
# A Foucauldian–Fairclaughian Discursive Analysis of the Social Construction of ICT for Environmentally Sustainable Urban Development – the Case of European Society

By Simon Elias Bibri

Thesis Submitted for Completion of Master of Science in Sustainable Urban Management, with a Major in Built Environment

Department of Urban Studies, Malmö University, Sweden

Supervisor: Jonas Alwall

January 2013

# Abstract

ICT has become so deeply embedded into the fabric of European society – in economic, political, and socio-cultural narratives, practices, and structures – that it has been constructed as holding tremendous untapped and inestimable potential for instigating and unleashing far-reaching societal transformation, addressing key societal challenges, and solving all societal problems. It has recently been seen, given its ubiquity, as a critical driver and powerful catalyst for sustainable urban development due to its potential to enable substantial energy savings and GHG emissions reductions in most urban sectors, especially buildings. However, related to this ubiquity, there are also a lot of visions (of limited modern applicability), hopes, myths, fallacies, and oxymora, which applies for the environmental subsystem of information society where debates focus on whether ICT can advance environmental urban sustainability. There are intricate relationships and tradeoffs among the multidimensional effects of ICT for the environment that flow mostly from the use and application of ICT – e.g. energy efficiency technology - throughout the urban sphere. Regardless, the technological orientation and framing of the sustainable city and the green economy has gained dominance in European society and become prevalent in what has come to be identified or known as the discourse of ICT for sustainable urban development (ICT4SUD).

The aim of this study is to carry out a critical reading of the social construction of ICT4SUD, the underlying ideology about the ICT potential in advancing environmental urban sustainability. To achieve this aim, a Foucauldian-Faircloughian discursive approach is employed to examine the selected empirical material. This approach consists of nine stages: (1) surface descriptors and contextual elements; (2) historical-diachronic dimension; (3) epistemic and cultural frames; (4) discursive constructions and discourses; (5) social actors and framing power; (6) discursive strategies; (7) discursive mechanisms; (8) political practice, knowledge, and power; and (9) ideological standpoints.

As a scholarly discourse, ICT4SUD is inherently part of and influenced by economic, societal, and political structures, and produced in social interaction. ICT4SUD is thus neither paradigmatic nor value-free, but rather socio-politically situated. It is shaped by cultural frames that are conventionalized by European society and attuned to its values, and it is a matter of a pre-intellectual space where ICT and sustainability constitute salient defining factors of the dominant configuration of knowledge, institutions, and material forces of European society. Indeed, ICT4SUD is impacted by earlier representations of reality and how they were reproduced in relation to the significance of discursive constructions of ICT and sustainability issues in the broader context of European culture. Moreover, the ICT4SUD discourse plays a major role in (re)constructing the image of the ICT industry as a social actor and in defining its identity and relation with other constituents of society, in that it is relocated new roles and attributed new societal missions. The dominant framing of the reports is clearly the one advanced by the ICT industry: it is constituted into the main definer of the represented reality. Further, positioning the ICT industry as the driver of the low-carbon city/economy aids the construction of an image of leadership in creating a low carbon society. The reports' construction of energy efficiency technology is a powerful legitimation of the ICT industry's views and actions. In addition, the ICT4SUD discourse is exclusionary, namely a number of facts and issues pertaining to structural, indirect, and systemic effects of ICT and the associated rebound effects are left out, concealed, or neglected. Also, the discourse is inclined to be deterministic, i.e. it postulates that ICT, supported by policy, will achieve SUD while it falls short in considering social behaviour and socio-economic relationships. It moreover tends to be rhetorical – that is, it promises environmentally SUD without really having a holistic strategy to achieve that goal. Furthermore, given the scientific discourse and the legitimation capacity of computing, climatology, and sustainability indicators, one can subsume a range of social and political effects under the category of discourse mechanisms through which ICT4SUD operates, which both show the power of discourse and potentially empower the ICT industry and its cohorts. There are different justifications for the development of energy efficiency technology in relation to decision-making processes. Plus, politics, as a consequence of its interaction with ICT4SUD, forces, though different mechanisms, the emergence and development of the ICT4SUD discourse, which is, simultaneously, influenced by the power/knowledge relations established in European society that bounds or expands its success. Finally, as to ideological reproduction, the ICT4SUD discourse reconstructs cultural claims, conveys ideological messages, and reproduces and legitimizes power structures.

**Keywords:** ICT, sustainable urban development, environmental urban sustainability, energy efficiency technology, GHG emissions reductions, ICT4SUD, discourse, episteme, discursive construction, European society, information society, ICT industry, buildings, rebound effects, Foucauldian

# Acknowledgment

I would like to express my acknowledgment and gratitude to my supervisor Jonas Alwall, Program Manager of the Master of Sustainable Urban Management and Professor of International Migration and Ethnic Relations at Malmö University, for his unwavering support and understanding during the course of the project work. His feedback was always constructive and his knowledgeable advising kept me on a sound research path while his good nature and humbleness made working with him a delight.

My sincere appreciation goes to Peter Parker, Professor of Leadership and Organization at Malmö University, for sharing his hands-on knowledge about project and process management as well as for his dedication to teaching and his sustainable pedagogical methods, particularly open dialogue, class discussion, group analysis of case studies, perspective sharing via reflection, and so on.

I owe special thanks to all my colleagues from the SUM Program 2012-2013 for the rich discussions, the fruitful cooperative (academic and social) learning, and the constructive knowledge sharing. My special thanks also go to the SUM Program team for the rich content of the courses.

I would like to express my profound gratitude to my beloved sister for her incessant encouragement and immeasurable moral support. This has for long been instrumental in undertaking and accomplishing my intellectual endeavors.

In short, I am grateful to everyone who contributed to this work both directly and indirectly, making it such an enlightening and enjoyable experience.

# Table of Contents

# Abbreviations

**CDA:** Critical Discourse Analysis

**EU:** European Union

**FDA:** Foucauldian Discourse Analysis

**GeSI:** Global eSustainability Initiative

**GHG:** Greenhouse Gases

**ICT:** Information and Communication Technology

**ICT4SUD:** Information and Communication Technology for Sustainable Urban Development

**ISTAG:** Information Society Technologies Advisory Group

**SUD:** Sustainable Urban Development

**WBCSD:** World Business Council for Sustainable Development

# Chapter One

## 1. Introduction

### 1.1. Environmentally Sustainable Urban Development and its Technological Orientation and Framing in the European Information Society

Climate change is considered to be one of the main challenges facing humanity in the 21st century as it is a multidimensional and overarching matter: with strong links to economic, social, and political issues, and with far–reaching societal implications – for the economy (Stern 2007), the environment (Parry 2007), and human health (McMichael, Woodruff & Hales 2006). This is due to the predominant paradigm of politico-economic development being largely oblivious to the risk of anthropogenic environmental upheavals at continental to global scales. Climate change is intrinsically linked to greenhouse gases (GHG) emissions – the culprit of global warming – which come mostly from energy use worldwide. Hence, the global consensus on the deleterious effects of GHG emissions and the growing concern about climate change has intensified the challenge to reduce energy consumption and its environmental implications.

It is widely recognized that cities are major consumers of energy resources and, thus, significant contributors to, or generators of, GHG emissions (see UN–HABITAT 2007) due to the density of urban population and the intensity of economic activities. Indeed, cities are seen as 'growth engines' which constitute the key to economic growth, hence the impact of urban areas on climate change. This has indeed become one of the most concerned issues of urban sustainability in recent years. With the growing concern about the environment and the rising acceptance of sustainable development, the challenge of making cities environmentally sustainable is in the forefront of the minds of many technology experts, academics, policy experts, government officials, and planners, especially in developed societies. The synergies between sustainable development agenda and climate change policy necessitate that these stakeholders work together and take a holistic view of the issues of energy use and GHG emissions.

Sustainable development has long been promoted as the solutions to global environmental problems (UN 2010). It has therefore been applied to most urban sectors, especially those with substantial contribution to GHG emissions such as buildings and transport. Accordingly, sustainable urban development (SUD) has gained increased prevalence and generated worldwide attention. It is a task that all the world's major cities are facing nowadays, and, in the coming years, there will be even more enormous pressure on urban planning due to the rising growth of the world's population and the wave of urbanization, a

dynamic clustering of population, buildings, and resources, which is occurring on a staggering scale. At present, across the globe, planners are taking on the challenge of developing cities in such a way as to enable them to provide human environment with minimized demand on energy resources – a smaller ecological footprint – and minimized adverse effects on the environment. SUD as a powerful framework for environmental strategies provide an opportunity for planners to utilize their substantive knowledge about how cities, ecologies, and economies interrelate and interact, so to put forth farsighted designs and plans that support the sustainable city, the environmental city, or sustainable urban living.

In the context of European society, the growing concern about the environmental implications of cities and urban areas is putting pressure on (state) urban planners to come up with conservation strategies for slashing energy consumption and mitigating GHG emissions. Given the technological character of European society – ubiquity presence of ICT – sustainability strategists and policy experts are turning to, and capitalizing on, energy efficiency technology as an application of ICT to address environmental challenges facing European cities. ICT is increasingly seen as a powerful catalyst for SUD due to its potential in enabling significant energy savings and GHG emissions reductions in most urban sectors (or sectors of the economy and society).

In discursive terms, the debate focusing on whether ICT can advance environmental (urban) sustainability has evolved into a 'hegemonic discourse' known as 'ICT for sustainable urban development' ICT4SUD whose imaginaries – huge ICT potentials for GHG emission due to its ubiquity – are discursively constructed and materially reproduced through institutional practices. This is illustrated by a mammoth number of discursive and material selectivity. According to ISTAG (2006), ICT has transformational effects that play a key role in Europe's future sustainability. 'As ICT becomes more deeply embedded into the fabric of European society, it is starting to unleash massive and far–reaching social and economic change. ICT is essential...for bringing more advanced solutions for societal problems…' (Ibid, p. ii) The entrenchment of ICT in societal structures enhances our position to make sustainable development work (Alakeson et al. 2003) The ubiquitous presence of ICT, in almost every social and economic process, makes ICT a key element for addressing the current societal challenges in as distinct domains as urban planning, transport, energy management, and so on (ISTAG 2012). 'ICT provides the solutions that enable us to 'see' our energy and emissions in real time [so]…to make them more efficient.' (GeSI 2008, p. 7) In all, significant opportunities exist for ICT to support new approaches to sustainable development and to tackle environmental threats (ISTAG 2003), and ICT has a great potential to 'shape Europe's future' (ISTAG 2006). No wonder that ICT has become a salient factor in the pursuit of urban sustainability in European society. Indeed, catchphrases such as 'ICT for low–carbon city' and 'ICT for low–carbon

economy' are frequently translated into concrete urban projects, strategies, and policies. Further to the point, while ICT has both positive and negative environmental impacts, critical views inside the ICT4SUD discourse claim that at the moment the balance tilts in favor of positive impacts.

### 1.2. Research Problem and Justification

Recent reports on ICT and sustainable development (e.g. ISTAG 2006, 2008; GeSI 2008; WBCSD 2009) demonstrate the fundamental role the European ICT industry plays, through many institutions, in the construction of ICT as: a positive force for societal transformations; a critical enabler for a low–carbon economy/city; and a key driver for GHG emissions reductions generated specially by buildings. This mode of talking resonates with the ICT4SUD discourse that is circulating in the European information society. In it, there is a strong belief that ICT can enable and catalyze major societal changes, e.g. sustainable urban change, due to its inestimable transformational effects and tremendous untapped potentials. Unquestionably (scientifically), ICT innovations have proven seminal in improving energy efficiency across many urban sectors. The generated value–added, though, is associated with energy savings rather than GHG emissions reductions – most economists would certainly agree. Due to the prevailing socio-economic realities, energy efficiency technology doesn't go beyond economic gains – the most significant, long–term benefits coming from using less energy – reaped by those that devour energy, such as industries and businesses, since GHG emissions continue to rise at unprecedented rate. In economic terms, energy efficiency technology translates into about €600 billion ($946.5 billion) of cost savings, of which €216 billion ($340.8 billion) comes from buildings technologies (GeSI 2008). But, arguably, estimating that energy efficiency technology will enable some global '1.68 GtCO of emissions savings' remains fallacious and ungrounded; this forecasting is based on delusional optimism, unreliable data, the use of inappropriate forecasting models, strategic misrepresentation, or, perhaps, honest mistakes. This is because ICT-enabled GHG emissions reductions are contingent on complex, intertwined socio-behavioral socioeconomic, and structural factors rather than solely on technological advancements.

Therefore, it becomes pertinent to question the manifesto of the ICT great potential in tackling environmental threats and, thus, the claimed ICT–oriented sustainable urban change. This argument leads to various interrelated assumptions. ICT may well be used as rhetorical and persuasive moves in the ICT4SUD discourse to achieve intentional economic and political ends. Moreover, it is likely that the ICT4SUD discourse is constructed in correspondence with the positions, institutional belonging, ideological commitment, and visions of the different social actors that support it. Besides, technology is seen as to develop dependently of society, a mutual shaping process where society and technology are

simultaneously shaped, to draw on a constructivist worldview. Thus, technologies are, like other socio–cultural artefacts, social constructions whereby seamless webs of economic, technical, social, cultural, and political factors and actors shape and influence the creation and development of technologies. This relates to the view of social embeddedness of technology, which assumes that technological innovations are loaded with symbolic and ideological meanings. Accordingly, as a key discursive element of ICT4SUD discourse, energy efficiency technology reconstructs ideological claims, conveys ideological messages, and reproduces power structures and relations. From a cultural political economy (CPE) perspective, the discursivity and materiality and the dialectical relationship between them – the discursive–material dialectics of SUD specific to European society – are essential to an adequate account of power reproduction. In relation to this, the discourse is likely to interact with political action and power as basic elements of its creation as a new object of knowledge and, eventually, its translation into concrete urban projects. That is, how urban sustainability is done in dialectic interplay between discursive selectivity (e.g. discursive chains, social identities) and material selectivity (e.g. institutions, actors' strategies, actor's calculation patterns of 'objective interests'), to draw on (Sum 2006).

Furthermore, it is of the very nature of discourse to leave out certain topics. Numerous studies have indeed pointed to a plethora of the environmental implications of ICT (e.g. Forge 2007; Madden & Weißbrod 2008; MacLean & Arnaud 2008) and the associated rebound effects (e.g. Plepys 2002 Berkhout, Muskens & Velthuijsen 2000). These aspects, which are of fundamental relevance to sustainability as an overarching model that can be affected by every aspect of societal development, tend to be neglected and sometimes concealed in the discourse of ICT4SUD. As a consequence, certain sustainable urban planning aspects are emphasized and others necessarily downscaled, which has impact on the overall sustainability goals.

All in all, very little is known about how ICT affects the environment in the urban complex system. The daunting challenge of urban sustainability renders most efforts to address environmental issues through technological advances of no guarantee to serve the purpose. With this point in mind, it is therefore relevant to critically engage with the ICT4SUD discourse in the context of European society.

In terms of the focus of this study, the European society has been chosen as the case study society because in Europe ICT has a strong institutional and governmental support and also a large body of successful practices. ICT has been embedded in one of the funding instruments of the European Commission, notably under its Framework Programs: FP5, FP6 and FP7. In this context, European society

refers to the united member states of the European economic and political community: an organization which aims at achieving economic and political union between different European member states.

### 1.3. Research Objectives

Set against the preceding background, this study aims to carry out a critical reading, by means of a Foucauldian–Fairclaughian discursive approach, of the social construction of ICT4SUD, the prevalent view of a major, ICT–driven sustainable urban change – in other words, the underlying ideology about the potential of mobilizing technological developments to make European cities environmentally sustainable. In this analysis, I examine key aspects of the contextual, cultural, and epistemic/historical contexts in which the ICT4SUD discourse operates. Also, I analyze how the ICT industry and the partner institutions communicate about ICT4SUD to the public and policymakers, by examining the main discursive strategies and mechanisms prioritised by a set of four reports to portray the discourse in question. Further, I attempt to establish inferences about how language as a symbolic form helps reproduce ideology and perpetuate power relations, by revealing several converging points between social knowledge, social actors, ideology, power, and political practice. This discursive research is thus of a category that views the text in a macro–context of institutions and ideologies.

Given the scientific–objective appearance of some aspects of the examined discourse and what this entails in terms legitimation capacity, I employ discourse analysis to understand why a particular view at some point becomes dominant and authoritative, while other views become inconsequential or discredited, in addition to understanding the social background and the social consequences of particular modes of talking, thereby conceiving of discourse analysis as an analytical approach based on what is being written as to consistencies, variations, and contexts.

### 1.4. Research Questions

Based on the above objectives, the following four questions can be formulated:

**Q1**: What contextual, epistemic, and cultural elements do shape the ICT4SUD discourse?
**Q2**: How is the discourse of 'ICT4SUD' socially constructed in terms of framing, rhetoric, subject positioning, and legitimation?
**Q3**: What characterizes the discursive mechanisms through which the ICT4SUD discourse operates and what are their effects on both the discourse and the agent?
**Q4**: What kinds of ideologies are advanced by the advocates of the ICT4SUD discourse?

To achieve the overall aim, a set of four reports is examined by means of a nine–stage discursive analytical approach: (1) surface descriptors and contextual elements; (2) historical–diachronic dimension; (3) cultural and epistemic frames; (4) discursive constructions and discourses; (5) social actors and framing power; (6) discursive strategies; (7) discursive mechanisms; (8) political practice, knowledge, and power; and (9) ideological standpoints.

### 1.5. Scope

ICT and SUD are sweeping concepts and topics. Combined, they form a large–scale societal discourse. This analysis is confined to the potential of ICT in catalyzing SUD in terms of transforming the way to save energy resources and reduce GHG emissions in urban sectors, with a particular emphasis on buildings. Other urban sectors with energy resource saving and purported GHG emissions reductions potentials via ICT processes and systems include: transport, manufacturing, power supply, and water management.

### 1.6. Conceptual Background Defintion

The key theoretical constructs that make up this study include the following: 'ICT', energy efficiency technology, 'information society', 'sustainability', 'sustainable development', and 'SUD'. I also briefly discuss the relationship between these concepts and their relevance to the study. As to discourse theory and discourse analysis method, they are addressed separately in chapter 4 and 5, respectively.

#### 1.6.1. Information and Communication Technology (ICT) and Energy Efficiency Technology

Abbreviated for information and communication technology, ICT can be defined as the study, design, development, implementation, and management of computer–based systems. These are used to process information and aid its communication through a microelectronics–based combination of telecommunications, networking, and computing. While it is used interchangeably with computing, which is defined as '…designing and building hardware and software systems for a wide range of purposes; processing, structuring, and managing various kinds of information…; making computer systems behave intelligently; creating and using communications…; finding and gathering information relevant to any particular purpose, and so on.' (ACM 2005, p. 9), computing theory is concerned with the way computer systems and software programs work, and ICT theory deals with the application of ICT in, and its effects on, society, which is the focus in this study. As an umbrella term, ICT encompasses computing devices and systems, such as computers, mobile devices, the internet, networks, telecommunication and satellite systems, sensors, and so on, and the associated applications and services. It has multiple applications that span

every sector of society. It is often spoken of based on the context of use, e.g. sustainable development, urban development. In the urban context, ICT is associated with energy efficiency technology, among others, as to its role in enabling energy savings and GHG emissions reductions. Examples of the application of energy efficiency technology include: smart buildings, smart transport, smart industry, smart power grid, and smart city planning. For a detailed definitional and descriptive account of energy efficiency technology and its use in buildings, the reader is directed to chapter two.

### 1.6.2. Information Society

ICT is a fundamental aspect of modern society. It has over the last few decades shaped the emergence of many labels of new kinds of society, such as information society, network society, knowledge society, postindustrial society, and so forth – these are seen as the successor to industrial society. These visions of a new era emanate from the pervasiveness and the transformational effects of new computing technology. ICT offers a new vision for European information society (e.g. ISTAG 2006), which promises to transform the way it functions. Social evolution theory has been used to analyze different visions of new age and to predict societal development.

There is no universally accepted notion of what can be termed information society. It can be described as a society where new ICT is used to create, disseminate, use, apply, and manipulate information as a significant economic, political, social, and cultural activity. Here, technological innovation is a key element to get closer to, and manipulate, information as an agglutinative aspect. According to Bell (1974), a post–industrial society is where information is of a central preoccupation and the prime source of innovation and social dynamism and power. He predicted that advanced societies would, by the end of the 20th century, reach the postindustrial stage, demonstrated by the growing importance and use of ICT, among others. Theories of industrial society argue that information will increase in importance compared to industry (Sztompka 2002). The increase in performance of computers and the development of communication technologies is a megatrend that will alter societies on a worldwide scale (Naisbitt 1982, cited in Sztompka 2002). However, some critics of the post–industrial society theory contend that technology domination remains unclear and uncertain. This is due to the unpredictable nature and behavioural patterns of technological innovation.

### 1.6.3. Sustainability

***Definitional Implications and Issues**:* Sustainability is an overarching notion that affects, and can be affected by, every aspect of societal development. It aims toward the wholeness of system – holistically conceived approach – when making decision and strategic choices. One premise of sustainability is to provide upstream solutions which focus on the root causes of problems, instead of downstream solutions which address the symptoms of problems. Sustainability can be thought of as a state in which society does not, through economic and political systems, undermine nature and people, which would otherwise occur through environment degradation, resource depletion, and hazardous chemical substances, as well as investments directions, technological innovation orientations, and institutional practices and patterns. According to Early (1993), sustainability entails integrating natural systems with human systems and celebrating 'continuity, uniqueness and place making'. The benefit of sustainability model lies in the long–term goal of a socio–ecological system in balance: society strives to sustain the ecological system along with the economic and social systems. Hence, as a goal set far enough into the future, urban sustainability allows us to determine how far away we are from it and to calculate whether we will attain it.

