, process and technical levels. Different standards and guides are made to meet different needs. Since a smart city is characterized by rapid changes, rather than the case of stable markets where detailed standards can be made for products and services, it is suggested that standards might need to be made based on current best practices and will need to be revised and updated in accordance with changes and learning that will occur. Technical group 1 and 3, have been meeting to agree upon steps needed to be taken in developing a future model to be used in order to map existing and future required standards and how this work should be carried out to be ready for the meeting of SSCC-CG on March 11th 2014 (SSCC-CG, 2013c). In this process, the groups will agree upon the requirements for such a model/framework and its criteria. The requirements for this model discussed were

- That it should facilitate the potential end user (the target audience) of Smart Cities' standards
- That it should enable the coordination of national/European initiatives so that any inconsistencies are avoided

- That it should make it possible for NBS's to identify the scope and gaps
- It should allow that those existing standards needed to be accounted for are identified when developing a smart city

This model, called the "architectural model for smart cities" are potentially targeted both at the end users as well as the different standardization organizations (NBS's), the SSCC-CG, the mayors of smart cities (SSCC-CG, 2013d). At the time when this paper is in the writing, the final purpose and use of such a model is still under discussion. Though, they have aimed at agreeing upon the steps to be taken in order to make such a model, it has been suggested that such a model can function as a global management system approach, a framework that will mapping, identify focus areas and for the selection of measurement tools. Further, it has been suggested that it should be an open model that enables it to be developed in accordance with the working process. Stakeholders should be part of this development process in order to meet users' needs and requests from the market.

The role of standards in helping a city or community in becoming smarter and more sustainable has be the SSCC-CG been states as

- To function as a tool and a guide to help leaders of cities in order to understand ways city systems can be integrated in order to meet their objective as well as to help evaluate what may be the best options for the city.
- Enable the objectives to be measured and met through providing metrics for the evaluation of progress.
- Use of common criteria and requirements can enable the cities to procure smart city products. This is also meant to enable the reduction of costs through enabling making products and services more commoditized.

Relating the SSCC-CG work to knowledge development and objectification and the implications for sustainable city development.

We can understand form the SSCC-CG work that this can be considered as being a systems-thinking endeavor. The SSCC-CG is attempting to make a framework model to function as a guide to both city developers and politicians in order to get an overview of what standards may fit to meet some specific objective of sustainable city development.

In chapter three, joss pointed to sustainable cities development as an ongoing process of innovation. This implies that sustainable cities development is still evolving and that the definitions of sustainability as a concept, what it contains and what a sustainable city is and how this is to be achieved is currently under negotiation. SSCC-CG work can be seen as part of this negotiation context. The SSCC-CG works through taking into account the needs of different stakeholders when attempting to make a framework model for sustainable cities. How such model will function is not clear. The work of the SSCC-CG is still under negotiation. But, through the presentation of objectification in relation to standardization and sustainable city development, there are some issues that can be pointed to.

Objectification has been understood here as a ways of making something diverse and spread into something commonly understood; from a subjective understanding to an objective understanding. Since the research of sustainable city developments point to the lack of a common definition of the sustainability of cities, an objectification process in this regard, would be making such spread and diverse definition into one agreed-upon definition. But, again, since sustainable city development is still in the learning phase, one can argue that it may be too early to settle upon one definition. At least if such common definition is not adjusted during the process of learning from sustainable city projects, this might be troublesome. Changing of standards is often considered a slow and expensive process, so we may question if the standards will be able to be changed in accordance with the rapid spread and development of sustainable city projects.

Also keeping in mind objectification as a production of knowledge in society, this is an ongoing endeavor where "proven facts" are made through observing real-life phenomenon, negotiated in various discursive networks and through specific scientific practices by applying preferred methods that fit the phenomenon studied (in accordance with the level of complexity, and the fitting system model and perspective). Taking Latour, that the classifications produced that e.g. distinguish knowledge from belief, or knowledge about sustainable cities versus belief in what sustainable cities are, does not make sense if we do not know the ways in which case and effects are attributed, how the classifications are linked to one another and the strengths and size of these links. The claims of what is to be understood as facts, or e.g. sustainable v.s. unsustainable are liked to cause and effect (what are our practices, and what are the effects of these), and how the unsustainable and the sustainable practices are linked. Further, classifications as these, there will be spokespersons that are seen as legitimate in a given context. We may understand that these on the bases of their knowledge and position in society will have their arguments more easily adopted by those who seek their advice (maybe without questioning the basis of this knowledge). They may in this sense have strong influence of the objectification of knowledge. All these connections, are not seemingly evident in society today in the overall negotiation of sustainability, its objectives and goals as well as how to meet these objectives. For the sake of values clarification and as well as the need for the conception of sustainability to evolve, this text have tried to argued that understanding objectification of knowledge in society may make contributions for making the right choices when it comes to definitions, values clarifications, and criteria and principles set on the path to what is to be understood as a sustainable city.