Sustainability is a complex concept. Generally, it denotes an ability of a system (e.g. ecosystem, economic system, social system) to sustain itself or reproduce indefinitely. This concept was born from the realization that human activities were imperiling future life on the earth (Samuel & Lesley 2007). While having deeper roots, sustainability concept didn't become popular until after the release of the Brundtland report in 1987. Since then, a veritable flood of studies has defined and redefined the notion and applied it to most human activities (Molnar, Morgan & Bell 2001). No single definition of sustainability exists. For example, from the political literature on sustainability, many definitions can be derived based on diverse discourses around sustainability, e.g. environmental discourse, green reformist discourse, socialist discourse, eco–feminist discourse, eco–marxist, democratic discourse, and so on (Huckle 1996; McManus 1996). This infers that no one definition is privileged over any other, except to surmise that on or some may predominate at some point. And different perspectives have their own opinion of what sustainability is, and tend often to be almost contradictory. Nonetheless, sustainability notion has proved powerful due perhaps to the contested nature of the concept. For it, in the urban context, to 'become a powerful and useful organizing principle for planning', it should be 'incorporated into a broader understanding of political conflicts… The more it stirs up conflict and sharpens the debate, the more effective the idea of sustainability will be in the long run.' (Compbell 1996)

***Sustainability Dimensions***: Sustainability is often cast in terms of the environment, the economy, and equity, which in a sustainable society should be enhanced over the long run. And their well–being should crucially be intertwined, not separated due to their interdependence and equal importance. Sustainability articulates how society values the environment, the economy, and equity (Paehlke 1994). The focus in this study is on environmental sustainability and economic sustainability. Economists view the economy and the environment as a single interlinked system (Dasgupta 2007; Hamilton & Clemens 1999).

Environmental sustainability is about sustaining the ecosystem's ability to meet current and future needs, which requires ensuring that the interaction patterns with the natural environment occur in such a way to perpetually conserve it. In this sense, society should design activities to meet human needs while indefinitely preserving the life supporting ecosystems. This rests on understanding, and living within, the carrying capacity of the planet – material and systemic limits. To this end, it is imperative to create novel processes and systems to monitor and manage biophysical constraints, thereby rethinking the links between ourselves and nature in ways to find ways to live mutually with it. 'Perhaps the root idea of environmental concern is that modern humans should find ways of consciously *living with the grain of nature*….The basic sustainability model of human continuance through permanent living self–adjustment to systemic constraint thus grows naturally from the metaphorical root of environmental concern.' (Foster 2001, p. 156) Put another way, the better sense making is to reshape ourselves to fit a finite planet than to attempt to reshape the planet to fit our infinite needs (Orr 2004).

Economic sustainability is to sustain indefinitely the amount of consumption without degrading capital stocks, including natural ones (Costanza & Wainger 1991). This occurs through identifying various strategies that enable to make the best out of available resources, thereby shunning unsustainable consumption of natural resources. This underlines an interlinkage between economic activities and resource exploitation in the sense that natural resources should be used by human activity in a way that can be replenished naturally. In the urban context, the goal of sustainability 'may be too far away and holistic to be operational: that is, it may not easily break down into concrete, short–term steps.' (Compbell 1996)

***Operational Sustainability***: Most strategies for operationalizing environmental sustainability are conceived based on the design and development of a wide variety of environmental indicators to monitor, measure, and assess environmental states over many scales and contexts, in an effort to support the transition towards sustainable development and, thus, to move towards sustainability. Indicators can be defined as variables, operational representations of a characteristic, property, or quality as attributes of a system. They depict our image of an attribute of system defined in terms of a specific measurement (Gallopín

1997), such as Ecological Footprint (Wackernagel et al. 2002) and the Environmental Space (Spangenberg 2002). For a comprehensive overview of the main sustainability indicators see (Modlan & Billharz 1997; Ekins 2003). Environmental indicators such as indices of GHG emissions per GDP and the Ecological Footprint are of frequent use in urban sustainability planning.

### 1.6.4. Sustainable Development and Sustainable Urban Development

Underlying the notion of sustainability is the idea of the long–term goal of a balanced socio–ecological system. Sustainable development is a process to achieve this goal. Hence, it entails the planned and strategic development processes of working towards retaining simultaneously a balance of economic, environmental, and social goals – that is, the need for economic development with both environmental protection and integrity and social equity and justice. These are sometimes competing, complementary, and contradictory. The notion of sustainable development was introduced and became widespread – as one of the most widely recognized or often–quoted definitions – in 1987 with the Bruntland Report, in which it is defined as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. Ever since, this definition has raised several critiques at different levels, e.g. vagueness because of value–based concern. Sustainable development is subsequently defined in multiple ways, and the conceptualization of the term is an oxymoron and widely contested (Hopwoodil, Mellor & O'Brien 2005; Redclift 2005; Rassafi, Poorzahendy & Vaziri 2006; Springett 2005; Molnar, Morgan & Bell 2001; Yanarella & Bartilow 2000; Jacobs 1999; Murcott 1997; Munda 1997; Jöst 1996). The difficulty of defining the term carries over its effects to most human activities to which sustainable development has been applied. Although many rely upon the WCED' definition, its operationalization and implementation at the local level is highly contested (Heberle 2006). But, the survival of the earth system is common to all the definitional implications. As argued by Compbell (1996), the concept retains integrity and enormous potential, notwithstanding the shortcomings in its formulation. Overall, sustainable development calls for a change based on rethinking the interaction with the environment, the direction of investments, the orientation of technological innovations, and the practice of institutions in ways that enhance current and future potentials and meet human needs and aspirations.

Since the release of the Brundtland report, sustainable development has been applied to most human endeavors spanning a variety of sectors of society. It has been applied to urban planning since the early 1990s (Wheeler & Beatley 2010). Drawing on the concept of SD, SUD is defined by Rechardson (1989, p.14) as '…a process of change in the built environment which foster economic development while conserving resources and promoting the health of the individual, the community, and the ecosystem. SUD

has proven to be difficult to define. Indeed, it is so malleable as to mean different things to different people. There is no unanimous notion about what kind of strategies and activities that SUD entails. Also, the use of environmental indicators is coherent with the type of the method used to define SUD and the conceptualization of the term as to minimizing demands on resources and adverse effects on the environment within cities.

Cities are the engines for economic development which co–exists uneasily with SD: economics assumes depleting resources and in many ways fail to support SD. The idea of sustainable development is viewed as an oxymoron as development inevitably degrades the environment (Redclift 2005). Nonetheless, to let holistic sustainable development be a long–range goal is an alternative to explore; 'it is a worthy one, for planners do need a vision of a more sustainable urban society. But during the coming years, planners will confront deep–seated conflicts among economic…and environmental interests that cannot be wished away through admittedly appealing images of a community in harmony with nature. One is no…likely to abolish the economic–environmental conflict completely by achieving sustainable bliss... Nevertheless, one can diffuse the conflict, and find ways to avert its more destructive fall–out.' (Compbell 1996)

### 1.7. Structure of the Study

Following chapter 1, which provides a description of the research work, the remainder of the report is structured as follows: Chapter 2 reviews the relevant literature material. Chapter 3 presents and discusses the conceptual and theoretical frameworks. Chapter 4 outlines and discusses the chosen research methodology. Chapter 5 presents the results of the empirical phase, which answers the research questions. Finally, chapter 6 provides concluding remarks, presenting a brief summary of the findings and how they answer the research questions, discussing and reflecting over them, and suggesting avenues for future research.

# Chapter Two

## 2. Literature Review

### 2.1. Environmental, Economic, and Socio–cultural Discursive Aspects of ICT4SUD

Most of studies on the relationship between ICT innovation, the environment, and urban development – identified as ICT4SUD – have estimated that potentially significant reductions in GHG emissions are likely to result from the use of ICT to improve the energy efficiency in most urban sectors. Much of the broader literature (e.g. GeSI 2008; ISTAG 2008; WWF 2008; WBCSD 2009) on ICT–oriented environmentally SUD is analytical or practical – that is, attempting to test various proposed solutions to make urban development sustainable on the basis of technological advances, or applying existing environmental technologies to different activities performed in the cities, urban planning and development. The critical literature focuses on the hopes, myths, dreams, and unrealistic visions associated with the ubiquity of ICT in modern society. This pertains to the ecological subsystem of information society where debates concentrate on whether ICT can advance environmental sustainability (e.g. Fuchs 2005; MacLean & Arnaud 2008). However, from the kind of prescriptive literature, focusing on normative prescriptions for mobilizing ICT to achieve SUD, it appears that ICT4SUD could be understood as a way of practically implementing or applying existing environmental technologies to the planning and development of existing and new cities.

The relationship between urban development and environmental technology implementation and environmental sustainability objectives has been a subject of much debate. That is to say, catalyzing SUD via ICT requires making myriad decisions about sustainable, effective technologies; buildings (re)development; governance; and policy processes. This decision–making occurs through a social process consisting of intricate negotiations, and often disagreements among different stakeholders, as argued by many contemporary scholars of urban and environmental planning processes (Hajer 1995; Healey 2007).

The ICT–oriented low–carbon city has been socially constructed through urban development, economic development, and policymaking processes. ICT4SUD as a discourse is the solution to, or contains an all–encompassing understanding of, current urban environmental crisis caused by economic activities. It is also the defining context for suggested technological solutions. Looking for the wider discourses behind the proposed ICT–based climate solutions reveals an idea of what the environmental problem is and how it is constructed in the broader social context. Before elucidating the relationship between the environmental

crisis of cities and the discursive and material dimension of ICT4SUD, the relationship between the ICT4SUD discourse and other discourses is described next.

## 2.2. The ICT4SUD Discourse

As a discursive field, ICT4SUD represents a wide range of interrelated discursive elements of different discourses circulating in European culture where they are given meaning and applied.

### 2.2.1. The Relationship between ICT4SUD and Other Discourses

The current debates focusing on the potential of ICT in catalyzing and achieving SUD relate to what has come to be labeled 'ICT for sustainable development' (ICT4SD), a discourse which falls under the overarching discourse of sustainable information society (SIS). This concept describes a society in which new ICT is used to improve the quality of life for people of current and future generations, an idea which 'is conceived in a multidimensional way, identifying ecological, technological, economic, political, and cultural aspects and problems.' (Fuchs 2005, p. 219) Therefore, the ICT4SUD discourse metonymically represents the discourse of sustainable information society and, thus, ICT for SD. It is, taken separately, a discursive field, a cluster of discourses around the relationship between ICT and urban sustainability. Thus, it inherently entails many discursive elements, one key of which is energy efficiency technology. This also plays an important role in the interaction between the different discourses that cohabit in, and are grounded by the dominant episteme of, European society, as it establishes a link between information society, sustainability, urban development, and politics discourses and the scientific discourses, such as computer science and environmental science.

### 2.2.2. Urban Crisis and the Discursive and Material Dimensions of ICT4SUD

The existing built environment, ranging in scale from buildings to cities, has numerous environmental impacts, including energy consumption and concomitant GHG emissions. According to IEA (2008), in 2005, households reached 29% of energy consumption, transport 26%, and manufacturing 33% (other services made up the final 12%); as to the total GHG emissions from human activity in 2002, 8% was from buildings (excluding operational energy), 14% from transport, 24% from the power sector, 23% from industry, 17% from waste management, and 14% from land use. The root causes to these environmental issues are understood to be the flawed design of the energy systems that power urban sectors. In other words, as a visible instance, climate change exposes underlying design flaws of industrial systems, which

substantiates the unsustainability of current economic trends. The solution is said to lie at the core of technological innovations, a perspective which resonates with the trend or vision of information society.

The ICT approach is claimed to be crucial to developing the built environment in ways that enables it to provide economic and economic environment with minimized demands on energy resources and minimized adverse effects on the environment. Consequently, planners, homeowners, communities, and businesses are encouraged to adopt energy reduction strategies to help address environmental challenges in European cities. ICT can dramatically improve energy efficiency, an action which is necessary to address climate change and energy use (WBCSD 2009). With ICT becoming a key element in the promotion of SUD initiatives, many European cities are increasingly adopting energy conservation strategies, by either exploiting or investing in energy efficiency technology within a range of urban sectors.

### 2.2.3. The Enabling Contribution of ICT to Energy Savings and GHG Emissions Reductions

***ICT Uses in Urban Activities:*** A number of environmental technologies are being applied to diverse activities that are performed in the cities to streamline urban processes, save energy resources, and reduce GHG emissions. The axis of SUD contemplates economic and environmental efficiency of urban operations associated with such diverse areas as buildings, transport, travelling, sustainable/renewable energy, water management, water management, and so on. ICT is used as a means to make urban consumption and production processes more efficient; hence, its use and application must provide solutions to the economic and environmental pressures which might affect the diverse activities that propitiate the efficiency and competitiveness of European cities. Such solutions depend on sustainable urban planning and strategies and on the projects that EU governments may implement, notwithstanding.

According to Griffiths (2008), quoting WWF, there are various uses of ICT that could improve energy efficiency and mitigate global GHG emissions by at least 100 MtCO2e by 2020, among which include: integrated renewable solutions: employ simulation, analytical, and management tools to enable a wide deployment of renewable energy; smart grid: deploy communication technologies and smart meters within electricity networks; smart city planning: deploy simulators to improve urban design to optimize energy efficiency; smart industry: deploy software applications to forecast, simulate and analyze energy use in production processes; dematerialization: use of ICT services to substitute for physical products and interactions; smart appliances: use of ICT in appliances to tailor their use with needs and improve efficiency; and smart buildings: use of sensors and control systems to improve efficiency. See (GeSI 2008) for ICT uses – technologies and services – in buildings, transport, power grid, motor systems,

and dematerialization and their enabling contribution to global energy savings and GHG emissions reductions. See also (WWF 2008) for global potential of strategic ICT solutions.

***Environmental Impacts of Buildings and Economic and Environmental Gains of Energy Efficiency Improvements:*** Buildings have significant impacts on the environment: major contributors to energy consumption which is correlated to GHG emission. For typical developed nations, buildings will generate about 24 to 40% of anthropogenic GHG emissions, 40 to 95% of which will be caused by operational energy consumption (Dimoudi & Tompa 2008; WBCSD 2009; Gustavsson, Joelsson & Sathre 2010). This is a complex challenge for which technological innovations are assumed to provide adequate solutions. Efficiency improvements from smart building technologies are expected to provide the greatest reduction of energy consumption and in many cases will be the most cost–effective opportunity. GeSI estimates that such technologies could potentially reduce emissions by 1.68 GtCO2e (or by 15%) in 2020 and be worth €187 billion of energy savings (GeSI 2008), with the largest economical energy savings potential coming from the commercial and residential buildings (Deda & Georgiadis 2009). By 2020 carbon emissions from building energy use can be reduced by 29% at no net cost (IPCC 2007, cited in WBCSD 2009) According to WWF (2008), the potential for carbon emission reductions by smart buildings – ICT for planning and operating new buildings – is estimated to increment up to 832 MtCO by 2030. However, notwithstanding the major contribution of buildings to tackling energy use and climate change (WBCSD 2009), the adoption of new technology by the buildings sector remains slow – typical is a 20–25–year cycle for residential buildings and a 15–year cycle for commercial buildings (GeSI 2008).

***Energy Efficiency Technology - Smart Buildings Systems:*** It is an ICT-based monitoring and control system used to manage and save energy. This system involves data measurement, aggregation, and analysis for optimization and intelligent decision support purposes, as well as 'the implementation of optimization strategies and decision taking processes in the underlying infrastructure' (ISTAG 2008). Commonly, 'energy efficiency' refers to rational use of energy, the minimum quantity of energy required, to achieve an intended performance of an application or deliver a functional output from an infrastructure or a system, e.g. building, transport system, motor system. While in theory energy efficiency should lead to less energy use and GHG emissions, this is not the case in practice due to the social and structural factors involved in the operation of systems. Nonetheless, energy efficiency technology is said to have positive impacts on the environment. In terms of the operational energy use of buildings, for example, efficiency should reduce 'energy consumption for acceptable levels of comfort, air quality and other occupancy requirements' (WBCSD 2009)

There are a number of technologies – e.g. measurement instruments, management tools, simulators, and intelligent software agents – available today that could enable more efficient buildings (see GeSI (2008) for a detailed account of relevant technologies and services), one of which is Building Management System (BMS), a computer-based system used in smart buildings to automatically control, monitor, and adjust the mechanical and electrical components and devices of heating, ventilation, and air-conditioning (HVAC) systems, lighting systems, home automation systems, power systems, and so on. It is to be installed in large buildings, public, residential, commercial, and industrial building. Its core function is to manage the environment within the building; monitor system performance; manage demand control ventilation; control temperature and minimize heat/cooling losses; monitor carbon emissions levels; manage window and door operations; provide lighting based on an occupancy schedule; and so forth. Smart building systems could have a significant effect for they have the advantage of being applicable in existing and new–build properties (Madden & Weißbrod 2008; GeSI 2008); however, buildings differ dramatically in terms of energy use, and hence the same ICT application can have very different effects (GeSI 2008).

BMS is based on context awareness: technology is able to sense, recognize, and react to contextual variables, e.g. physical environment (e.g. location, physical conditions) Building 'offer one of the major sources for reduction in electricity consumption by better monitoring in real-time of the ambient environment through autonomous wireless sensor networks, through smart HVAC systems coupling electronically to weather conditions, to sensor networks and to the presence of people in different rooms,…by using more context aware technologies.' (ISTAG 2008, p. 6)

### 2.2.4. Energy Efficiency: Stumbling Blocks and Policy Control and Regulatory Instruments

Notwithstanding the ICT's proven potential in improving energy efficiency in buildings, numerous barriers still seem to be preventing those involved in the design, construction, and use of buildings from adopting energy efficiency technology as ICT–based climate solutions, and, consequently, emissions continue to rise. Various hurdles of financial, informational, organizational, and behavioral form stand in the way of immediate action, albeit the awareness of the availability of technology. A detailed account of these barriers and the proposed solutions to overcome them is provided in (GeSI 2008; WBCSD 2009). For the same issues concerning other urban areas, such as transport, power grid, industry, and dematerialization, the reader is directed to (GeSI 2008).

To support building industry and market transition to energy efficiency, there is a growing need for appropriate policy tools. While several national schemes set up to establish and promote best practice

standards in efficiency and guide proactive urban planners, 'until this currently niche market becomes mainstream, with mandatory standards and smart building regulations, the full positive impact of ICT on the building sector will not be felt.' (GeSI 2008) To corroborate that, WBCSD (2009) found that many building industry professionals adopt new practices because of regulations; hence, 'businesses in the building industry need a supportive policy framework to achieve dramatic improvements in energy efficiency.' Moreover, anecdotal evidence shows that urban planners in European society believe that the EU must financially support efficient buildings in order for the market to move into the right direction. All In all, policies and regulations seem to be indispensable to achieve energy efficiency improvements and market changes. Therefore, considering the contribution of buildings to climate change, policymakers are working on devising the most efficient, cost–effective approaches to improving energy efficiency in building and reducing concomitant GHG emissions. For a tabulated form of suggested policy control and regulatory instruments, see (WBCSD 2009).

# Chapter Three

## 3. Conceptual and Theoretical Frameworks

Discourse analysis cannot be used with all kinds of theoretical frameworks; crucially, it is to be employed together with its theoretical and methodological foundations. In it, theory and method are intertwined as a basis for its use in empirical studies. In this study, I attempt to present and discuss theoretical models in this chapter and methodological guidelines and analytical techniques in the next chapter. The typical vocabulary features the following central notions: 'discourse', 'statement', 'discursive truth', 'episteme', 'knowledge representation', 'power/knowledge', 'subjects', 'social practice', and 'interdiscursivity'. With these notions, I create conceptual and theoretical frameworks that critically link discourse to society.

### 3.1. Foucauldian Theory of Discourse and its Appropriatness for the Study

Much has been written on Foucault's contribution to the social sciences, with a large body of work dedicated to exploring the implications posed by, especially, his theory of social criticism. Foucault played a significant role in the development of discourse analysis through both theoretical and empirical endeavors. Many attempts of exegesis have reflected on the relevance of Foucauldian theories for use in examining and understanding scholarly discourses. Scholars continue to employ the Foucauldian paradigm to different social settings. Until recently, Foucault's theory of discourses has been extended from being used to investigate social issues (e.g. health, security) to include environmental and sustainability discourses and different elements of ecological modernization (Hajer 1995; Dobson 1996; Forsyth 2003; Luke 1999). This has been made possible by the integration of critical social theory with environmental thinking through recent interdisciplinary thought (e.g. Wilson 1992; Ross 1994). Accordingly, this study is informed by the work of Michel Foucault, and the foundations for theory are found in the archeological and genealogical phase of his work. The discussion of discourse in Foucault's work bares the most relevance for understanding and examining scholarly content, e.g. ICT4SUD.

### 3.2. Key Concepts

#### 3.2.1. Discourse

The term *discourse* can be used in varying ways, with different meaning in different contexts. As an environmental planning scholar, Hajer (1995, p. 44) defines discourse as 'a specific ensemble of ideas, concepts, and categorizations that are produced, reproduced, and transformed in a particular set of practices and through which meaning is given to physical and social realities'. Scholars of social sciences

tend to construe the Foucauldian approach to the concept of discourse from different perspectives, such as representation and power/knowledge. According to Hall (1997, p. 44) Foucault defines discourse as '[A] group of statements which provide a language for talking about – a way of representing the knowledge about – a particular topic at a particular historical moment… But since all social practices entail meaning, and meanings shape and influence what we do – our conduct – all practices have a discursive aspect'. To Gordon (2000, p. i–xli), Foucault conceives of it as 'an identifiable collections of utterances governed by rules of construction and evaluation which determine within some thematic area what may be said, by whom, in what context, and with what effect'. But common to all the definitions is that discourse is a particular way of thinking and talking about some aspects of social life or the world – language and its constitution role. The cluster of discourses around ICT4SUD as some aspect of social life is a discursive field. Language used in this discursive field is structured according to particular patterns that, for example, urban planners or ICT experts' utterances follow when they take part in the domain of ICT–oriented SUD. An object of knowledge (e.g. ICT4SUD) can be brought into existence by both language and practice, to draw on Barker (2000). In addition, where a particular set of statements are ideological, discourse is defined as a system of representation developed socially to create and circulate a coherent set of meanings, which serve the interests of certain groups of society (Fiske 1987).

### 3.2.2. Statements and the Governing Rules of Construction

A discourse denotes a coherent body of statements that are organized in a systematic way to create a self-confirming account of social reality and attempt to make it true. The rules governing the construction of statements determine, within a particular topic, what is possible to say, when, and in what context. Foucault analyzes the conditions of existence for meaning production in discourses, and how statements emerge on the basis of historical rules, which delimit what can be uttered. He states that discourse consists of 'a limited number of statements for which a group of conditions of existence can be defined. Discourse in this sense is not an ideal, timeless form…it is, from beginning to end, historical – a fragment of history…posing its own limits, its divisions, its transformations, the specific modes of its temporality.' (Foucault 1972, p. 117) Accordingly, as a discursive field, ICT4SUD creates a network of rules as preconditions for statements to exist and to be meaningful. In this sense, such rule–bound sets of statements impose limits on what gives meaning in the ICT4SUD discourse, and, as a consequence, innumerable statements are not articulated and would never be accepted as meaningful. This relates to Foucault's (1980) conception of power as a constraining force: power is responsible for the particular ways in which the social world can be talked about, ruling out alternative ways of talking.

### 3.2.3. Discursive Truth

Foucault's aim is to study the structure of various systems of knowledge, namely, the rules for what is considered to be true or false. He adheres to one of the premises shared by social constructionist approaches: that our knowledge of the world is not a mere reflection of reality, and thus should not be treated as objective truths; indeed, reality is accessible to us through categories, so our knowledge and views of the world are products of how we categorize it, or, from a discursive analytical perspective, products of discourses (Gergen 1985; Burr 1995). Therefore, truth is a discursive construction or created discursively and hence different discourses as systems of knowledge determine what can be true and false. For example, an array of discourses of sustainability (McManus 1996; Huckle 1996; Jacobs 1999) are available to people today; each carries with it a supporting body of knowledge, and thus 'truth' according to the way things are seen by those who claim a version of truth. Likewise, the construction or formulation of urban sustainability discourses depend on particular intellectual commitment or socio–cultural and socio–political 'baggage' brought to the issue of urban sustainability. While discourses as ways of talking about (urban) sustainability carry different 'truths', only a few, in not one, at some point gain dominance and become authoritative while others are discredited. Indeed, urban planners are in contact with a few discourses of sustainability and the associated knowledge and practices. Constructivistic worldview posits that constructions don't reflect absolute truth in any sense, but are only more or less informed and sophisticated (Schwandt 1994)..

### 3.2.4. Episteme

The concept of discourse is central to Foucault's notion of *episteme*. In Foucault's (1970, p. xxii) terms, episteme is the pre–cognitive space that determines 'on what historical a priori, and in the element of what positivity, ideas could appear, sciences be established, experience be reflected in philosophies, rationalities be formed, only, perhaps, to dissolve and vanish soon afterwards.' The premise is that different periods of history constitute different systems of thought, a historical *a priori* which grounds knowledge and its discourses and hence represents the conditions of their possibility, co–existence, and interaction. Foucault's notion of episteme postulates that all social constructions of knowledge – discourses – fall under the episteme of a historical epoch. Accordingly, discourses around ICT4SUD reflect the configuration of knowledge that is grounded on a set of claims and assumptions that are basic to, or mirror, the prevalent episteme, what European society considers and values to be knowledge, from episteme to episteme. This relates to historical analysis that is used to determine dominant formations of bodies of ideas, institutions, and material forms, in which actions take place.

### 3.3. Cultural Specificity, Historical Contingency, and Representation of Knowledge

Foucault's (1972) asserts that knowledge, whether theoretical or practical, is fundamentally contextual and constantly a matter of episteme. In other words, it is based on historical contingency and cultural specificity. Foucault adheres to the social constructionist worldview that we are fundamentally cultural and historical beings and our knowledge about the world is the product of culturally and 'historically situated interchanges among people' (Burr 1995; Gergen 1985, p. 267). Hence, the way in which we understand and represent the world are perennially changing and constitutes one representation of the world among many other possible representations. Foucault's work is based on poststructuralist approach, which posits that discursive objects are constantly constructed and reconstructed through discursive (and social) interaction. In fact, he seeks to transcend this approach (see Dreyfus & Rabinow 1983), offering what has been called a 'culturalist reading of modernity' (Harrison 1992, p. 84), which is 'historically grounded' and supported by empirical inquiry (Hall 1997, p. 43). With his central concepts of discourse and discursive formations (the regularities that produce discourses), Foucault links culture to representation, and hence culture and its hierarchies and power relations to scholarly texts.

As to historical situativity, discourses emerge as products of people's daily making of history; they circulate freely once established, and change over time. Accordingly, the ICT4SUD discourse is relatively new; it only entered the public mainstream in the late 1990s. It is now established as social practices – institutionalized actions – attached to urban development relate to it in a structured way. It is thus circulating in European culture that it is established as valid ways of thinking about SUD practices; however, it may become powerful or vanish.

### 3.4. Power as Productive and Constitutive Force

One of Foucault's (1970) central assertions is that a discourse of knowledge is a discourse of power, as knowledge is an effort not only to order facts and social actions and events, but also to order human subjects according to a given center. Accordingly, ICT4SUD involves a play of power since no knowledge is for knowledge sake. In dissecting the nature of power, Foucault (1991) contends that it is far more than simple force, radiating around in a complex web of directions and thus operating at all levels of society. In common with discourse, power is everywhere, spread across social practices, and thus not held by particular agents or actors with particular interests (Phillips & Jørgensen 2002). Accordingly, power should not be seen as exclusively exercised in domineering or oppressive acts of particular individuals or social groups, but may be enacted in the myriad taken–for–granted social practices and actions of daily

life. Foucault (1980, p. 19) asserts that power 'needs to be considered as a productive network which runs through the whole social body, much more than as a negative instance whose function is repression.' Discourses and their functions thus become 'tactically productive and strategically integrative notions' (Flyvbjerg 1992, p. 122). In this sense, power constitutes discourses, disciplines, institutions, subjectivities, practices, bodies, and so forth. Foucault 1980) states that power holds good and is accepted because it traverses and produces things, induces pleasure, forms knowledge, and produces discourse. Accordingly, the power of ICT4SUD provides the conditions of possibility for ICT–oriented SUD and what it entails as an aspect of social life. It is difficult to imagine the sustainable city without ICT4SUD in European society.

### 3.5. The Relationship between Power, Knowledge, and Truth

Foucault's notion of power/knowledge has implications for his conception of truth. What draws his attention is the relationship between knowledge and power, and the way it can lead to the generation of particular 'truths' about the human subject (McHoul & Grace 1993). In essence, he concurs with the adage that 'knowledge is power' (power/knowledge), contending that power is implicated in the manner in which certain knowledge (and thus truth) is applied (Hall 1997). Therefore, in his later work, he investigated the way in which a discourse is applied to the social world, focusing on the discursive formations of a particular society, which comprise institutional apparatuses and their techniques, including the rules, the episteme, the institutions, the subjects, and the things. Such formations support what Foucault label 'regimes of truth', which are made true through 'discursive practices'. He thus views truth 'as a system of procedures for the production, regulation and distribution of statements' (Phillips & Jørgensen 2002, p. 14) (as textual arrangements). Accordingly, ICT4SUD imaginaries are discursively constructed and materially reproduced through the European institutional and socially anchored actions or practices. Foucault notes In relation to discourse: 'Truth isn't outside power. …Truth is a thing of this world; it is produced only by virtue of multiple forms of constraint. And it induces regular effects of power. Each society has its regime of truth, its "general politics" of truth; that is, the types of discourse which it accepts and makes function as true'…and 'the status of those who are charged with saying what counts as true'. (1972, cited in Hall 1997, p. 49) Therefore, truth is entrenched in, and produced by, systems of power. In view of that, ICT4SUD as a system of truth is infused with power relations and, thus, ways of seeing which has impact upon the human subject. Put differently, ICT4SUD operates within the limits of the regime of truth and the discursive formations of European culture. However, some views argue that Foucault renders the notion of 'truth' problematic. He exposes his argument of discursive 'regimes of truth' 'to the charge of

relativism', as his focus on discourse can ignore the material and economic structural factors involved in the distribution of knowledge/power (Hall 1997, p. 51). But material processes, e.g. urban environmental crisis, are discursively interpreted – that is, on the basis of socio–cultural, economic, and political factors. Notwithstanding Foucault's theories of power/knowledge are insightful, 'their totalising, omnipotent, metaphysical position places almost too much stress on the Foucauldian paradigm to account for everything…' (Hobbs 2008, p. 13)

With the above points in mind, it is not, Foucault asserting, 'possible to gain access to universal truth since it is impossible to talk from a position outside discourse; there is no escape from representation. "*Truth effects*" are created within discourses.' (Phillips & Jørgensen 2002, p. 14) in this sense, truth becomes unattainable, and thus discourse, being socio–culturally or –politically situated, can make only a tentative claim to truth. This argument is not without critic. Foucault's argument that discourse produces the meanings of objects and practices is an idea that makes the nihilistic proposition that nothing can exist outside discourse (see Danaher et al. 2000). Regardless, '…truth can never be captured and represented in its pure, multi–dimensional form by the limited symbolic constraints of discourse and the limited physical constraints of the medium.' (Hobbs 2008, p.11)

### 3.6. Subjects and Discourses

Foucault provided an insight into discourse analysis' understanding of the subject. One of his key arguments in this regard is that subjects are created in discourses: 'discourse is not the majestically unfolding manifestation of a thinking, knowing, speaking subject' (Foucault 1972, p. 55). This relates to the idea that discourses as systems of representation are linked to culture and its hierarchies and power relations, and thus ways of seeing, which impact on the human subject. As Hall (1997, cited in Hobbs 2008, p. 12) notes of Foucault's implications for understanding representation: 'It is discourse, not the subject who speak it, which produces knowledge. Subjects may produce particular texts, but they are operating within the limits of…*the discursive formation, the regime of truth*, of a particular…culture... This subject *of* discourse cannot be outside discourse, because it must be subjected to discourse. It must submit to its rules and conventions, to its dispositions of power/knowledge. The subject can become the bearer of the kind of knowledge which discourse produces. It can become the object through which power is relayed.' In expressing this position, Kvale (1992, p. 36) states: 'The self no longer uses language to express itself; rather language speaks through the person. The individual self becomes a medium for the culture and its language.' All in all, Foucault's argument is 'that people are not really free to think and

act, because they – and their ideas and activities – are produced by the structures (social, political, cultural) in which they live' (Danaher et al. 2000, p. 8).

### 3.7. Social Practice

There is a dialectical relationship between discourse and social practice. Certain social practices become legitimate forms of actions from within ICT4SUD discourse as a system of understanding the world, and these practices, in turn, reproduce and support the discourse which legitimates them in the first place. Constructionist worldview posits that particular understanding of the world leads to particular social actions, whereby some forms of actions become unthinkable. The ICT4SUD discourse is reshaping the actions of urban planners and policy makers as actors, as well as the meanings these actors ascribe to their undertakings. '…since all social practices entail meaning, and meanings shape and influence what we do…all practices have a discursive aspect' (Foucault 1972, cited in Hall 1997, p. 44). However, particular discursive constructions and the position contained with them open up and close down opportunities for actions, by constructing particular ways of seeing the world and positioning an array of subjects within them in particular ways.

### 3.8. Interdiscursivity

Interdiscursivity is at the core of the construction of ICT4SUD as a corpus of texts, each of which is informed by various discourses regulated by the main discourse. Discourse draws on previous discursive structures by building on related established meanings, and, by merging various discursive elements, it changes the individual discourse as well as the socio–cultural world (Phillips & Jørgensen 2002). Accordingly, ICT4SUD builds on information society, sustainability, and urban development as discourses, and shape some aspects of social reality. Investigation of change is a central area of attention in Fairclough's (1995a) CDA. However, different discourses struggle for the right to define or create truth and thereby operate with a more conflictual picture, a conception that is followed by the majority of discourse analytical approaches and that diverge from Foucault's propensity to identify a single knowledge regime in each historical epoch (Phillips & Jørgensen 2002).

# Chapter Four

## 4. Research Methodology

### 4.1. Qualitative Inquiry: Discourse Analysis Approach

This study involves methodological perspectives drawn from social science, which has its own methodologies – theory and analysis of how research should proceed within a certain domain or research paradigm. Methodological design involves a qualitative method as this investigation is interpretive in nature. Qualitative inquiry entails a range of approaches into data collection and analysis that social scientists/researchers typically rely on, or employ, to examine social, and more recently environmental, issues. The choice of any qualitative approach depends largely on what the researcher intends to investigate. Accordingly, as a qualitative researcher, I employ a discourse analysis approach as a form of contextual, historical, and textual analysis that focuses on discursive content available from the European culture and the more contextual and historical specificities. In the social sciences, discourse analysis is employed to explore the way in which views and understanding are socially constructed and the social effects of specific modes of talking within some thematic area at a particular time of history. Likewise, in environmental sociology, discourse analysis is employed to explore the manner in which environmental issues are constructed by social actors (Dryzek 2005; Hajer 1995). Positioned in the area of SUD, this study deals with the construction of knowledge and the social, cultural, political, and economic contexts in which such representations are ascribed meaning, form, and, ultimately, applied. The next step is to explain what discourse analysis is and the main characteristics of the proposed discursive approach.

### 4.2. Discourse Analysis Methodology

As a trans–disciplinary analytical approach, discourse analysis refers to the study of language usage in relation to some aspects of social life or a particular type of social practice. A number of studies undertaken in recent years to investigate various pertinent social and environmental issues, and in particular issues related to new ICT (e.g. Bibri 2012), urban sustainability (Rapoport & Vernay 2011), sustainability indicators (Ortega–Cerdà 2004), and environmental science (Forsyth 2003; Dryzek 2005), have employed discourse analysis as a research methodology. This emphasizes the appropriateness of discourse analysis as a research instrument in studies of ICT4SUD.

In this study, discourse analysis is employed as an instrument to examine a set of selected documents – that is, to deduce how meanings are constructed in these documents on the kind of environmentally SUD

enabled by ICT, and how these meanings are shaping urban practices in European society in this historical epoch. This is done by exploring patterns in and across a collection of utterances within the thematic area of ICT4SUD and identifying the social implications of different discursive constructions of reality. Informed by various discourses, the selected documents are taken as a socio–politico–economic product, produced by certain European institutions, and interpreted and consumed by European urban planners, individuals, communities, businesses, and organizations. In this context, they are examined for their effects that are associated with discursive 'truths' and how these are created within ICT4SUD through particular discursive mechanisms. What need to be analyzed are the processes through which discourses are constructed as to giving the impression that they depict true or false image of reality (Phillips & Jørgensen 2002).

The intent of discourse analysis is to show how a cluster of discourses around ICT4SUD are deployed in a text to achieve particular effects in the broader context in which that text operates. Indeed, the particular value of discourse analysis is its ability of revealing the effects of linguistic utterances upon social practices: it ought to say something about how social and political action is engineered through discourse. The underlying assumption is that the work of deconstruction and reconstruction of texts can provide hints about issues, such as the intention of the authors of a text due to, for example, their institutional belonging, political commitment; politically dominant ideologies; or the potential influence of certain topics on the people and, thus, their actions. In the context of this study, the ICT4SUD discourse plays an important role in the reproduction of the potential of ICT in achieving environmentally SUD. It is clear from reduction strategies that different social actors advocate the uses of ICT to orientate sustainable cities. In this way, they acquire the mental and social models, the social knowledge, and the ideologies that shape their planning actions. Numerous authors have shown the importance of discourse analysis to understanding how planning decisions are made (Kumar & Pallathucheril 2004; Portugali & Alfasi 2008).

### 4.3. A Foucauldian and Fairclaughian Discursive Analytical Approach

In my analysis, I shall integrate two approaches to discourse analysis, following the work of Michel Foucault (Foucault 1972, 1973, 1991) and drawing on Fairclough (1995a). This relates to what can be identified as multiperspectivism, which entails, in this case, merging elements from Foucauldian Discourse Analysis (FDA) and Critical Discourse Analysis (CDA) as analytical perspectives. Multiperspectivism is of value to this discursive study because different perspectives provide different forms of knowledge about, and thus a broader understanding of, ICT4USD as a phenomenon. Thus, different analytical tools are brought together from CDA and FDA in a unified approach to achieve the objective of this study.

FDA and CDA approaches both aim at a more abstract mapping of the discourses that circulate in society in a particular historical epoch. FDA is concerned with language and its role in the constitution of social life, as well as the role of discourse in wider processes of power and legitimation. It focuses on power relations in society as expressed through the language. From a historical perspective, FDA explores the way in which discourses may shape historical subjectivities. Among the reasons for examining ICT4SUD under Foucauldian discursive approach are that it considers that, in each historical epoch, many discourses (e.g. urban development, sustainability, information society, etc.) coexist and interact; and that it posits that discourses are in constant interaction with political practice and power as two basic elements of the creation and use of knowledge. CDA, on the other hand, studies language as a form of social practice and focuses on the ways socio–political power is said to be visible in text (Fairclough & Clive 1995). Among the reasons for employing CDA in this study is to look at political dimensions of ideology. CDA seeks to unmask the ideological thought and beliefs of the subjects of discourses. While power is a central concept in both FDA and CDA, the latter tends, according to Phillips and Jorgensen (2002), to be ambivalent towards Foucault's conception of power as a constitutive force. Nevertheless, most contemporary discourse analytical approaches, including several types of CDA, find their roots in Foucauldian paradigm. Indeed, among the main tenets of CDA include: discourse is historical; discourse constitutes culture and does ideological work; power relations are discursive; and the link between text and society is mediated (Fairclough & Wodak 1997).

Foucault's approach to 'culturalist reading of modernity' (Harrison 1992, p. 84) has been of a significant contribution to the application of critical thought to both social and environmental issues and the unveiling of hidden politics within the socially dominant discourses. Expanding on Foucault (1991), discourse analysis is used to study the politics of environmental discourse and various elements of ecological modernization and policy processes (Hajer 1995; Forsyth 2003; Luke 1999). One implication of this is that scholarly discourses are socio–politically situated; an argument that rejects the possibility of 'value–free' knowledge. As argued by critical discourse analysts, scholarly discourses are 'inherently part of and influenced by social structure, and produced in social interaction' (van Dijk 1998, p. 352). In a dialectical relationship, discourses reflect and reshape social structures (Fiske 1987). However, critical approaches share the common aim 'of carrying out a critical research, that is, to investigate and analyze power relations in society and to formulate normative perspectives from which a critique of such relations can be made with an eye on the possibilities for social change' (Phillips & Jorgensen 2002, p2). Similarly, a Foucauldian or Fairclaughian discursive approach asserts that the role of discourse analysis is 'to maintain

a critique of social power at the same time that it is bound to *learn* from that critique, or put it to use in concrete, utilizable social analysis.' (Dorfman 2004, p. 11)

### 4.4. Analytical Techniques – Nine Stages

Discourse analysis entails an interpretative reading of texts that is made possible by immersion in a particular culture or society, which provides a discourse analyst with a thick tapestry of 'ways of talking' that he/she may identify, construe, and relate to in a communicative situation. Yet, there are no hard–and–fast or standard approaches to reading texts or identifying discourses, but rather a multiplicity of procedural choices – a set of selected analytical techniques – which provide different insights into the text and, thus, different outcomes. '...there is no clear consensus as to what discourses are or how to analyze them. Different perspectives offer their own suggestions... ' (Phillips & Jørgensen 2002, p.1) Discourse analysis hence constitutes a constellation of approaches rather than a single unitary approach – in other words, discourse analysts use a combination of varied analytical tools to orientate a critical reading of action in texts and reveal the kind of effects they try to achieve. Having identified a set of dimensions that matter the most in the construction of the overall meaning of the selected documents that ought to be analysed, I set out nine stages in discourse analysis. These are detailed separately below.