Examples of Sustainable cities initiatives in Norway

Framtidens Byer can like the initiatives of sustainable cities be viewed as "lighthouse project" that in addition to contribution to overall policy targets can be understood as initiatives for learning about sustainable city solutions. The outcome of Framtidens byer initiatives where aiming at yielding results that are measureable and at the same time act as practical examples for other cities and for development of policies on all levels (state, region, local). In the initiation of the agreement, there was stated a need for better cooperation between the public and the private. While the state was to provide for good conditions for the private sector to invest in sustainable and innovative solutions, business themselves may contribute to

reduction of ghg-emissions, contribute to the developing of a greener economy (and thereby also strengthen its own competitiveness). 13 cities/city areas are part of the Framtidens Byer initiative. The Framtidens Byer initiative focuses on four main areas; land use and transport, stationary energy use in buildings, consumption patterns and waste, and adapting to climate change. The Framtidens Byer initiative focuses on cooperation between the city/city regions as well as cooperation with the private sector. Brøst city area is an urban area of Trondheim development project under the Framtidens Byer umbrella. It has ambitious goals of being a climate neutral urban area.

The outcome of the Framtidens Byer initiatives is not clear at this point. But the overall Framtidens Byer initiative and the specific example of Brøset points to the problem of making indicators form monitoring and evaluating the initiative. Both are part of the overall national goals of ghg-reduction, in addition to attend to the four focus areas of Framtidens Byer. The processes of making and negotiating these developments can be seen as a learning process where the outcome of the initiatives can be used as bases for future developments of cities in Norway.

We may make the connection that the same processes of knowledge development through the process of objectification is at play here, through really pinpointing how this can be detected in actual practices, will be in need of a future case study on the topic.

6. Conclusion

The issues of how to make sustainable city development come about are clearly detectable in the research literature on sustainable city initiatives. Specifically this relates to the fussiness of sustainability and how the path to some defined goal of sustainability should be met. Currently standards are being developed for the purpose of making sustainable communities in practice by ISO. This poses the question of if these will contribute to making sustainability in society more feasible. how to meet challenges of planning is not evident. Must be set through formulation of needs and how these are to be met. The importance of assessment and measurement processes to be meaningful for those involved is understandably key in order for meeting goals of sustainability. For the purpose of sustainable development, a variation of standards may apply. Making these fit together in a systematic purposeful way, development of a framework for sustainable development with the inclusion of indicators have been suggested both by the EU and researchers

The initial assumption in this regard was that there exist connections between the development of standards and indicators that enables the assessment of abstract concepts and systems that is enabled by an objectification process. Systems thinking can be seen as a process of objectification, those who make, apply the standards, as well as the standards themselves, can be viewed as objectification…Still, as pointed to, the issues of sustainability and solving them for the attempt to make sustainable transitions in current and future sustainable city developments, may benefit from understanding the connection between systems thinking, objectification and standards.

Making the associations between the reasoning made when developing theories, constructs or systems does not suffice form taking a specific scientific stand in a sustainability context. Through the understanding of how the different science come to view separate parts sustainability and how different perspectives are suitable for specific ends and the combination of the various perspectives, e.g. interpretive, functionalist or complex adaptive or understood through realist or social constructivist stance when combined and integrated for the purpose of and understanding of both social, economic and environmental aspects of sustainability, understood as a sustainable city system, we might go long way in making sustainable transitions. More specifically, that is if their processes of reasoning are coming clearer to discuss the basis of their proven facts, aiming at some clarification of criteria and sustainability principles negotiated among the different disciplines. Different systems; mechanistic, organic, semiotic, that are best described through applying the suited scientific perspective (functionalistic, interpretive) in accordance with the level of complexity. Understanding this would be that different scientific disciplines have their strength of explaining specific part of sustainability. Functionalist perspective is well suited for a quantitative assessment of sustainability. But, in a sustainable city system, both the interpretive and complex adaptive systems are applicable, but for different purposes: Social and economic aspect of sustainability will need to be included, are typically provided by the interpretive and CAS perspectives. The functionalist perspective has its strength when it comes to the precise quantification of problems and that it allows the chosen parameters to be optimized. Still, oversimplification of social and human factors and the underplaying of the actors subjectivity are seen as limitations for this approach. Assessing sustainability,

measurements are needed, but the functionalist perspective is not well suited for the purpose of measuring all aspects of social sustainability.

In order to make connections between standards, objectification and sustainable cities development, a conceptual knowledge system have been developed in this study as a frame of reference to the thinking process, but also to specifically attempting to describe these fuzzy connections. But such an inquiry can be applied by others seeking to understand the connections between knowledge development, systems theory, objectification, sustainable cities development, standards and indicators, or more generally for understanding abstract concepts and systems. The conclusion of this paper is that there exist connections between the development of standards and indicators that enables the assessment of abstract concepts and systems that is enabled by an objectification process. But, such a process is nor clearly evident for researchers or practitioners, nor is objectification used in the way as attempted to in this paper. Still, understanding these connections; the understanding through investigation the objectification process at play in sustainable city initiatives, may make the fuzziness of sustainable practices more evident.

7. Suggestions for future research

Through such a process of objectification the individual perspectives are transformed to new structures and standards. Along this path, different initiatives like standards of the International Standardization Organization and others like BREEAM, are competing to become the main standard within the field of sustainable city development; individual standards or a set of standards of standards framework that might move the existing practice to meeting the goals of sustainable development. In this context, how objectification may be linked to standardization in practice will be in need of more case studies. Additionally, future research may want to through specific case studies of the application of BREEAM and the future standards for sustainable city development of ISO in order to pinpoint traces of objectification as well to know how such tools may or may not have an effect of making cities more sustainable. Making the practical specific reality through standardization into something of a commonality enabled by an objectification process may clarify some of the sustainable city development issues, but this may involve trade-offs where the specific context can be lost…. Bad traits that may not be easily solved?

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