#### 4.4.1. Surface Descriptors and Contextual Elements

In this stage, I suggest to look at surface elements of the reports – the author and the date of publication – and preliminary background information on the institutions involved in the construction and promotion of the ICT4SUD discourse. Knowing the authors' stand, scholarly or industry affiliation, ideological/political commitments, and institutional belongings serves to locate the text in a certain context. This ought not to imply a deterministic view of the authorship.

#### 4.4.2. Historical–diachronic Dimension

A fundamental aspect of discourse is its historical nature. Texts always build on previous ones, taking up former discourses. Fairclough (1995a, 1995b) conceptualize this relation as intertextuality. I look at the time–related diachronic dimension of analysis, thereby pursuing a historical–diachronic analysis. This is done through examining the temporal evolution of the ICT4SUD discourse where I look at the discursive constructions of ICT and sustainability issues and assess their significance, as well as how constructions of reality in earlier reports did impact on subsequent ones.

### 4.4.3. Epistemic and Cultural Frames

This phase of (frame) analysis looks at epistemic and cultural frames. These are determinant in the construction of social knowledge and its discourses. Belonging to society, an epistemic frame is composed of knowledge, values, truth, identities, and relations, linked by a particular epistemological field – ways of thinking, making decisions, acting, and justifying actions. This relates to the significance of ICT and sustainability issues and of their wider political, social and economic context of information society. Cultural frames involves 'higher level' cultural models, a sort of shared forms of understanding the world. Fisher (1997) advances the notion of 'cultural frames' as 'socio–culturally and cognitively generated patterns which help people to understand their world by shaping other forms of deep structural discourse'. Such frames can be equated to social representations. These are, according to Moscovici (1984), cultural–specific and conventionalized by each society and attuned to its values, as well as prescriptive, in the sense that they shape the way people think.

### 4.4.4. Discursive Constructions and Discourses

In this stage, I identify how discursive objects are constructed in the documents depending on the research questions. It is of import to include both explicit and implicit references as this is a critical step towards understanding and deconstructing the function of discourses. Broader and specific discursive objects are both to consider as well. Having identified all sections of text which contribute to the construction of the discursive constructions, I then focus on the differences between such constructions, as what seems to be one and the same discursive object may be constructed in various ways. Also, I intend to locate the various discursive constructions within wider discourses.

### 4.4.5. Social Actors and Framing Power

This stage looks at the social actors mentioned in the documents as subjects – they do things – and objects – they are the talked about, as well as how they are depicted. Constructing the image of social actors and defining their relations and identities is a key important function of texts (Fairclough 1995b; Phillips & Jørgensen 2002). In addition, the influence of actors in shaping the overall meaning of the text by dictating their views has been discussed in the literature. This relates to what is known as 'framing power' of social actors, which can be described, in the context of this study, as the capacity of one social actor (e.g. ICT industry) for conveying its views and positions through the scholarly or/and business community, by having them represented by scholars, experts, or practitioners in the form of regular text. Having the predominant framing power in relation to a certain topic, e.g. ICT–oriented low–carbon city, is a key

form of socio–political influence, keeping in mind that such a power is not denied by scholars, experts, or practitioners who hold a major power of discursive construction of techno–environmental issues.

### 4.4.6. Discursive Strategies

They provide insights into how the discourse of ICT4SUD operates as to constructing meanings in relation to social, cultural, and political contexts. Wodak (1999, p. 188) describes discursive strategies as: 'plans of actions that may vary in their degree of elaboration, may be located at different levels of mental organization, and may range from automatic to highly conscious.' They entail the forms of discursive manipulation of a certain reality by social actors (e.g. institutions) in the sense of an intervention on that reality to achieve particular effects. Common with discourse is that our ways of talking don't reflect the world, but rather reproduce, transform, challenge, or fix the meaning assigned to reality. This is done by using numerous discursive strategies at different levels of specificity. The focus in this study is on rhetoric and its advanced forms, including framing, subject positioning, and legitimation.

***Framing**: T*he concept of 'framing' or 'frame' has been used in varying ways, by many authors with quite varied meanings. Adding to the abovementioned cultural and epistemic conceptions of frames is that which relates to the structuration of discourse: a central organizing principle that gives meaning to a diverse array of statements. It entails organizing patterns in the text that direct its construction in the sense of giving meaning and coherence to its content. This process logically excludes certain topics. This corollary of framing is one of the key characteristics of discourse. Of relevance in the analysis of framing is how, and not whether, social agents frame the reality in the ICT4SUD discourse. From a textual perspective, framing as a highly discretionary discursive strategy involves an operation to organize a text according to a certain perspective, an authorship intervention which involves using selection and composition/salience when talking about a rather complex reality. In highlighting the notion of choice in discourse, Fairclough (1995b) assumes that text as constructions of reality is a result of choices and alternative choices could have been made. A related, yet distinct, view of framing which puts emphasis on perspective is advanced by Entman (1993, p. 55): 'Framing essentially involves selection and salience: 'To frame is to select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described'. All in all, framing involves a structuring process of inclusion and exclusion of facts and opinions to produce certain meanings.

***Rhetoric:*** It looks at figures of style, including rhetorical figures, such as hyperbolic enhancement and rhetorical mitigation and understatement, and persuasive moves, such as quoting credible sources, scholars, or experts; storylines; argumentative schemes; and so on. Known as the art of discourse, rhetoric entails using language persuasively, a talking mode in which a range of persuasive means can be deployed to achieve intentional effects, e.g. to enlighten, convince, or motivate particular audiences and move them to action with arguments in specific situations.

***Subject Positioning and Legitimation***: Discourse constructs particular ways of seeing the world and positions an array of subjects within them in particular ways. Subject positioning is about constructing social actors into a certain relationship with others, which may entail their entitlement to do certain things. A subject position identifies a location for social actors within the structure of rights and duties for those who use that repertoire. 'Discourses construct subjects, and thus make available positions within networks of meaning, which authors can take up or place other social actors within.' (Bibri 2012, p. 33) While, legitimation entails justifying certain actions by social actors on the basis of normative, environmental, economic, or/and political reasons.

### 4.4.7. Discursive Mechanisms

Discourse mechanisms entail processes through which discourses operate in terms of the construction of meanings in relation to social, political, and cultural contexts. In the discourse of ICT4SUD, such an operation is associated with the creation of meanings in such a way that gives the impression that this discourse represents true images of reality. As a consequence, discursive mechanisms consist of wider effects on the discourse in the broader social context. The force of the discourse and the empowerment of the agent are induced by the variety of effects under the category of discourse mechanisms (Hajer (1995). In the context of this study, discursive mechanisms are associated with discourse structuration in terms of the domination of discursive chains or themes that have a scientific or objective appearance. While this could be intentional, it is not contingent to the actors' constructions. Put differently, actors' discursive interventions are not implicated in discursive processes. However, they do play a subtle role in the way discourses shape and influence social and political action or inaction.

### 4.4.8. Political Practice, Knowledge, and Power

In this stage, I propose to look at some linkage patterns between political action and the ICT discourse. Following Foucauldian approach, political action affects the conditions of the emergence, integration and functioning of discourse rather than the transformation of its meaning and form (Foucault 1991). In

addition, power and knowledge relations affect discourses. The ICT4SUD discourse as an object of knowledge may induce power effects, an exercise that may lead to new objects of knowledge. In Foucault's words, there is constant articulation 'of power on knowledge and of knowledge on power. We should not be content to say that power has a need for a certain discovery, a certain form of knowledge, but we should add that the exercise of power creates and causes to emerge new objects of knowledge and accumulates new bodies of information… The exercise of power perpetually creates knowledge and, conversely, knowledge constantly induces effects of power.' (Gordon 2000, p. i–xli) He adds that it is under the assumption that knowledge is of practical use rather than it is true or false that it should be considered of usefulness and essential to the exercise of power (Ibid).

### 4.4.9. Ideological Standpoints

Ideology is a fundamental shaping influence in the text: it impacts upon the construction and selection of objects, social actors, and discursive strategies and mechanisms deployed in a text. This overarching aspect emanates from the premise that ideology is the basis of social representations and beliefs, and hence impact on the subject of discourse as a text producer. One implication of this is that Ideology reproduces and legitimizes social structures and power. Fairclough 1995b, p. 14) states that ideologies, propositions figuring as implicit assumptions in texts, 'contribute to producing or reproducing unequal relations of power, relations of domination.' Several authors (e.g. Thompson 1984, 1990; Fairclough & Wodak 2000) have investigated the link between ideology and discourse, and identified multiple strategies that serve the power, using linguistic practices in disguise. In all, ideology as a way of representing the world legitimizes or serves the interests of particular social groups. One manifestation of this is that authors may participate (perhaps unwittingly) in the government of society.

In the field of environment, ideology has to do with both political and normative stances on the relation between people and the natural environment. Accordingly, I should look for both stances in the text. 'Political reading' of texts recognizes that politics is not natural, but 'contingent, plural and conflictual' (Carver & Hyvarinen 1997, p. 6). The political dimension of ideology entails the basis for fundamental political standings – that is, in the context of this study, what is the role of the state, which policy instruments are needed, and how European society should respond to environmental issues and be organized. The normative nature of ideology involves values and moral judgment. According to van Dijk (1998, p. 8), as the basis of social representation, '…ideologies allow people…to organize the multitude of social beliefs about what is the case, good or bad, right or wrong, *for them*, and to act accordingly.'

The above stances can be classified into the following discourses: sustainable development, innovation, environmental modernization, green romanticism, and administrative and economic rationalism.

### 4.5. Methodological Reflections

Through interpretive reading, discourse analysis seeks to uncover meanings constructed in texts, and in this way it brings up the issues of the analyst's role, preconception, and subjectivity. The ways in which the analyst influences the reading of texts remain intricate and ambiguous. Although thinking in an interpretive work necessarily is individual, the construction process entails other socio–cultural artefacts and thus inevitably becomes socio–cultural. This relates to constructivistic worldview that reality is socially constructed. Consequently, it is difficult for a discourse analyst to be neutral because he/she is part of a socio–cultural and historical context and thus the text's context, hence the necessity to account for his/her role relative to the text. Discourse analysts may share many of the taken–for–granted understandings, common beliefs, or unquestionable truths – doxa – articulated in the material as a product of their own culture. Therefore, it becomes difficult to treat discourses as socio–culturally constructed systems of representations that could have been different. In addition, the analyst's aim and approach to the topic, and how he/she influences the process of selection, delimitation, and analysis of the material obviously creates a situation where subjectivism becomes inevitable.

Furthermore, our knowledge constitutes one representation of the world among many other possible representations. Thus, it is not a reflection of the actual reality, but rather a product of the way we categorize the world: it is perceived in various ways (and also epitomizes a perennial pattern of change). That said the position taken in relation to ICT or urban sustainability as a field of study from which I, as a discourse analyst, see reality might be different from other taken positions in terms of which reality could look different. Any position taken has implications for determining what can be perceived as reality and be presented as results by the analyst. There exists no single unitary reality apart from the researcher's perceptions, nevertheless.

Espousing a multiple forms of reflexivity is of value to any discursive endeavour. The analyst's role should be tackled reflexively (Phillips & Jorgensen 2002). Reflexivity is 'a key to methodological approach, since the approach itself recognizes that knowledge claims are…permeated with values' (Schwandt 2000, p. 198). To a large extent, it enables the analyst to reduce potential biases. In this regard, a sound way is to explore discourses as yet unexplored universe or system of meaning by distancing him/herself from the material. It is, in fact, fruitful (and necessary) to extract oneself from living in a

culture and what it entails in terms of socially shared representations, to reflect on a culture. It is precisely the taken–for–granted, common–sense understandings that are to be investigated: how some statements are accepted as true is what the analysis should focus on (Phillips & Jorgensen 2002). Alternatively, by seeing the world though theories, it becomes possible to distance oneself from some of one's taken–for–granted understanding (Ibid). It is moreover important to keep in mind that there is no way to gain access to universal truth outside discourse (Foucault 1980). Reality can never be reached outside discourses and thus discourses become the object of analysis (Phillips & Jorgensen 2002).

All in all, reflexivity doesn't solve all issues, but being conscious of one's role, preconception, subjectivism, and intellectual position, and thus associated limits is a starting point to provide a base from which one can pursue methodological rigor when carrying out discursive research. It is argued that a rigorous application of both method and theory generates well–founded arguments and legitimizes produced knowledge. Finally, the aim of this discursive endeavor is to practice social criticism without, obviously, making claims to 'absolute truth' in any sense; besides the aim of discourse analysis is to help realize unacknowledged agendas/motivations rather than to provide definite answers.

### 4.6. The Corpus and Context

The context and origin of the reference documents – four reports – for the ICT4SUD discourse as such is situated to engage critically with it. That is to say, they are produced, interpreted, and consumed within European society. They were published during the years 2006-2009, a period that marked an intense activity of the construction of ICT4SUD discourse - the concept of ICT was introduced and integrated into environmentally sustainable urban planning. The key European promoters of ICT4SUD are: ISTAG, GeSI, and WBCSD. These institutions focus on ICT issues related to economic, urban, societal, and sustainable development. Their reports are thus the main data sources and provide 'thick descriptions' to be analyzed– the key empirical material for the study. As a general rule, I shall delimit the material by making a very narrow selection of texts for analysis. Given both the variety of issues of ICT for SD portrayed in recently published documents as well as the fact that it is typically considered ideal not to use a large size of samples when employing discourse analysis, I decided to examine only those documents dealing with energy efficiency and GHG emission in relation to the urban context.

Given the large size of the body of documents included in this study, only the most relevant excerpts (pertaining to the topics of prominence in the discourse analyzed) of texts are examined in–depth. Of significance, though, to engage in detailed readings of excerpts of text entails working with the entire

content of the selected documents since the objective is to provide a reading of a larger body of material. As an analyst, I am set to examine how discourses operate in the body of the respective reports, which can be attained by showing how discourses, such as urban development, relates to other discourses, such as information society, environmental sustainability, and politics, and how they function in different instances. CDA involves analyzing the dialectical relationships between different discourses (Fairclough 2003). All in all, it is essential to read various texts to illustrate patterns of consistency and variation in the ICT4SUD discourse, in addition to engaging in in–depth readings of excerpts of text. The general premise is that detaching a text from its hinterland is of necessity to misinterpret it since everything is part of everything else. With locating a text in context, one can understand its effects.

# Chapter Five

## 5. The Empirical Study – Critical Discourse Analysis

Till now, I set out a research agenda, confined the empirical data, and decided how it is to be examined to answer the research questions. The aim is to produce a multifaceted, unified analysis.

### 5.1. Surface Descriptors and Contextual Elements

The corpus of texts selected – based on a purposive sampling – for analysis consists of four reports on the potential of ICT in catalyzing and achieving SUD:

1. *Shaping Europe's Future through ICT,* published by ISTAG in 2006.
2. *ICT and Sustainability (including Energy and Environment),* published by ISTAG in 2008.
3. SMART 2020: *Enabling the Low Carbon Economy in the Information Age,* published by GeSI in 2008.
4. *Energy efficiency in building: business realities and opportunities,* published by WBCSD in 2009.

As mentioned above, the ICT4SUD discourse is promoted by certain stakeholders in European society: people, companies, industries, and institutions. While there is nothing wrong with that, to understand the discourse, its context should be acknowledged.

Located in Brussels, Belgium, ISTAG is the committee which advises the European Commission's Information Society Directorate General on the overall strategy for ICT R&D under the Framework Programs for Research and Technological Development (RTD), as well as on the definition and implementation of policy for research in ICT. It consists of a group of scholars and experts operating mainly within the ICT sector. It is thus a strong promoter of ICT, including new ICT visions and the role of ICT in the economy and society.

Located in Brussels, Belgium, GeSI represents an international partnership of ICT companies and industry associations around the globe that claims to be committed to creating and promoting ICT that foster economic and environmental sustainability. Through GeSI, the ICT industry claims to seek to help enhance global environment and economic development and thus contribute to a global sustainable future.

Located in Geneva, Switzerland, WBCSD is a coalition of around 200 international businesses and industries that claim to be united by a shared commitment to SD. This council is concerned with the areas

of energy and climate, the role of business in society, urban infrastructure initiative, energy efficiency in buildings, and so on.

The above information provides fertile insights into key aspects of the context surrounding the ICT4SUD discourse. Due to their raison d'être and driven by their economic objectives within European information society, GeSI and WBCSD work in close partnership on issues relating to ICT and SD. As GeSI (2008, p. 6) states, we will continue to work collaboratively with WBCSD as part of our commitment to continuing to work across the ICT industry as a force for change. They coordinate with ISTAG on issues pertaining to ICT innovation and sustainable development policy, with GeSI and WBCSD providing policy recommendations on energy, climate change, and the economy, and ISTAG defining and implementing policy for research in ICT and its societal and economic application. Evident is their usual, positive stand and submission to the discourse of ICT4SUD, given the institutional position they are offered within it. Also, as institutions, their emergence and development are conditioned by the ICT industry and its success and sustainability in European society. The intricacy of this involvement with, and dependence on, the ICT industry places them in a situation where they are forced to promote the goodness and godliness of new ICT and translate the ICT4SUD discourse into concrete urban strategies and projects that resonate with the industry's ethos and visions of environmental urban sustainability. Moreover, their institutional belonging, ideological commitment, and politico–cultural 'baggage' have implications on their understandings of the role of ICT in advancing environmental sustainability – constructing ICT as holding *a huge* potential in improving the environmental subsystem of information society. All in all, to draw on social constructionist worldview, socially constructed views depend on the situativity of social selves – cultural specificity and historical contingency of human knowledge and actions.

The ramification of this worldview is that ICT4SUD as a scholarly discourse and practice is a reflection and inherent part of, and influenced by, diverse economic, political, and socio–cultural structures. This relates to the relation between scholarship and society. When looking at the role of scholars in the polity and society in the sense that they construct discourse enterprises in cooperation with dominated groups, e.g. industries, corporations, and institutions, in order to, more often, serve mutual interests, it becomes legitimate to cast doubt on, or rather simply reject, the idea of 'value–free' science or scientific knowledge. Indeed, the discourse is constructed in ways that enable those actors to meet their own ends: be a leading institution in the field of ICT for SD; influence policy making to create conditions for the ICT industry to shape the practice of SD; promote the business case for SD; and demonstrate the ICT industry's contribution to urban sustainability and, thus, a sustainable society.

### 5.2. Historical–diachronic Dimension

This dimension is linked to the temporal patterns underlying the emergence of the discourse of ICT4SUD – the release of all reports during the second half of the last decade. ISTAG's reports spell out the prospects, visions, and expectations for mobilizing the potential of ICT to achieve the goals of sustainability, and provide a broader picture of discourse on ICT for SD. Specifically, the first report aims to present a vision for the role of ICT in European society and economy, with a focus on the transformational effects of ICT for Europe's future economic growth and sustainability. The second report intends to highlight the environmental dimension of the link between ICT and sustainable development – energy savings and GHG emissions reductions. These reports helped to understand the role that the ICT sector can play in the transition and progress towards a low–energy, low–carbon city/economy, which is at the core of urban planning. Moreover, with its special politico–economic position in European society and its involvement in ICT R&D for more than a decade, ISTAG has significantly contributed to the emergence, insertion, and development of discourses around ICT for SD. Therefore, the ISTAG's reports paved the way for the production of GeSI's report, which, in fact, comes as a detailed version of the first and second chapters of the ISTAG's second report, while the WBCSD's report is linked to the first section of the ISTAG's second report on 'Building on Cities ', as well as presents a detailed account of energy efficiency in buildings, which is one of the ICT enabling effect covered in the GeSI's report. All in all, the idea of ICT4SUD has discursive, rhetorical, narrative, and material grounds from which it has grown and is starting to solidify into a defined approach into thinking about urban development practice. This historical diachronic analysis indicates how intellectual and ideological consistencies between reports led to the construction of ICT4SUD.

### 5.3. Epistemic and Cultural Frames

To comprehend the framing of the whole discourse of ICT4SUD, it is essential not to conceive of it as an 'isolated island' or a freestanding – detached from a pre-cognitive space. One may wonder whether in the light of counter conceptions that the ICT4SUD discourse is constructed (perhaps unwittingly) by its promoters in information society. Indeed, the view on the ICT potential in achieving SUD is prevalent nowadays primarily because the institutional structures and/or practices are being transformed in a way that embodies the discourse. ICT4SUD is so entrenched in European culture that it is very difficult to see how one can challenge it or treat it as socio–culturally constructed meaning–system because of the taken for–granted, commonsense understandings that are articulated in it. Adding to this is the predominant framing power held by its promoters, which is an important form of social and political influence.

### 5.3.1. Epistemic Setting/Background

The question is why it is that the technological understanding of sustainable cities has gained dominance and become authoritative while other understandings seem to be discredited in the framing of urban reality. One justification for this is that the underlying discursive and material selectivity of ICT4SUD mirrors the current dominant configurations of bodies of ideas, institutions, and material forces of European society, what it considers and values to be knowledge and institutional practices, within which actions take place. The subjects who produce the ICT4SUD discourse are operating within the limits of the episteme, the institutional apparatus and their techniques, and the regime of truth, of European culture at this historical epoch. Therefore, EU governments as agents are seen to work within – and will change – the parameters created by more general (dominant) structures. Other patterns of drawing together agency and structure in relation to SUD will materialize, and hence the future is not predetermined, but open to alternatives which can be shaped by social practices – e.g. the adoption of ICT-based reduction strategies. Indeed, changing overtime, social constructs as objects of knowledge and facets of reality are constantly reconstructed by people as they act on their knowledge over and over.

### 5.3.2. Socio-cultural Constructs

The above point relates to the second justification which is that the respective understandings operate within the prevailing socio–cultural frames. Regardless of whether the social framing power is yielded or denied by the promoters of ICT4SUD who hold a major power of discursive construction of urban techno–environmental issues, the interplay between ICT4SUD and information society as well as the links to macro cultural and economic approaches, ought to be recognized. The underlying macro norms and regulations support the discursive–material dialectics of the so–called ICT–oriented sustainable urban change as part of a foreseen social transformation. The underlying beliefs of the information society discourse is that 'a total social transformation is predicted and that this transformation is generally a good and progressive movement' (Uimonen 2001). The idea is that ICT as an overarching notion, must affect, and be affected, by every aspect of societal development.

Consequently, urban environmental crises ought to be cognitively and socially perceived through the cultural frames of information society – the lens of ICT culture. ICT innovations and what is technological feasible – unexplored possibility of the discursive–material dialectics of ICT–enabled SUD – ought to be prioritized as to solving such crises – that is, to occur within what is conventionalized by information society and attuned to its values. The knowledge of ICT and sustainable development as part of the

prevailing episteme is a result of social interaction where shared truths and values are constructed. In this sense, viewing the world is generated and maintained by socio–cultural processes that lead to the generation of shared constructs (or frames) in the form of patterns which are used to understand the world through forming different deep structural discourses. None of such constructs could have existed without society; and they could have been constructed differently had the society so chosen. See the next analysis phase - section 5.4 - for examples frames in relation to SUD.

### 5.3.3. Urban Environmental Crisis and the Discursive and Material Dimensions of ICT4SUD

Concerning the question of why it is that SUD becomes technological. Attention would be directed towards different material trends affecting the conditions for ICT4SUD. These trends include: and are not limited to, complete dependence of the economy on ICT, ICT pervasiveness and massive use, and the evolving technologization of society. The urban environmental crisis as material processes get interpreted discursively accordingly: the root causes to such a crisis are understood to be the flawed design of the energy systems that power urban activities. In other words, climate change exposes underlying design flaws of industrial systems, which substantiates the unsustainability of current economic trends. The solution is said to lie in ICT innovation, a perspective which resonates with the vision of information society.

Jessop (2004, p. 167) states: crisis 'is never a purely objective process or moment that automatically produces a particular response or outcome; in short, it is potentially a path–shaping moment, and such path–shaping is mediated discursively and materially. 'Crises encourage semiotic [or discourse] as well as strategic innovation.' Accordingly, urban environmental crises encourage the discourse of ICT4SUD and the use of technology. Thus, the ICT orientation of sustainable city becomes possible with the discursive use of the pervasiveness of, and the complete dependence on, ICT in the information society which relies on the transformational and constitutive effects of ICT for its development. A discursive interpretation about the nature of the urban environmental crisis takes place and the choice of certain conservation strategies over others – discredited – is formulated against that interpretation. Then, ICT4SUD as a social phenomenon becomes institutionalized, conventionalized, and known by the constituents of society. The inescapability of the employment of CT has consequently implications for formulating unconventional reduction strategies for addressing urban environmental challenges; indeed, it is a strange switch to make in the event of the dominant societal model. Thus, ICT–oriented sustainable city should not be treated as something universal or neutral. ICT4SUD should rather be conceptualized as a 'hegemonic discourse' socially constructed in the light of specific views and conceptions about the recent economic, political, and socio–cultural changes to European society. Accordingly, 'ict4sudic' imaginaries become hegemonic

because they are discursively constructed and materially reproduced through institutional practices. Drawing on Jessop (2004), a resonance with material practices is crucial for the construction of ICT4SUD.

In all, the ICT–oriented sustainable city/economy has been socially constructed through urban development, economic development, and policy–making processes, that is, through the intersection of diverse economic, socio–cultural, and political narratives which seek to ascribe meaning to current urban problems by construing them in terms of past industrial fiascoes and future technological opportunities - what ICT has to offer in the context of the postindustrial society. Thus, ICT4SUD is not a model, but the outcome of a social process involving certain European stakeholders. From this perspective, there can only be a scattered archipelago of local perspectives on sustainable city/economy. In other words, it is relevant to make sense of the diversity of different SUD approaches.

### 5.4. Discursive Constructions and Discourses

Contingent to the research questions, the main discursive objects of the reports include: 'ICT has a role in 'Europe's future…sustainability'; ICT is 'shaping Europe's future'; ICT is 'a key element for addressing the challenges in…urban planning'; 'ICT is essential for bringing more advanced solutions for societal problems'; 'ICT is 'an enabler for sustainable development'; and ICT is 'an enabler for energy efficiency'. A key implicit object is: the EU's central role in the development and promotion of ICT4SUD.

As a discursive field, ICT4SUD entails a cluster of discourses, which circulate simultaneously in European society, including sustainable information society, SD, sustainability, urban development, neoliberal economy, politics, and so on. In the reports, the authors draw on information society discourse when they talk about the transformational effects of ICT for societal transformations, e.g. Europe can, through ICT 'realize a green economy and make the transition to a low carbon economy' (GeSI 2008, p. 3), as well as when they construct technological innovations as of a pivotal role in shaping Europe's future. Describing how ICT can contribute to sustainable development through providing climate solutions, e.g. smart buildings technologies to reduce GHG emissions, resonates with sustainable information society discourse. Speaking about indices of GHG emissions draws on sustainability indicators which are key discursive elements of sustainability discourse. Talking about the possibility of achieving a sustainable urban society in terms of zero emissions is informed by sustainability discourse as well. Constructing sustainable development as best achieved through open and free markets draws on neoliberal economy discourse. Paradoxically, Keynesianism model seems to be still needed, *but only for the transition of the local market towards* energy efficiency in buildings. 'Appropriate policies and regulations are necessary to ensure

that the right conditions are in place for the market to work effectively [i.e. to move to energy efficiency in buildings].' (WBCSD 2009, p. 30) This mode of talking involves also politics discourse: stressing the role of policy in the adoption of energy efficiency technology in buildings, in addition to giving recommendation to sanction the ICT sector to lead sustainable development in European society.

### 5.5. Social Actors and Framing Power

The main European actor represented in the report is the ICT industry (in addition to political and policy bodies and the authors themselves as institutions). This is an indicator of the preferred sources and of the reports' main framing of the potential of ICT in enabling and catalyzing SUD. In the reports 1 and 3' construction of this social actor, the following aspects are worth noting: the repetition of references to the ICT sector; the fact that the reports' account of techno–environmental construction follows the views of this actor closely; and the highlight awarded to constructing its image, as illustrated by the following quotes:

'The ICT industry has a very significant role to play in reducing [GHG]…emissions.' (GeSI 2008, p.3)

'We now have evidence demonstrating that the ICT industry is a key player in creating a low carbon society.' (Ibid, p. 6)

'The ICT sector can't act in isolation if it is to seize its opportunity to tackle climate change. It will need the help of governments and other industries.' (Ibid, 9)

This constitutes this social actor into the main definer of the represented reality. In other words, the dominant framing of the reports is clearly the one advanced by the ICT industry – that is, its accounts and visions of ICT4SUD are all over. There is both an interpretive and descriptive reinforcement of the ICT industry's role, position, and views. Therefore, the construction of ICT4SUD by GeSI, WBCSD, and ISTAG is very much a function of the initiative of this social actor to organize their claims. Precisely, while the GeSI and WBCSD' depiction of ICT4SUD depends on the preferences of the sustainable development and business practitioners, it necessarily builds on the ways the ICT industry (through ISTAG) constructs ICT in its previous discourses and future visions. In all, the agency of the ICT industry and ISTAG is influential in the construction of reality. Furthermore, in ISTAG's framing of reality (reports 1 and 2), there is no link to specific scenarios, and hence recommendations in relation to ICT4SUD seem to be more abstract: they are quite comprehensive and provide broad guidelines. The reframing of reality by GeSI and WBCSD entails concrete application scenarios, and therefore specific recommendations are more easily reduced to practical decision making and strategies relating to urban development and policy practice.

In report 3 and 4, planners and homeowners are talked about as passive recipients of what the ICT industry proposes as a smart solution, and the building sector is, in report 4, blamed for not embracing it.

### 5.6. Discursive Strategies

#### 5.6.1. Framing – Operation of Inclusion and Exclusion

The framing of reality revolves around highlighting the appealing economic and environmental benefits that cities can gain from the adoption of ICT–oriented reduction strategies. A detailed account of related facts, opinions, and value judgment – inclusion process – is provided in the literature review chapter. See also Appendix A for a set of specific quotes illustrating this framing operation which entails a textual arrangement to produce a certain meaning and selecting some aspects of the perceived reality and rendering them more salient in communicating the reports to the public and policymakers, in such a way as to promote the urban environmental problem definition, causal interpretation, and treatment recommendation for ICT and thus energy efficiency technology. Underlying this framing operation is the wide assumption that potentially significant GHG emissions reductions could result from the use of ICT to improve the efficiency of buildings and cities and other urban sectors.

With an evident attempt to turn, or extend, what is predominantly economic to environmental as well as to present the critical look into ICT only in terms of its direct environmental effects, the frame, the main underlying idea, leaves out significant aspects of the construction of ICT4SUD, meaning that an array of facts and issues are ruled out in the construction of reality which is far more complicated than how it is framed within the technological perspective of how to make cities environmentally sustainable. Indeed, there are intricate relationships and tradeoffs among the direct, indirect, systemic, structural, and constitutive effects of energy efficiency technology as an instance of ICT, in addition to the associated rebound effects, for the environment that flow from the embeddedness, development, use, application, and disposal of energy efficiency technology throughout the urban sphere. If widely deployed, energy efficiency technology is likely to be as pervasive and massively used as computers and mobiles given that its application spans every urban arena. However, the ICT4SUD promoters seem to eschew the interrogation of energy efficiency technology, preferring to see it as a realist urban enterprise.

***Structural and Constitutive Effects***: They are extremely intricate to tackle because they arise from the embeddedness of technology in economic, industrial, and socio–economic structures and practices. ISTAG (2006 p. ii) states: '…ICT becomes more deeply embedded into the fabric of European society…' As a 'constitutive technology', ICT shapes how we do things; 'it transforms…and becomes an integral part of

almost everything we do' (Ibid, p.2). From this perspective, the large–scale structures are so dependent on technology that technology becomes the defining factor of the overall patterns of energy consumption – assuming that current economic trends are unsustainable due to the current levels of GHG emissions being released in the atmosphere. Put differently, given that cities are seen as major consumers of energy resources and generators of GHG emissions primarily due to the intensity of economic activities, and given the fact that 'ICT is providing the key basic infrastructures for all vital social and economic processes' (ISTAG 2012, p. 3), ICT must have a seminal shaping influence in the way energy is being used and the kind of profound effects this use pattern has on the environment in the context of postindustrial or information society. As a postulation, if ICT innovations play a key role in fuelling economic growth and improving productivity, which obviously requires energy resources in addition to information manipulation, then the development of ICT inherently define the amount of energy to be consumed. This is analogous to what happen in the past with the electric motor and the steam engine as pervasive, efficient technologies: they increased society's energy use because of economic growth and productivity. It seems that in ICT4SUD the view of Heideger (1962), which postulates that technology will enflame our world, is reconstructed. Society and its resources are made available as input to the acting of technology as artificial devices and systems in urban environment. A critical discourse analysis should reveal the constitutional price information society has to pay for this offer of economic growth and productivity improvement. It becomes clear how ICT effects on the economy have evolved to the point of complete dependence for which there seems to be a penalty to pay in terms of energy usage as an externality to the embedding and constitutive effects of ICT.

***Rebound Effects***: Structural effects are intricately linked to rebound effects which are as difficult to come to grips with. ICT advancements have played a key role in improving the (energy) efficiency of motor systems – machineries and engines – used in manufacturing processes, which applies for the industrial plants and facilities that produce ICT equipment such as smart and environmental technologies and services. This improved efficiency results in lower manufacturing costs, decreased prices, and greater purchasing power and, consequently, result in increased demand for such technologies and services given their economic gains, which comes with adverse environmental impacts. Likewise, a higher efficiency of the production of energy as a product or service due to technology, among other factors, leads to an increase in energy consumption subsequent to price decrease. Adding further complexity, it is because smart sensors, computing devices, and ubiquitous computing infrastructures become financially affordable that energy efficiency technology, and other new ICT applications, has recently attracted increased

attention. It is the dramatic favorable shift in cost and performance of technology that makes it accessible and widespread and defines each era of computing and its application in information society.

Furthermore, GHG emissions reductions enabled by energy efficiency technology are likely to be minor, if not worsened, in the improvement of energy efficiency technology coupled with the absence of parallel measures to manage or alter demand for energy that power urban sectors, especially buildings. This is due to the rebound effects likely to be triggered by increased demand for energy resulting from its decreased price due to less use of energy subsequent to energy efficiency improvement. In this sense, energy use will continue to increase in buildings (and other urban sectors such as transport and industry). While ICT allows for better energy efficiency in all types of buildings, energy savings are lost to greater consumption of energy due to rebound effects. Similarly, the improved performance and efficiency, in addition to low cost, of energy efficiency technology, paradoxically, may not result in less GHG emission, as opposed to what is widely assumed, but rather escalate it due to an ensuing increase in the consumption of energy efficiency technology equipment which requires energy to operate. A commonsensical conclusion is that energy efficiency improvement to function, it must be combined with demand management side in terms of both products and services; but, the conundrum lies in the unfeasibility of this amalgamation simply because one can't manage what one can't have control over (individual and social behaviors). Ignoring the factor of social behavior with respect to how energy efficiency technology as an ICT application performs is meant to mask the detrimental face of ICT as to the environmental impacts resulting from its increased use due to the intensity of economic activities that take place in cities. Coming to grips with rebound and structural effects is no easy task under the dominant economic and social structures. For further discussion of rebound effects, examples relating to other urban sectors, and in relation to energy efficiency in buildings in Sweden, see Appendix B.

***Indirect, Direct, and Systemic Effects***: In the urban context, indirect effects arise from the adoption and use of energy efficiency technology throughout the urban sphere, e.g. commercial, public, residential, and industrial buildings. From this perspective, the environmental impacts of energy efficiency technology derive from the GHG emissions resulting from the extensive energy required to power the myriad computing devices, systems, and processes embedded in automated building systems across cities. Such computing technologies are used to operate and control the mechanical and electrical components of energy systems that power buildings operations. They are also entrenched in transport systems, motor systems, and power grid for efficiency purposes. What may worsen the indirect impacts of energy efficiency technology is the design flaws imbedded in ICT hardware and software in terms of energy use. For a detailed account of the unsustainability of ICT design approach in terms of energy–intensive use

and concomitant GHG emissions, coming mostly from the use phase of the whole life–cycle, see (Bibri 2009). The indirect environmental effects of energy efficiency technology are difficult to measure at the micro and macro level.

In addition, the use of smart and environmental technologies – processes, devices, and systems – involves direct impacts on the environment, which arise from the development, manufacture, distribution, maintenance, and disposal of energy efficiency technology equipment and services by the ICT industry. Such technologies induce environmental impacts by generating GHG emissions which drive from the energy used to produce computer hardware and software, operate industrial facilities, transport energy efficiency technology equipment, and provide services. The direct environmental effect of ICT, in general, has been discussed profusely and researched extensively (e.g. Forge 2007; Madden & Weißbrod 2008; Bibri 2009; WSIS 2003, 2005; Hilty, Ruddy & Schulthess 2000) in terms of: resource depletion, through extracting huge amounts of material and scarce elements; hazardous chemicals; toxic waste disposal; and water waste. The direct effects of energy efficiency technology will exacerbate due to the projected growing demand for energy efficiency equipment and services due to the economic gains resulting from the long–term benefits coming from using less energy and reduced energy costs, adding to the belief in the ICT unsurpassed ways to enable a low–carbon society.

The systemic effects of energy efficiency technology are more complex to deal with than the indirect and direct ones. No wonder that they are utterly concealed in the ICT4SUD discourse. Addressing this complex challenge is of a real dilemma in information society. There is unlikely to be a 'magic bullet' solution for this conundrum. There is uncertainty surrounding the kind of changes that will result from the obtainability and utilization of energy efficiency technology in terms of how the overall energy consumption patterns will play out. That is to say, in what way the adoption of energy efficiency technology will change social, economic, and behavioral parameters, including attitudes and behaviors of citizens and communities as adopters of energy efficiency in buildings, organizational structures, and economic structures, patterns, and behavior. While the large–scale economic, social, and individual choices if made in the 'imagined' direction would have a great potential in responding to the challenge of climate change, current realities of, for example, energy efficiency in buildings reveal a whole different story: there is a long way to go to mainstream energy efficiency technology, if this materializes at all. It is evident from report 3 and 4 as well as other studies (e.g. Nassen, Sprei & Holmberg 2008; Nair, Gustavsson & Mahapatra 2010) that the process of acceptance and adoption of energy efficiency technology is not straightforward or without struggles with homeowners; urban planners, designers, and architects; and building businesses and professionals. The acceptance process is far more complex than how GeSI (2008) and WBCSD (2009)

describe it and propose to resolve it. It entails a set of intertwined, convoluted micro– and macro socio–economic, socio–cultural, and political factors. At present, the adoption of energy efficiency in buildings involves informational, behavioural, financial, market, and organizational hurdles to the adoption of energy efficiency in buildings that must be addressed and overcome prior to talking about how ICT uses will change economic and social structures behavior. All in all, what remains of greater certainty is that there is no certainty as to how the environmental conundrums of ICT could be tackled.

### 5.6.2. Rhetoric

***Rhetorical Figures and Persuasive Moves:*** Are used to persuade and motivate citizens, communities, and organizations, as well as political bodies to move to action as to the adoption of energy efficiency technology and its institutionalization, respectively. Hyperbole, the exaggerated construction of the potential of ICT in enabling and achieving SUD, is most frequently used in all reports, as it has a strong influence on people's perceptions and social models. Hyperboles 'preferentially affect the organization of models or the formation of opinions embodied in such models.' (van Dijk 1993, p. 259) Among the persuasive moves deployed in the reports include: rhetorical mitigation of rebound effects; rhetorical understatements of 'our' negative actions (ICT direct effects); hyperbolic enhancement of 'our' positive actions and 'their' negative actions; storylines (in report 2 and 4); and quoting credible sources or experts. Argumentative schemes are intensively at work given the formal and scientific writing style followed in the reports. They involve the use of sustainability indicators; overblown future estimations of GHG emissions reductions offered by ICT; and climate change whose deleterious and catastrophic effects are a type of rhetoric that is hyperbole itself, according to some skeptics. See Appendix C for excerpts of texts depicting the above rhetorical moves and for a discussion of the persuasive effects of rhetoric.

In the grip of the sustainable city fallacy, forecasters and ICT4SUD promoters predict scenarios based on delusional optimism rather than on a rational weighting of environmental gains, risks, uncertainties, and probabilities. They overestimate the ICT-enabled GHG emissions reductions. They involuntarily spin scenarios of success and gloss over the potential for miscalculations and failures. Looking at the dominant socio-economic realities, scenarios for environmental gains are built upon not only delusional optimism, but also upon unreliable data, the use of inappropriate forecasting models, strategic misrepresentation, or, perhaps, honest mistakes. In other words, these scenarios are only extrapolations from the present, based on the views of certain players – with particular agenda – as to how ICT would dramatically reduce GHG emissions in an undeviating fashion. For the ICT industry and GeSI and WBCSD coalitions, such scenarios serve as springboards for ideas about what sort of SUD, environmental technologies, low–

carbon economy, energy efficiency technology markets, and sustainable information society, are necessary to arrive at these scenarios. To make scenarios for GHG emissions reductions remains far from an above suspicion activity. In addition, energy efficiency technology scenarios, applications, and developments depict an unproblematic sustainable urban change. They are inclined to portray only the bright side of energy efficiency technology; its rejection is hardly envisioned while its current–day social and corporate acceptance is facing many hurdles.

***Rhetorical Elements***: Energy efficiency technology plays a key role in the creation and evolution of the ICT4SUD discourse and in its interaction with political discourses. Built on monitoring and control systems, energy efficiency technology can be used as rhetorical elements, giving ammunition to an ICT–oriented approach to SUD because of the potential of ICT in transforming the way to manage, use, and save energy resources across urban sectors. This indeed enables significant energy savings, but there is no empirical evidence – statistical significance – for GHG emissions reductions. In addition, with the intention to persuade others to a particular view of urban environmental problems and of ways to solve them, energy efficiency technology tends to be used as rhetorical elements giving ammunition to supporting different pre–determined political positions. This entails the introduction of new concepts by WBCSD or GeSI (or other partner institutions), such as those indicators or codes associated with efficient, smart, or green buildings. Many of related concepts have been successfully introduced into European society. 'The ICT sector must act quickly to demonstrate what is possible, get clear messages from policy makers about targets and continue to innovate radically to reduce emissions.' (GeSI 2008, p. 6) Introducing these labels, WBCSD or GeSI seek to shift attention away from the aforementioned multiple effects of energy efficiency technology, and ICT more generally, on climate change (which is of high topicality at the present time), which are associated mainly with economic structures and behavior. Instead, the focus is moved to barriers and policy issues (see report 3 and 4). By introducing this new rhetoric, the view of the problem shifts from the adverse environmental impacts of energy efficiency technology.

### 5.6.3. Subject Positioning, Legitimation, Power, and Subjectivity

Subject positions and power relations between subject positions are key aspects of discourse. In constructing objects, the ICT4SUD discourse offers an array of subject positions with implications for legitimation and power. When taken up, positions have also ramifications for subjectivity.

***Positioning and Legitimation***: ICT4SUD as a set of discursive constructions produced by certain European institutions positions different social actors in ways that entitle them to undertake different actions in

different context, e.g. SUD. It positions ISTAG as the advisory leading agent of ICT R&D and ICT policy and the pioneer of new ICT visions, and its actions are legitimized on the basis of the mission to shape European society's future and transform the way it functions by transforming the role of ICT in the leading sectors of society, e.g. urban development. The ICT4SUD discourse positions GeSI and WBCSD as leading institutions in the promotion of ICT business solutions to SD, and their actions are legitimized because of their claimed commitment to foster environmental and economic sustainability. In addition, positioning the ICT industry as the enabler and the driver of a low–carbon economy aids the construction of an image of leadership in creating a low carbon society and, thus, instigating urban sustainable change. The reports' construction of energy efficiency technology is a powerful legitimation of ICT industry's understandings and actions as to SUD. This legitimation entails altering the social and physical reality of urban development. in all, the legitimacy of these groups is tied to their behavioral patterns and the general assumption of this pattern as desirable – ICT–oriented SUD – within the European constructed system of beliefs, norms, values, and meanings.

***Subject Positioning and Power Relations:*** By the formulation of ICT4SUD, the discourse legitimizes the disciplines or fields concerned, such as ICT–oriented SUD and ICT–enabled low–carbon city/economy. These fields construct, refine, and impart the related knowledge, and scientists and scholars working within such fields both develop this knowledge and gain by being experts in it. The institutions (e.g. ICT companies, sustainable development institutions, planning councils) are also legitimized as the experts in knowledge surrounding ICT4SUD. It could be said that these institutions lay claim to ICT4SUD. The subject positions dictated in the ICT4SUD discourse give the ICT industry the power to research and develop new smart and environmental technologies in collaboration with sustainable development institutions and policymakers. Together, they contribute to discursive practice (to write, speak, teach, promote); induce power effects of ICT4SUD as an object of knowledge; and implement, market, sell, and disregard technological solutions. Furthermore, the ICT4SUD discourse establishes a complex relationship and interdependence between the ICT industry and its partner institutions, on the one hand, and other social actors in European society, including citizens, communities, planners, and organizations, on the other hand. It places the latter actors in the position of the receiver of expert knowledge handed on by ICT and ICT for SD experts. In other words, different subject positions are dictated by ICT4SUD, but each of these positions has subordinate status to these experts. A power relation is central to how the subjectivity of the experts and the other entities is performed. Hall (1996) describes the process of calling into action subjectivities as interpellation. Subjectivities are performed by people carrying out what is required of them, namely, activating their agency (see McNay 2000). To draw on Foucault (1980), power becomes

both constructed and employed by those who gain by the discourse, related fields, and titles. Further, as to the link between discourse, power, and truth, the ICT experts concerned with ICT4SUD gain their status and prestige by claiming access to expert knowledge that is constructed as true and assured by academic and expert positions.

***Subjectivity***: As to the relation between the ICT4SUD discourse and subjectivity, when taking up the main positions, the ICT industry and its partner institutions inevitably see the world from the vantage point of those positions and in terms of the discursive constructions they use, which are made relevant within the discursive practice in which they are (favorably) positioned. This has implications for the ICT experts, scholars, and companies' subjective experiences. There is no necessary direct link between language and (collective) social cognitive states, I can do no more than to delineate what can be experienced or thought from within the offered subject positions; whether or not, and to what extent, ICT experts, scholars, and companies, via their institutional representatives, do think in these ways on particular occasions is a different question, which can probably not be answered solely on the basis of CDA or FDA. It could be argued that the experience of: making big strides towards SD, the triumph of finding the missing link between the economy and the environment, and being capable of delinking urban development from environmental degradation due to the potential of ICT to manage and save energy are available to those positioning themselves within the construction of ICT as an enabler and driver for urban sustainable change. While taking up the position of the ICT promoter or positioning oneself within the construction of ICT as the strongest change means Europe has to its disposal involves a sense of time urgency in relation to making decisions and taking actions. As ISTAG (2006) states, there is an added sense of urgency for Europe to reshape its economy and society through ICT to ensure a sustainable future.

### 5.7. Discursive Mechanisms

#### 5.7.1. Scientific Discourse and its Legitimation Capacity

ICT–oriented conservation strategies represent a reaction by European society to the pressure of global warming resulting from the build–up of GHG emission generated by urban activities. Pressure–state–impact–response scheme, which brings out the cause–effect links of the environment and the actions realized by the society on it, is a common approach used in Europe for constructing environmental indicators. Energy efficiency technology–oriented reduction strategies are conceived based on the development and monitoring of urban environmental indicators. Given that energy efficiency technology is a key discursive element of, and plays a key role in, the ICT4SUD discourse, it becomes obvious that ICT4SUD builds on environmental indicators and climate change as key discursive elements of

sustainability discourse, in addition, evidently, to computer science (or computing). These are associated with the scientific discourse which gives legitimacy and authority to the ICT4SUD discourse. There are many expressions inside ICT4SUD that use (overstated future) estimations of GHG emissions reductions enabled by ICT and linked to climate change and values of environmental indicators to increase the credibility of the utterances. The following is an illustrative quote:

In total, ICTs could deliver approximately 7.8 GtCOe of emissions savings in 2020. This represents 15% of emissions in 2020... It represents a significant proportion of the reductions below1990 levels that scientists and economists recommend by 2020 to avoid dangerous climate change… Globally, smart buildings technologies would enable 1.68 GtCO e of emissions savings…' (GeSI 2008, p. 9)

The uses of computing, environmental indicators, and climate change all have the particularity of having a scientific–objective appearance. Computing involves the accuracy of data measurement and monitoring of energy use and GHG emissions in buildings and cities. This allows the users of computing in relation to energy efficiency technology to link SUD utterances with the scientific discourse, which is a main source of legitimacy in European information society today. With this legitimacy, energy efficiency technology plays a major role in ICT4SUD. However, given the actuality of GHG emissions reductions, there is an overvaluation of objectivity by computer science and ICT industry. Furthermore, most of environmental indicators are seen as objective for they are quantitative – statistically–based. They are claimed to be useful as they are objective measurement tools (Bosch 2002). Likewise, having the particularity of having objective appearance allows their users in the discourse to link SUD utterances with the scientific discourse. However, environmental indicators are not without criticism; for a related discussion, the reader is directed to Appendix D. Linked to environmental indicators, climate change is often used to bring validity and credibility to the definition of environmental problems and their solutions. Climate change has been recently solidified into a defined science; the scientific evidence of global warming, which leads to climate change, has been corroborated by climate scientists. Likewise, the scientific character of climate change allows their users to link SUD utterances with the scientific discourse. With its legitimization capacity adding to its powerful role in sustainability discourse, climate change contributes to the legitimation of the ICT4SUD discourse. Especially, climate change is intrinsically linked to GHG emissions which come mostly from energy use. Energy efficiency technology comes into play as an approach to mitigate climate change. More to creating truth effects in the ICT4SUD discourse through the use of climate change is that cities are seen as significant consumers of energy resources and generators of GHG emissions. Given the focus of this study, there is no intent to take up what has been discussed elsewhere about the uncertainties and controversies surrounding the phenomenon of climate change as to

triggering abrupt or irreversible changes that would be catastrophic for human well–being, but rather to unveil how the ICT4SUD discourse operates as to constructing meanings in ways that create a true image of reality – discursive truth. But there is a global call to shift the climate change debate from whether climate change is occurring or not to what can be done to mitigate the atmospheric levels of GHG.

What makes the ICT4SUD discourse even more powerful in terms of authority and validity as to the definition and interpretation of the represented reality is the subtle ways the discursive mechanisms through which ICT4SUD operates interweave and function as to constructing meanings. Energy efficiency technology seamlessly integrates computing, climate change, and environmental indicators in the form of a unified package of various scientific strands. It moreover plays a key role in the interaction between sustainability, urban development, and information society as discourses, especially because it establishes a link between these discourses and scientific discourse, which is considered as a main source of legitimacy in European society when it comes to knowledge–making, decision–making, and policy–making. In terms of indicators, for example, over the last few decades, there has been an increasing global interest in using indicators to support all kinds of political process (Dhakal & Imura 2003). Also, due to the perception of its scientificity and objectivity, energy efficiency technology play an important role in shaping decision– and policy making processes – the effects of the construction of scientific knowledge on political actions.

### 5.7.2. Uses of Energy Efficiency Technology in Decision–making Processes

The success of ICT4SUD seems to be owed to the capacity of energy efficiency technology to influence the decision making process relating to economic policies. Energy efficiency technology has been of influence in energy efficiency improvement across most sectors of the economy. The common justification of the development of energy efficiency technology is its use to introduce objective information – e.g. measurement, monitoring, and analysis of data – into the decision–making process, thereby enhanced. However, there is little empirical evidence of the use of energy efficiency technology in decision making relating to environmentally sustainable urban planning policies. This is because the relation between energy efficiency technology and its capacity to be used as objective measurement for GHG emissions reductions is economically and academically disputable. For example, the decision–making process relating to the redevelopment project of Western Harbor (the first stage of which was completed in 2001) in Malmo city was based on different conservation strategies, including renewable energy sources, local energy production from wasted energy resources (waste and sewage), insulation, passive heating and cooling, and energy efficiency technology. In recent years, energy efficiency technology seems to be

of no leverage in decision–making processes relating to urban planning, as manifest by many recent urban redevelopment projects that neglect energy efficiency in buildings. A relevant example is the urban development project of Hyllie in Malmo, which demonstrates the force of other material trends. These are described as 'urban crises', such as deindustrialization and financial crisis of local governments (Dannestam 2008), adding to the prevailing model of neoliberal market economy (Baeten 2012). In all, energy efficiency technology doesn't seem, at present, to have much impact on decision making process relating to urban policy, whether at the municipal or regional scales in Europe. This hints at its failure to introduce objective information into the decision–making process, so to be improved.

Another common justification of the development of energy efficiency technology is its use as an all–embracing solution and deployable in every urban arena – due to the pervasive nature of ICT – to persuade, at once, the majority of the society – planners, homeowners, communities, and businesses – that the urban environmental problems identified by the decision–makers can be all contained and solved by technological solutions. However, its success has been, looking at current realities, very limited, as many subjective decisions and choices are made, and fundamental socio–economic, behavioral, and economic factors are ignored, in the development and implementation of energy efficiency technology. Subsequently, energy efficiency technology is not perceived 'objective' in terms of GHG emissions reductions, and its capacity to be a link between the ICT4SUD discourse and the scientific discourse – e.g. environmental indicators and climate change – seems, in the context of information society, to be lost. It is clear, though, that both the 'objectivity' associated with the rationalization of energy use and the perception of this objectivity in relation to GHG emissions reductions play a key role in the deployment of energy efficiency technology across urban sectors.

From a socio–cultural perspective, energy efficiency technology could also be considered as rhetorical elements in the decision–making process, utilized as a symbolic element. The fact that more research activities, supported by political action, continue to be undertaken, coupled with attempts to persuade the public to the adoption of energy efficiency technology for improving environmental urban sustainability in Europe (e.g. WBCSD 2009), that policy instruments for reducing carbon emissions of buildings are devised (Urge-Vorsatz, Koeppel & Mirasgedis 2007; WBCSD 2009), and that citizens and communities are encouraged to adopt energy efficiency technology (e.g. Nair, Gustavsson & Mahapatra 2010) for reducing carbon emissions while, as seen above, the application of energy efficiency technology has adverse effects on the environment, and there is little evidence of its use in decision–making, appears to contend that it is really being utilized as a symbolic element. Perhaps, the European society is too optimistic about the positive role of ICT in SUD or the process of deploying energy efficiency technology

gives a ritualistic assurance that decision–makers hold appropriate attitudes and act properly towards decision–making relating to environmental urban sustainability planning policy.

### 5.8. Political Practice, Knowledge, and Power

The political practice and power/knowledge relation with the information society and sustainability discourses condition the appearance and success of ICT4SUD. It is, in other words, affected by the political practices in relation with SUD discourse and, concurrently, influenced by the power/knowledge relations established in European society, which bounds or expands its success. Energy efficiency technology as a key discursive element of ICT4SUD discourse is used by quite many European institutions and figure in political and statements and argumentations and policy frameworks, especially in relation to the economy. This multidimensional link is crucial to understanding today's ICT4SUD and energy efficiency technology.

#### 5.8.1. Power and Knowledge Relation and Energy Efficiency Technology

Understanding why energy efficiency technology appears and why it is successful or fail – unbecoming climate solution – has to do with the relationship between power and knowledge. Drawing on Foucauldian thinking, the power exercise by computing and sustainability knowledge because of its practical usefulness creates and causes to emerge ICT4SUD, and thus energy efficiency technology, as new object of knowledge and accumulates a new body of information. This new object of knowledge uses that practical usefulness to maintain its success, which seems to be of a limited period as it doesn't seem to induce new effects of power in relation to environment improvement, adding to the uncertainties and bottlenecks associated with the adoption of energy efficiency technology in buildings. In other words, given the realities of energy efficiency in buildings, in particular, it seems that the objectivity and scientificity of ICT4SUD borrowed from computing, environmental indicators, and climate change as knowledge are key elements to explain its past and current success, rather than rhetorical items used for its practical usefulness to the exercise of power in the domain of urban environmental sustainability. Contrariwise, the emergence and success of ICT knowledge for economic efficiency is related to the exercise of power. In the first case, energy efficiency technology can be conceived of as an exogenous factor introduced into the policy process based on its capacity to incorporate objective information by energy efficiency, but not by GHG emissions reductions, whereas in the second case, ICT knowledge cannot be conceived of as exogenous elements, detached from the economic and political processes, and other forms of relations of power in information society. Accordingly, while ICT tends to have wider

applicability in decision–making processes relating to economic and energy policies, the success of energy efficiency technology has been very limited as to environmental policies, as many socio–economic, behavioral, and economic factors are ignored in the adoption of energy efficiency technology and subjective decisions are made in the development of energy efficiency technology. No wonder that 'the knowledge, technology and skills are already available but are not being widely used to achieve dramatically lower energy use in buildings.' (WBCSD 2009, p.17)

### 5.8.2. Political Practice and ICT4SUD

In European information society, politics, as a consequence of its interaction with ICT4SUD, forces the emergence and development of the discourse of ICT4SUD, without directly creating it – constructing its meaning or form. The underlying operations of this link is driven by the efforts of constantly transforming the role of ICT in society, building new socio–technological visions, and unlocking new transformational effects or exploring untapped potentials of technology. I shall explore here only some of the main facets of such operations as visible in the examined reports.

There are different mechanisms that underlie how political action is contributing to a further development of ICT4SUD. The first mechanism is manifest in EU assigning a scholarly-societal-economic role, political status, and institutional position to the ISTAG, thereby authorizing it and legitimizing its actions as to conducting ICT R&D, contributing to policy formation, and, more importantly, constructing new visions of ICT which new discourses build upon and interact and cohabit with other discourses in European society. This mechanism relates to the general politics of society in terms of the ability of the political action to distinguish the status of those who are in charge with saying what counts as true - that is, to establish criteria to designate collective social actors - by licit or explicit administrative schemes - that have the right to hold (or create) urban sustainability discourse as a large-scale societal discourse. These actors include the advocates of the ICT industry, which, in promoting ICT business solutions to SD, operate under the institutional apparatus and the regimes of truths – e.g. traditional economics and local sustainable development – of European society. A second mechanism is the creation of direct policy instruments to push social and corporate acceptance of energy efficiency technology (report 2, 3, and 4), thereby the functioning of ICT4SUD discourse. Finally, political action has led to a new mode of diffusing, mainstreaming, and teaching urban sustainability planning principles relating to ICT-based climate solutions and friendliness, which is increasingly performed inside of urban development universities and research centers across Europe as well as in specific research fields such as urban sustainable design and energy efficiency in buildings. Concerning these higher educational institutions, and the creation of

environmental urban sustainability programs in such organizations, one observes the introduction of ICT as a catalyst for SUD.

### 5.9. Ideological Standpoints

#### 5.9.1. Ideological Claims

Technology–based discourse construction is not new and that it typically promises a new world. Societal transformations are always promised upon the advent of technological discoveries. In this epoch new smart and environmental technologies pop up, sustainable urban change is promised on the basis of technological breakthroughs, e.g. context awareness technology (see Bibri 2012; ISTAG 2008). As it has always been, the issue is that the ICT4SUD discourse is technological deterministic. It looks only at what is technological feasible to reduce energy efficiency and GHG emissions and has a simplistic account of how urban sustainable change occurs by overlooking, or falling short in considering, the social behavior and dynamics and socio–economic relationships involved in the innovation process.

The discourse also serves the purpose of ICT industry as to looking for ways to make ICT permeate every urban arena. The city is ideologically and symbolically constructed as 'a sustainable haven in a world of mounting environmental cataclysms'. ICT will continue to have strong impacts on the economy and society, with, inopportunely, adverse environmental implications. This is linked to the unintended effects ICT may have on urban behavior and lifestyles at different levels, just like other old technologies. In fact, it becomes useful to put the rhetoric's about the ICT-oriented sustainable city of the (near) future in perspective when looking back to the time when electricity and steam engine were once new. For example, a century ago, electricity was constructed as the 'fuel of the future', as a liberating technology with promises for providing a clean, healthy, and efficient way of life (Forty 1986). And today, most of electricity is generated from fossil fuels and coal which are the culprit of pollution and global warming. ICT4SUD is thus a subject of ideological claims: ICT4SUD is like older discourses surrounding the introduction of electricity, steam engines, and telegraphs technologies.

#### 5.9.2. The Culture of Innovation and Power Relations

Urban sustainability is a value that is claimed to have driven the innovation of energy efficiency technology and that serves as a parameter for reading urban patterns, which is an important characteristic of ICT experts and companies as successful innovators. However, seen from the perspective of social embeddedness of technology, technology is much like a text, a socio–cultural construction. It can

reflect (or reproduce) varying cultural values, through its use and diffuse, but also can carry ideological messages, reproduce power, and induce specific social behaviour. Hence, it becomes legitimate to speak of the political dimension of the use and adoption of energy efficiency technology, particularly in relation to buildings. Seen as carrying with it an aggregation of ideas – 'loaded' with all kinds of symbolic meanings by ICT producers that the adopters have to deal with – technology represents a European cultural invention, in that it brings forth a new urban world. It emerges out of European cultural conditions and in turn helps create new ones, whereby existing power relations are privileged and social relations are perpetuated. Out of this awareness, it becomes relevant to engage with smart building technologies as a political and social institution when looking at its actual political properties – as what a social constructivist would do. When looking at the hegemonic role of the ICT industry in information society and its dominant framing power in the construction of urban reality, adding to, worth noting, the current hurdles to the adoption of energy efficiency technology and the necessity of creating new policy instruments to push into its social acceptance and to reshape corporate conviction to move the market into it, it becomes evident for a critically minded analyst the conflicting social processes through which such a technology comes to life, and the realized deployment of energy efficiency technology becomes the platform for continuing social struggles, where the adoption of energy efficiency in buildings as such may support political and economic ends. The process of acceptance and use of energy efficiency technology doesn't seem to be harmonious and linear. Rather, it is presented as a struggle between the energy efficiency technology and the adopters, where they aim to shape, override, or ascribe social meaning to technology. This is a sign of resistance to energy efficiency technology rather than of an active social acceptance process, as the 'advocates' of ICT4SUD would claim. Therefore, putting efforts into critically analysing the use and adoption of smart building technologies and its meaning for occupiers and owners and society in general, and further, to recognize alternative perspectives can be justified by the fact that the use and adoption are directed towards certain economic and political directions. A critical approach must therefore draw on insights into a kind of practice that aims at changing the use of technologies.

One corollary of the above conception when it comes to the evaluation of smart building technologies is to investigate the likelihood of the perpetuation of power relations via energy efficiency technology use and adoption, and then formulate normative views that should inform the possibilities for technological change based a critique of power relations. Another corollary is that the implemented technologies ought to be examined according to the kind of other potential agenda they might be directed to, the complexity they involve in their use, and the social values they confront. Of particular concern in the critical reading of ICT4SUD might be in what ways, and to what extent, smart building technologies

promote, for instance, autonomy or dependence, simplicity or complexity, democracy or hierarchy; and sustainability or unsustainability. For example, the adoption of energy efficiency technology ought to be based on a democratic process for architects, designers, and homeowners, just like it is the case for commercial and industrial buildings' owners that have economic thrust towards implementing energy efficiency technology: slashing energy costs. Further to the point, quoting Gareth Ashley, 'Building owners and operators want simplicity. They do not want too much automation and intelligence built into the system without the ability to override it.' (GeSI 2008, p. 44) Stephen Selkowitz adds: 'If airplanes were built like buildings, you wouldn't fly in them.' (Ibid)

### 5.9.3. Reconstructing the Structures of Power

The reports reproduce, at varying degrees, the ideological field of European society in a way that also legitimizes and reproduces the structure of power. The ICT4SUD discourse reconstructs and enacts existing social and institutional structures, and these structures, in turn, support and validate the discourse. This is evident in how the structures of text are linked to structures of sociopolitical context. Therefore, the discourse plays an important role in perpetuating power relations. See Appendix E for a set of selected quotations illustrating dominant political ideologies in terms of the role of the EU state, the needed policy instruments, and the way society should respond to urban environmental crisis.

In the context of sustainable urban planning, ideology has to do with normative and political standpoints on the relation between society and the environment. The discourses of reports can be classified as urban sustainability, technological development, environmental modernization, and administrative and economic rationalism, the assumption that SUD can be achieved by legal–techno–politico–economic formulas.

# Chapter Six

## 6. Concluding Remarks

The aim of this study was to perform a critical discourse analysis of the social construction of ICT4SUD, the prevalent view of a major, ICT–driven sustainable change to cities. The analysis meant to highlight contextual, cultural, and epistemic/historical context in which the ICT4SUD discourse operates; unmask what is ruled out, concealed, undervalued, overvalued, and exaggerated; and reveal intricate relationships between the discourse, social actors, ideology, and power. A range of discursive strategies and mechanisms are deployed in the reports, with the intention to frame reality, to exert social and political influence, and reproduce ideology and power. Findings are to be drawn from the analysis of the contextual, culutural, historical, and textual aspects of reports.

### 6.1. Summary of Key Findings and Discussion

As to the contextual and historical aspect of the analysis, as a scholarly discourse, ICT4SUD is inherently part of and influenced by economic, social, and political structures and patterns. This contingency renders its formation socio-politically situated and subjective. Thus, ICT4SUD is not a model or of 'value-free' knowledge. The interlacing pattern seems to be dialectical in the sense that the discourse reinforces existing economic and social structures, which, in turn, support the emergence and functioning of the discourse. The discourse is also shaped by high-level cultural frames that are conventionalized by European society and attuned to its values. It should therefore not be conceptualized as something universal or a paradigm, but rather as a 'hegemonic discourse' socially constructed in the light of specific conceptions about the cultural, social, political, and economic changes of European society that has recently taken place in European society. Speaking of a particular time of history, the ICT4SUD discourse as social knowledge is a matter of the prevalent episteme, a pre-cognitive space where ICT constitutes a salient defining factor of the dominant configuration of knowledge, institutions, and material forces of European society. Cultural and epistemic frames have implications for discursive and material selectivity associated with the interpretation of the urban environmental crisis and the type of the proposed reduction strategies as strategic innovation. Europeans have become so dependent on how they have organized society, technologies, and economies around their investments in the environment for their way of life. Huge investments continue to be made into the ICT sector with large expectations for environmental improvements while largely oblivious to the adverse environmental effects of ICT. This poses a risk of misallocation of financial assets. The availability of discursive economy and society

resources has implications for those who live within it. One corollary of the historical contingency of understanding the world is ruling out alternatives of conceptualizing urban sustainability.

Further to the historical characteristics of discourse, ICT4SUD is impacted by earlier representation of reality and how they were reproduced in relation to the significance of discursive constructions of ICT and sustainability issues, in the broader context of European culture. In taking up these former discourses, ICT4SUD draw on previous discursive structures by building on established meanings. It comes to life by merging various discursive elements and also changes the socio–cultural world.

The textual analysis provides illuminating findings. The discourse plays a major role in reconstructing the image of certain social actors, as well as in defining their identities and relations in way that create and relocate roles and attribute new societal missions. The dominant framing of the reports is clearly the one advanced by the ICT industry; hence, it is constituted into the main definer of the represented reality of SUD. In connection to energy efficiency in buildings, planners, owners, communities, and organizations are talked about as passive recipients of what the ICT industry has to offer as climate solutions. Achieving SUD should rather be based on participative actions that actively involve all the stakeholder groups concerned with urban sustainability. That is, they ought to have a stake in the reconstruction of social reality as 'collective consciousness' – in other words, their views should be momentous in the societal efforts that are meant to achieve urban sustainability. The underlying assumption of asking for their views is that they may have insights into how to contribute to SUD on their own terms. With energy efficiency technology, it is the ICT industry's outlooks of a sustainable urban change that seem to dictate how e turban universe will be altered. People are active shapers of urban reality, not simple consumers of technological solutions. Failing to consider this approach could be one of the main reasons for the barriers to the adoption of energy efficiency in building, notwithstanding the ICT's proven role in energy savings, the availability of technology, and the interest stimulated by policymakers.

The discourse is exclusionary: a number of facts and issues pertaining to structural, indirect, direct, systemic effects of energy efficiency technology and the associated rebound effects are left out, either deliberately concealed or neglected. SUD is a complex, multi–dimensional matter. ICT innovations having positive impacts on urban prosperity and urban productivity and thus attractiveness – urban products and their accessibility – is a causal (economic) link that ought not to be forced to extend to include unrealistic environmental improvements. ICT is the most effective solution to urban environmental crises. 'Icitizig' the urban sphere is not enough to make cities environmentally sustainable. In fact, the whole conceptualization

of the term 'SIS' is an oxymoron: the development, embeddedness, and use of ICT inevitably depletes, degrades, and pollutes the environment. Huge energies are devoted to rethinking the urban environmental problem rather than solving it. No wonder that the urban environmental crisis continues to worsen while most technological solutions to address them seem to be failing. Technology tends to provide only downstream solutions which address the symptoms rather than the causes of the problem. Indeed, it is argued that it is by changing economics and politics that sustainable development is likely to come true. Thus, upstream solutions that address the source of the problem are much more needed than ever. Otherwise, there is a risk that as fast as 'innovative' solutions – quick fixes to rather complex issues – are discovered they are rejected because they become useless or no longer valid, a pattern which shows the intractability and illogicality of the functioning of our socio–ecological system. Urban sustainability is about the strategic embrace of holistic thinking and deep understanding of the whole system necessary to move towards a sustainable society.

The discourse tends to be deterministic, i.e. it assumes that technology, supported by policy, will achieve SUD. There is no such thing that the 'icitization' and 'policization' of urban environment makes it environmentally sustainable. It falls short in considering social and economic structures and behaviour and socio–economic relationships involved in the innovation process. Rather, it tends to reflect a modernist propensity to unreflectingly compartmentalize intricate socio–eco–techno–economic changes into one–dimensional environmental issue in a bid to solve it through techno–policy fixes – enforcement of social and corporate acceptance of energy efficiency technology. ICT-based reduction strategies and policy instruments are not conceived and designed based on a holistic analysis of social dynamics, social behavior, socioeconomic reality, and economic relationships. Regardless, to reconcile economic–socio–environmental conflicts remains a daunting challenge for which there is unlikely to be a panacea.

The discourse is inclined to be rhetorical – i.e. it promises sustainable urban change without really working towards that goal – no strategy. It exaggerates the potential of ICT in achieving SUD while ignoring the risks and uncertainties associated with technology and characteristic for living in a technologized urban world, e.g. current–day social acceptance of energy efficiency technology is with many struggles. energy efficiency technology is cheerfully described: it is the way out of environmental impasses in cities and the 'icitization' of urban environment represents a huge opportunity for the GHG–emission–culprit urban sectors to make big strides to SD, thereby making the reality of a low–carbon city happen. In addition,

energy efficiency technology is used as rhetorical elements, giving ammunition to an ICT–oriented SUD approach. Other approaches, such as low–energy urban development, passive heating and cooling, renewable energy sources (see Appendix F for more clarification), and local production of energy from waste and swage should rather be emphasized given their effectiveness in achieving real GHG emissions reductions. Moreover, with the intention to persuade others to a particular view of urban environmental issues and of ways to address them, energy efficiency technology is used as rhetorical elements, giving ammunition to support some pre–determined political positions.

Positioning the ICT industry as the enabler and the driver of the low–carbon city/economy aids the construction of an image of European leadership in creating a low carbon society. One corollary of this is that ICT industry may dictate its own vision of how urban environmental issues should be addressed while the other involved stakeholders become obliged to accept ICT industry terms: what it has to offer as environmental solutions, a position which requires them to delegate some of their decision power to the ICT industry and its elites. Making certain ways of being, the discourse of ICT4SUD is strongly implicated in the exercise of power, and, as one of dominating discourses in European society, tends to privilege the version of social reality that legitimates existing social structures. The institutional position of the ICT industry is played with subjective identification, and hence taking it up has a direct implication for subjectivity. In societal matters such as urban sustainability, institutional positions ought to be replaced, or combined, with roles which prescribe particular parts to be acted out by urban planners, citizens, communities, and organizations, and can be played without subjective identification.

Given the scientific discourse and related legitimation capacity of computing, climate change, and environmental indicators, one can subsume a range of social and political effects under the category of discourse mechanisms through which the ICT4SUD discourse operates, which both show the power of discourse and potentially empower the ICT industry and its cohorts as agents. In addition, the success of ICT4SUD seems to be owed to the capacity of energy efficiency technology to influence the decision making process relating to economic policies. However, there is little empirical evidence of the use of energy efficiency technology in decision making relating to environmental urban policies. Further, energy efficiency technology is used as an all–embracing solution and deployable in every urban arena to persuade, at once, the majority of the society that the urban environmental problems identified by the decision–makers can be all contained and solved by technological solutions. It is also EFT used as rhetorical elements in the decision–making process, utilized as a symbolic element: the process of

deploying it gives a ritualistic assurance that decision–makers hold appropriate attitudes towards decision–making relating to urban sustainability planning policy.

The discourse is affected by the political practices in relation with SUD and information society discourses. Specifically, politics, as a consequence of its interaction with ICT4SUD, forces, though different mechanisms, the emergence and development of the ICT4SUD discourse, without directly creating it. It is concurrently, influenced by the power/knowledge relations established in European society, which bounds or expands its success. The power exercise by computing and sustainability knowledge creates and causes, due to its practical usefulness, to emerge ICT4SUD, and thus energy efficiency technology, as new object of knowledge.

Concerning ideological reproduction, the discourse reconstructs cultural claims, conveys ideological messages, and perpetuates power relations. The promises of SUD that are to result from the 'icitization' of European cities remain a subject of ideological claims. ICT4SUD makes huge claims for the degree for which the potential of ICT can be mobilized to achieve SUD. However, claims are typical for new discourse construction – e.g. Ambient Intelligence (ISTAG 2001), the 'mechanization of the household', and 'the electrification of private life' (Flichy 1995). They all promise to bring radical social transformations. However, as mentioned above, the discourse is driven by technological and economic concerns rather than environmental concerns. The proposed energy efficiency technology is detached from the prevailing economic and social realities. Furthermore, seen as carrying with it an aggregation of ideas – and 'loaded' with all kinds of symbolic meanings – technology emerges out of European cultural conditions and in turn helps create new ones, whereby existing power relations are privileged and social relations are perpetuated. In addition, the discourse reproduces and legitimizes the structures of power. It enacts existing social and institutional structures, which, in turn, support the discourse. Therefore, ICT industry's ideas have links to power and interests and that the power to create symbols via the culture of innovation is far from being an unbiased force. It has a relative autonomy in European society where the dominant power cannot directly oversee this determining cultural apparatus. It plays a hegemonic role by producing an ideology that serves to reconstruct and legitimize societal structures.

### 6.2. Avenues for Future Research

Environmental urban sustainability is a complex, multidimensional matter. Conspicuously, ICT solutions alone, no matter how innovative they can get and intelligently they can be used, cannot hence solve the urban environmental crisis. Besides, the intricacy of the relationships and tradeoffs among the ICT multi–

adversative environmental effects, adding to the associated rebound effects, renders energy efficiency technology inadequate solution to achieving urban unsustainability. Hence, there is a need for alternative (interdisciplinary and trans–disciplinary) research directions and innovations that may be more effective in achieving the sought goal. Also, a plethora of issues need to be reexamined in the pursuit for such a goal. Far from exhaustive, I shed light on some issues and present some avenues for future research.

### 6.2.1. Rethinking Key Issues

As the basic premise of sustainability is the long–term goal of a balanced socio–ecological system, and sustainability discourse will persist as a way of thinking about societal practices for a long time yet to come, in the construction of any related discourse, it is crucial to consider balancing between innovative trends, futuristic visions, and realistic assumptions, with regard to achieving any sustainable change. This is necessary for a sustainability–focused discourse to persist as a way of thinking about social practices. Otherwise it, albeit becoming established due to some situated or contingent discursive–material dialectics, it will cease to exist soon after its appearance and functioning.

Of importance too is to retain simultaneously a balance between the power of the dominant collective groups – institutions and industries – and those of civil society – citizens and communities – given the positive force of the collective effort in achieving societal goals such as urban sustainability. The question of power and with whom it resides is central, and civic engagement entails reclaiming this power from the institutions, so to create a sustainable urban environment that advocates negotiation among people and their natural surroundings. There exist always conflicts of interests at, and across, the macro and micro level of society that should be addressed when it comes to sustainability effort. Overcoming these conflicts is necessary for the public to act. As to any ICT-oriented approach to urban sustainability, assuming that it is ideologically unthinkable to do without ICT since it undergirds the functioning, and shape the evolution, of information society – and hence there is no escape from it – a sound way to solve unshakable conflicts is through conflict resolution rather than incessant inception of new policy instruments – law enforcement -seems to generate more power imbalances and further conflicts of interests between many constituents that have a stake in the organization of sustainable information society.

The focus of legislative effort should be directed towards the implementation of more effective approaches to environmental urban sustainability (introduced above), which are of more significant contribution to energy conversation and GHG emissions reductions. Indeed, there is a need for new policies that ought to endorse technologies that most effectively promote urban sustainability, as well as

for changing the order of priority for environmental protection, so to enable optimum management of innovation and resource allocation.

To make urban sphere environmentally sustainable, innovation is needed throughout the information society, that is, in economic models; institutional apparatuses and their techniques; social structures, relations, and behaviors; and technology push philosophies. While this may sound an unattainable goal, it is imperative for policy makers to be aware of the environmental implications of ICT in the complex urban system of today. This awareness could, at least, serve to rethink current and future investment in the ICT sector and thus to optimize future urban development with a balance between ICT-oriented reduction strategy and other conservation strategies, thereby setting more realistic action plans to achieve environmental urban sustainability.

It is of necessity to question whether the model of ICT–driven sustainable urban change, the current object of urban planning's fascination in information society, is useful to guide urban planning practice. The discursive idea of ICT as a catalyst for SUD in its current narrow construal is vulnerable to the criticism of ideological symbolism and vague idealism pertaining to urban planning in European society. In this case, the symbolic and idealistic fascination appears to build upon a romanticized view of emerging and future visions of ICT – inspiring and far–reaching but of limited modern applicability. The model ought to be redefined and embedded into a broader understanding of socioeconomic and sociopolitical conflicts in European society, so to become an influential and useful ethos for shaping urban development. Otherwise it epitomizes an unproblematic, peaceful technological 'ecotopia' in the information age.

### 6.2.2. Suggested Studies

The discursive (or critical social) approach to ICT4SUD is still in its early stages, but further studies in this direction could help to comprehend the promotion of ICT–oriented urban sustainability and the implementation of related policies, as well as the relations between knowledge, power, and politics in the information society arena. The decision of when implement an energy-environment policy is compounded by why, where, and how it should be implemented, and who should oversee the process.

A holistic (systemic) analysis should be carried out on the intricate linkages between social behavior, social dynamics, socio–economic relationships, and logics of ICT embeddedness, development, and application in relation to the environment, as an attempt to understand how to build a built environment in ways that reduce energy use and GHG emissions, thereby providing upstream solutions to the urban

unsustainability. Policy design and political decisions made with regard to ICT4SUD are to be based on such an analysis, so to devise meaningful policy instruments that can effectively affect people to make astute choices about how to use ICT to change their behaviors.

Further research is also needed to look into developing frameworks for weighing up different energy conversation methods against each other, identifying the suitability of each method and whether, and how, it can be combined with other existing methods based on such factors as geography, building location and type, and climate, as well as demographics, economic development, and the spread of new technology, considering the multicultural character of European society – 'Europe of the cultures'. Speaking of culture, of importance is also the investigation of how solutions of energy conservation could be developed and implemented alongside policy instruments based on the cultural specificity of each member state of the European community, identifying relevant approaches and policy initiatives that hold the potential to achieve the desired outcomes. The successful adoption of energy conservation approaches requires an adjustment of strategies to national and political context, specific requirements to enable a large cost–effective energy savings potential to come from the residential buildings.

In relation to urban development, future research on the relationship between ICT innovation and the environment needs to focus on the structural, direct, and systemic effects of ICT, which are more difficult to analyze and model, in order to be able to make ICT one of the organizing principles for urban planning. The wide assumption that ICT is capable of decoupling urban development from environmental degradation or of advancing environmental protection is grounded on fallacies. Realistically, realizing the unsolved issues of structural, direct, and systemic effects and rebound effects should inspire or stir other alternative climate solutions, which may not necessarily lie within the boundaries of the prevailing ICT culture. It is imperative to consider these effects when establishing the link between ICT and urban sustainability. Ignoring these effects will otherwise continue to disguise the dark side of ICT, to ignore its potential risks and uncertainties, and to quixotically place high expectations on it. Therefore, the rebound and adverse effects issues are worthy of attention from policymakers that are struggling to figure out a way to manage the relationship between ICT innovation and the environment

# References


Alakeson, V, Aldrich, T Goodman, J & Jorgensen, B 2003, *Making the network*, Sustainable Development in a Digital Society Forum for the Future, Teddington, 2003.

Baeten, G 2012, 'Normalising Neoliberal Planning: The case of Malmö, Sweden', in Tuna T–K & Baeten G (eds.), *Contradictions of neoliberal planning. cities, policies, and politics* , Springer, Dordrecht

Barker C 2000, Cultural studies: theory and practice, Sage, London.

Bell, D 1974, *The coming of post–industrial society*, Harper Colophon Books, New York.

Berkhout, PHG., Muskens, JC & Velthuijsen JW, 2000, '*Defining the rebound effect*', *Energy Policy*, vol. 28, no. 6–7, pp. 425–432.

Bibri, SE 2009, *Sustaining ICT for sustainability: towards Mainstreaming de–carbonization–oriented design & enabling the energy–efficient, low carbon economy*, Master thesis, School of Computing (COM), Blekinge Institute of Technology.

Bibri, SE, 2012, *A critical reading of the scholarly and industry's construction of AmI for societal transformation of Europe*, Master thesis, School of Communication, Culture and Art, Malmo University.

Binswanger M 2000, 'Technological progress and sustainable development: what about the rebound effect? Paper presented at the *ESEE Conference*, Vienna.

Bosch, P 2002, 'The European Environment Agency focuses on EU–policy in its approach to sustainable development indicators', *Statistical Journal of the United Nations,* vol. 19, pp. 5–18.

Brookes LG 1990, 'EEand economic fallacies', *Energy Policy,* vol. 783, no. 5.

Burr, V 1995, *An introduction to social constructivism*, Sage, London.

Carver, T & Hyvarinen, M 1997, 'Introduction', in Carver T & Hyvarinen M (eds.), *Interpreting the political, new methodologies*, pp. 1–6, Routledge, London.

Costanza, R & Wainger L 1991, *Ecological economics: mending the Earth*, North Atlantic Books, Berkeley

Dannestam, T 2008, 'Rethinking local politics: towards a cultural political economy of entrepreneurial cities' *Space and Polity,* vol.12, no. 3, pp. 353–372.

Dasgupta, P 2007, 'The idea of sustainable development', Sustainability Science, vol. 2, no.1, pp. 5–11.

Deda, P & Georgiadis, G 2009, '*Talking climate change at home': trends and challenges in enhancing energy efficiencyin buildings in the UNECE region*, Report.

Dhakal, S & Imura, H 2003, 'Policy–based Indicator Systems: emerging debates and lessons', *Local Environment*, vol. 8, pp. 113–9.

Dimoudi A, Tompa C 2008, 'Energy and environmental indicators related to construction of office buildings', *Resources, Conservation and Recycling*, vol. 53, pp. 86–95.

Dobson, A 1996, 'Environment sustainabilities: an analysis and a typology', *Environmental Politics*, vol. 5, pp. 401–28.

Dorfman, B 2004, *Culture, media, theory, practice perspectives*, Aalborg University Press, Aalborg.

Dreyfus, HL & Rabinow, P 1983, *Michel Foucault: beyond structuralism and hermeneutics* University of Chicago Press, Chicago.

Dryzek, JS, 2005, *The politics of the Earth: environmental discourses*, Oxford University Press, Oxford.

Ekins, P 2003, 'Sustainable Development', in Proops, J & Page, A (eds.), *Environmental thought*, Edward, Elgar Cheltenham.

Entman, RM, 1993, 'Framing: toward clarification of a fractured paradigm', *Journal of Communication*, vol. 43, no. 4, pp. 6–27.

Eurobarometer 2008, *Europeans' attitudes towards climate change*, viewed 10 November 2012, /http://.ec. europa.eu/public_opinion/archives/ebs/ebs_300_full_en.pdf S.

Fairclough, N 1995a, *Critical discourse analysis*, Longman, London.

Fairclough, N 1995b, *Media discourse*, Edward Arnold, London.

Fairclough, N 2003, '*Analyzing discourse: textual analysis for social research,* Routledge.

Fairclough, N & Clive, H 1995, Critical discourse analysis: the critical study of language, Longman.

Fairclough, N & Wodak, R 1997, 'Critical discourse analysis', in van Dijk TA (ed.), *Discourse studies, A multidisciplinary introduction, Discourse as social interaction,* Sage, London, pp. 258–284.

Fisher, K 1997, 'Locating frames in the discursive universe', *Sociological Research Online,* vol. 2, no. 3, pp. U40–U62.

Fiske, J 1987, *Television culture*, Methuen, London.

Forge, S 2007, 'Powering down: remedies for unsustainable ICT', *Foresight,* vol. 9, no. 4, pp. 3–21

Forsyth, T 2003, 'Social framings of environmental science', in *Critical political ecology*, Routledge, London, New York, pp. 77–102.

Foster, J 2001, 'Education as sustainability', *Environmental Education Research,* vol. 7, no. 2, pp. 153–165.

Foucault, M 1970, *The order of things: an archaeology of the Human Sciences*, Random House, New York.

Foucault, M 1972, *The archaeology of knowledge*, Routledge, London.

Foucault, M 1973, *The order of things: an archaeology of the human science*, Vintage Books, New York.

Foucault, M 1991, 'Politics and the study of discourse', in G Burchell, C Gordon & P Miller (eds.), *The Foucault effect: Studies in governmentality*, Harvester Wheatsheaf, The University of Chicago Press, pp 53–72.

Fuchs, C 2005, *Sustainability and the Information Society*, ICT&S Center: Advanced Studies and Research in Information and Communication Technologies & Society, University of Salzburg, Austria.

Gallopín, G C 1997, 'Indicators and their use: Information for Decision–making', in Moldan, B & Billharz, S (eds.), *Sustainability indicators. Report of the project of indicators of sustainable development,* Wiley, New York.

GeSI 2008, 'SMART 2020: *Enabling the low carbon economy in the information age*, *Report* by the Global eSustainability Initiative, viewed 02 September 2009, http://www.theclimategroup.org/assets /resources/publications/Smart2020Report.pdf

Gordon, C 2000, 'Introduction', in Rabinow, P(ed.), *Michel Foucault power – essential works of Foucault 1954–1984, volume* 3, pp i–xii, The New Press, New York.

Greening LA, Greene DL, Difiglio C 2000, 'EEand consumption: the rebound effect – a survey', *Energy Policy*, vol. 28, no. 6/7, pp. 389–401.

Griffiths, M 2008, 'ICT and CO2 emissions', *Parliament Office of Science and Technology Post–note,* no.319, pp. 1–4.

Gustavsson L, Joelsson A & Sathre R, 2010, 'Life cycle primary energy use and carbon emission of an eight–storey wood–framed apartment building', *Energy and Buildings*, vol. 42, pp. 230–242

Hajer, MA1995, *The politics of discourse: ecological modernization and the policy process*, Clarendon Press. Oxford.

Hall, S (ed.) 1997, *Representation: cultural representations and signifying practices*, The Open University, Sage Publications, London.

Hamilton, K & Clemens, M 1999, 'Genuine savings rates in developing countries', World Bank Econ Review, vol. 13, no. 2, pp. 333–356.

Harrison, PR 1992, 'Michel Foucault', in Beilharz P (ed.), *Social theory: a guide to central thinkers*, Allen and Unwin, St Leonards, NSW.

Heberle, LC 2006, *Sustainable urban development: local strategies as global solutions: Local Sustainable Urban Development in a Globalized World*, viewed 5 November 2012 *http://www.ashgate.com/pdf/SamplePages/Local_Sustainable_Urban_Development_in_a_Globalized_World_Intro.pdf*

Heidegger, M 1962, '*Die Technik und die Kehre*', Verlag Günther Neske, Stuttgart.

Hilty LM Ruddy, T & Schulthess, D 2000, *Resource intensity and dematerialization potential of information society technologies*, Solothurn University of Applied Sciences North–Western Switzerland and the authors, Solothurn.

Hobbs, M 2008, *On discourse and representation: reflections on Michel Foucault's contribution to the study of the mass media*, University of Newcastle, viewed 16 April 2011, http://www.tasa.org.au/uploads /2011/05/Hobbs–Mitchell–Session–19–PDF.pdf.

Hopwood B, Mellor M & O'Brein G 2005, 'Sustainable development: mapping different approaches', *Sustainable Development,* vol. 13, no. 1, pp. 38–52.

Huckle, J 1996, 'Realizing sustainability in changing times', in Huckle J & Sterling St (eds.), *Education for sustainability*, Earthscan, London.

International Energy Agency (IEA), 2008, *Energy policies of IEA countries: Sweden 2008 review*, International Energy Agency Publications, Paris, France.

International Panel on Climate Change (IPCC), 2007, 'Summary for Policymakers', Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to *the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, and NY.

ISTAG 2001, *Scenarios for Ambient Intelligence in 2010*, viewed 22 October 2009, ftp://ftp.cordis.lu/pub/ist/docs/ istagscenarios2010.pdf.

ISTAG 2003, *Ambient Intelligence: from vision to reality (For participation – in society & business)*, viewed 23 October 2009, http://www.ideo.co.uk/DTI/CatalIST/istag–ist2003_draft_consolidated_report.pdf

ISTAG 2006 ISTAG Report on Shaping Europe's Future Through ICT, viewed 22 March 2011, http://www.cordis.lu/ist/istag.htm

ISTAG 2012, *Towards horizon 2020 – Recommendations of ISTAG on FP7 ICT work program 2013*, Report, viewed 15 March 2012, http://cordis.europa.eu/fp7/ict/istag/reports_en.html.

Kasemir, B; van Asselt, BAM ; Durrenberger, G & Jaeger, CC 1999, 'Integrated assessment of sustainable development: multiple perspectives in interaction', *International Journal of Environment and Pollution,* vol. 11, pp. 407–425.

Khazzoom, JD 1980, 'Economic implications of mandated efficiency standards for household appliances', *Energy Journal*, vol. 1, no. 4, pp.21–40

Kuhn, TS 1962/1970/1996, *The Structure of scientific revolutions*, University of Chicago Press, Chicago.

Kumar, S & Pallathucheril, VG 2004, 'Analyzing planning and design discourses. Environment and planning B: planning and design' vol. 31 pp. 829–846.

Kvale, S 1992, 'Posmodern psychology: a contradiction in terms?' in Kvale S (ed.), *Psychology and Postmoderism*, Sage, London.

Jacobs M. 1999, 'Sustainable development as a contested concept', in Dobson A (ed.), *Fairness and Futurity,* Oxford University Press, Oxford.

Jeroen CJM & van den Bergh 2001, 'Ecological economics: themes, approaches, and differences with environmental economics', '*Regional Environmental Change*, vol. 2, no. 1, pp. 13–23.

Jessop, R 2004, 'Critical semiotic analysis and cultural political economy', *Critical Discourse Studies*, vol. 1, no. 2, pp. 159–174.

Jöst, F 2002 'Sustainable development: the roles of science and ethics', in Faber, M; Manstetten, R & Proops, J, *Ecological economics. Concepts and methods*, pp. 75–92, Edward Elgar, Cheltenham.

Lee, K 2000, *Global sustainable development: its intellectual and historical roots: global sustainable development in the 21st Century*, Edinburgh University Press, Edinburgh.

Luke, T 1999, 'Eco–Managerialism: environmental studies as a power/knowledge formation', in *Living with nature. Environmental politics as cultural discourse*, Oxford University Press, Oxford, pp. 103–120.

MacLean, D & Arnaud, BS 2008, *ICTs, innovation and the challenge of climate change*, International Institute for Sustainable Development (IISD), viewed 21 May 2009, http://www.iisd.org/pdf/2008/ict_innovation_climate.pdf.

Madden, P & Weißbrod, I 2008, *Connected ICT and sustainable development, Forum for the Future: Action for Sustainable World*, viewed 22 April 2009, http://www.forumforthefuture.org/files/Connected.pdf.

McManus, P 1996, Contested terrains: politics, stories and discourses of sustainability', *Environmental Politics,* vol. 5, pp. 48–73.

McMichael AJ, Woodruff RE & Hales S 2006, 'Climate change and human health: present and future risks'*The Lancet*, vol. 367, pp. 859–69.

McNay L 2000, *Gender and agency: reconfiguring the subject in feminist and social theory*, Polity Press, Malden, Mass.

Moldan, B. and Billharz, S (ed) 1997, '*Sustainability indicators', Report of the project of indicators of Sustainable Development,* Wiley, New York.

Molnar, D, Morgan, AJ & Bell, DVJ 2001, *Defining sustainability, sustainable development and sustainable communities,* Working paper, Sustainable Toronto Project, University of Toronto, Toronto.

Munda, G 1997, 'Environmental economics, ecological Economics, and the concept of sustainable development', *Environmental Values*, vol. 6, pp. 213–233.

Murcott, S 1997, 'Definitions of sustainable development', *AAAS Annual Conference, IIASA Sustainability Indicators Symposium*

Nair, G, Gustavsson, L & Mahapatra, K 2010, 'Factors influencing energy efficiencyinvestments in existing Swedish residential buildings', *Energy Policy*, vol. 38, no. 6, pp. 2956 – 2963.

Nassen, J, Sprei, F & Holmberg, J, 2008, 'Stagnating energy efficiency in the Swedish building sector – economic and organizational explanations', *Energy Policy*, vol. 36, pp. 3814–3822.

Orr, DW 2004, 'Earth *in mind: on education, environment and the human prospect',* Island Press, Washington, Covelo, London.

Ortega–Cerdà, M 2004, *Sustainability indicators as discursive elements,* viewed 20 October 2012, http://ent–consulting.com/images/stories/ENT/pdf/articles/indicators.pdf

Parry ML 2007, Climate Change 2007: impacts, adaptation and vulnerability: contribution of Working Group II to the fourth assessment report of the Intergovernmental Panel on Climate Change, Cambridge University Press.

Phillips, L & Jørgensen, MW 2002, *Discourse analysis as theory and method*, Sage, London.

Plepys, A 2002, 'The grey side of ICT', *Environmental Impact Assessment Review*, vol.22, no. 5, pp. 509–523.

Portugali, J. & Alfasi, N., 2008. An Approach to Planning Discourse Analysis. Urban Studies, 45(2), pp.251–272.

Rapoport, E & Vernay AL 2011, 'Defining the eco–city: a discursive approach', *Management and Innovation for a Sustainable Built Environment*, Amsterdam.

Rassafi A, Poorzahendy H & Vaziri M 2006, 'An alternative definition of sustainable development using stability and chaos theories', *Sustainable Development* vol. 14, no. 1, pp. 62–71.

Redclift, M 2005, 'Sustainable Development (1987–2005): an Oxymoron Comes of Age', *Sustainable Development* vol. 13, no. 4, pp. 212–227.

Ross, A 1994, *The Chicago gangster theory of life: ecology, culture, and society,* Verso, London and New York.

Rubin, J 2007, *Dim prospects that 'energy efficient' will pay off: CIBC*, The Globe and Mail.

Richardson, N 1989, Land use and planning and sustainable development in Canada, Canadian Environmental Advisory Council, Ottawa.

Samuel, M & Lesley, S 2007, 'Computing and sustainability', *Annual Conference of the National Advisory Committee on Computing Qualifications* (NACCQ)

Sev, A 2009, 'How can the construction industry contribute to sustainable development? A conceptual framework', *Sustainable Development*, vol. 17, pp. 161–173.

Schwandt, TA 2000, 'Three epistemological stances for qualitative inquiry: interpretivism, hermeneutics and social constructionism', in Denzin NK & Lincoln YS (eds.), *Handbook of qualitative research*, Sage, London, pp. 189–213.

SCB 2009, *Yearbook of housing and building statistics 2009*, Statistics Sweden, Orebro.

Sorell, S 2007, 'The Rebound Effect: an Assessment of the Evidence for Economy–wide Energy Savings from Improved Energy Efficiency', UKERC, viewed 22 September 2009, http://www.ukerc.ac.uk/Downloads/PDF/07/0710ReboundEffect/0710ReboundEffectReport.pdf.

Spangenberg, J 2002, 'Environmental space and the prism of sustainability: frameworks for indicators measuring sustainable development', *Ecological Indicators*, vol. 2, pp. 295–309.

Springett D 2005, 'Critical perspectives on sustainable development', *Sustainable Development,* vol. 13, no. 4, pp. 209–211.

STEM 2008, *Energy in Sweden. Facts and figures 2008*, Swedish Energy Agency, Eskilstuna.

Stern NH, 2007, Treasury GB. The economics of climate change: the Stern review, Cambridge University Press.

Sum, NL 2006, *Toward a cultural political economy: discourses, material power and (counter)hegemony*, EU Framework 6, DEMOLOGOS project, workpackage 1.

Sztompka, P 2002, *Socjologia, analiza społeczeństwa*, Znak, Kraków, Wyd.

Thompson, JB 1984, *Studies in the theory of ideology*, Polity Press, Cambridge.

Thompson, JB 1990, *Ideology and modern culture*, Polity Press, Cambridge.

Uimonen, P 2001, *Transnational.dynamics@ development.net: internet, modernization and globalization*, Dissertation, Stockholm University, Stockholm.

UN 2010, *Sustainable development: from Brundtland to Rio 2012,* Background paper prepared for consideration by the High Level Panel on Global Sustainability at its first meeting.

UN–HABITAT 2007, 'Urbanization: a turning point in history', viewed January 7 November 2012, http:// www.unhabitat.org/downloads/docs/Press_SG_visit_Kibera07/SG%205.pdf.

Urge–Vorsatz, D, Koeppel, S & Mirasgedis, S, 2007, Appraisal of policy instruments for reducing buildings' CO emissions, *Building Research & Information*, vol. 35, pp. 458–477.

van den Berg, LM & van Winden W 2000, *ICT as potential catalyst for sustainable urban development: experiences in Eindhoven, Helsinki, Manchester, Marseilles and The Hague*, European Institute for Comparative Urban Research (EURICUR), Erasmus University.

van Dijk, TA 1998, '18 Critical discourse analysis', viewed 28 April 2011, http://www.discourses.org/OldArticles/Critical%20discourse%20analysis.pdf.

Wackernagel, M; Schulz, NB; Deumling, D; Callejas Linares, A; Jenkins, M; Kapos, V; Monfreda, Ch; Loh, J; Myers, N; Norgaard, R & Randers, J 2002.'Tracking the ecological overshoot of the human economy', *Proceedings of the National Academy of Sciences*, vol. 99, pp. 9266–71.

Wheeler SM & Timothy (ed.) 2010, *The sustainable urban development reader,* Routledge, London and New York.

Wodak, R 1999, 'Critical discourse analysis at the end of the 20th century', *Research on Language and Social Interaction,* vol. 32, no. 1&2.

World Commission on Environment and Development (WCED) 1987, *Our Common Future (The Brundtland Report)*, Oxford University Press, Oxford/New York.

Wilson, A1992, *The culture of nature: North American landscape from Disney to the Exxon Valdez,* Blackwell, Cambridge and Oxford.

World Business Council for Sustainable Development (WBCSD) 2009, energy efficiency in building: business realities and opportunities, Summary report.

Word Summit on the Information Society (WSIS) 2003, 2005, EPFL – working group on the impact of ICT on the environment, viewed 20 May 2009, http://www.itu.int/dms_pub/itu–s/md/03/wsispc2/c/S03–WSISPC2–C–0043!!PDF–E.pdf.

World Wide Fund for Nature (WWF) 2008, *Becoming a winner in a low–carbon economy: ICT solutions that help business and the planet,* Letter to IT users.

Yanarella E & Bartilow H 2000, 'Beyond environmental moralism and policy incrementalism in the global sustainability debate: case studies and an alternative framework', *Sustainable Development* vol. 8, no. 3, pp. 123–134.

# Appendix A: Framing as Selection and Salience

ICT is seen 'as an enabler for sustainable development…through improved monitoring and control systems.' (ISTAG 2008, p. 6)

'Consumers and businesses can't manage what they can't measure. ICT provides the solutions that enable us to 'see' our energy and emissions in real time… Efficiency may not sound as inspirational as a space race but, in the short term, achieving efficiency savings equal to 15% of global emissions is a radical proposition.

The breadth of solutions will span motor systems, logistics and transport, buildings and electricity grids – across all key economies in the world...

Companies that implement the solutions will capture part of the potential global savings of €600 billion ($946.5 billion), once again showing that tackling climate change is not only good for the climate but good for the economy…

This sends a clear message to industry leaders and policy makers around the world that, through collaboration, ICT solutions can unlock emissions reductions on a dramatic scale.' (GeSI 2008, p. 7)

Buildings are responsible for at least 40% of energy use in most countries. The absolute figure is rising fast, as construction booms...It is essential to act now, because buildings can make a major contribution to tackling climate change and energy use.' (WBCSD 2009, p. 2)

Progress must be made now if we are to vastly improve the energy efficiency of both new and existing buildings.' (Ibid, p. 3)

'This global political and societal context [climate change] has profound consequences for practically all European citizens, and ICT has an important role to play into it.' (ISTAG 2008, p. 1)

If Europe takes the lead in developing new ICT–based solutions, this will…create business opportunities in a number of sustainability related areas, promoting the creation of jobs...' (Ibid)

'Only by enthusiastically embracing digital technologies in all areas of our economy and society will...Europeans achieve their true potential.' (ISTAG 2006, p. ii)

'As technology becomes ever more closely entwined in our daily lives, so it becomes more closely related with our…moral values. We should welcome this and make the most of the opportunities it brings.' (Ibid, p. 4)

'The need for much–improved energy efficiency presents risks and opportunities for companies in the building industry seeking to enter this market. The EEB Project's view is that early entrants can gain first mover advantage, but there are risks, especially with regards to the timing of market entry.' (WBCSD)

# Appendix B: Rebound Effects

## 1. The Phenomena of Rebound Effects

Several studies on rebound effects by energy economists (Berkhout, Muskens & Velthuijsen 2000; Binswanger 2000; Khazzoom 1980; Brookes 1990) point to the uncertainty in the net impacts of increased energy efficiency. There is thus no such theory that greater or improved energy efficiency leads to less energy use and fewer GHG emissions. The efficiency gains will not be secure because savings will be lost to greater consumption. For example, demand for final products and services will increase as a consequence of improved transport efficiency which results in lower manufacturing costs, lower prices, and greater purchasing power (e.g. Berkhout, Muskens & Velthuijsen 2000; Plepys 2002). Using technology that saves operational energy use of an industrial building may mean more energy is available for other potentially higher–carbon manufacturing processes for extra production. Energy gains from smart buildings, e.g. commercial buildings, may mean more energy is available for use in other business operations or services. Consumers are likely to drive bigger cars (or do more trips) and heat bigger homes as a result of efficiency gains. One can think of numerous examples in the urban context, which illustrate how gains in energy conservation can be cancelled out by rising demand for final products or services. In a nutshell, a more efficient use of energy resource does not always reduce its absolute consumption. Likewise, rebound effects apply to environmental technologies as products pertaining to smart buildings, smart transport, dematerialization, and smart motor systems. The increased efficiency resulting from the improved smart devices and control systems will not necessarily translate into reduced GHG emissions due to a phenomenon known as Khazzoom–Brookes Postulate, which posits that increased energy efficiency may result in overall reduced costs, generating gains and increasing demand for energy consumption and thus concomitant GHG emissions.

## 2. Different Types of Rebound Effects Attributable to Energy Efficiency in Buildings in Sweden

When discussing the causes of the environmental impacts of the introduction of energy efficiency technology as ICT equipment and services, it is useful to use the analogy with the rebound effects in energy sector. See (Greening, Greene & Difiglio 2000) for a comprehensive literature review of the rebound effects from energy efficiency improvements and their taxonomy.

Factors pertaining to building owners, such as income level, social norms, energy prices, and so on can influence energy efficiency in residential buildings in most European countries. This includes even Sweden, one of the most climate aware societies in the world (Nair, Gustavsson & Mahapatra 2010; Eurobarometer 2008). With 37% of the national final energy coming from mainly residential sector use in 2007 (STEM 2008), the Swedish government set a goal to reduce related energy use by 20% by 2020 (IEA 2008). In a survey conducted in 2008 in Sweden, Nair, Gustavsson and Mahapatra (2010) found that homeowners' preference for a particular type of energy efficiency measure is still influenced by such contextual factors as age of the house, past investment, perceived energy cost, and other factors such as income, education, and age influence. In some cases, the efficiency gains can be offset by insatiability for consumption of ever more energy, which occurs when increased energy efficiency gains followed by final price decrease stimulate new demand for energy, leading to an overall increase in energy consumption. Conversely, an increase in energy price may induce homeowners to actively search for measures to

reduce energy use (Ibid). Nassen, Sprei and Holmberg (2008) found that specific energy use for heating in existing Swedish buildings decreased due to an increase in energy prices. However, the effectiveness of energy use reduction may be reduced by the low price elasticity of energy demand by increased energy prices (Urge–Vorsatz, Koeppel & Mirasgedis 2007). Regardless, homeowners with low–income are the least likely to adopt building envelope measures; instead, providing investment subsidies may encourage them to adopt such measures (Nair, Gustavsson & Mahapatra 2010). In other cases, energy can be used until the constraints of satiation or budgetary trade-offs with unanticipated expenditures; the consumption pattern in this instance can be determined by such factors as consumer's time budget, i.e. busy lifestyle characterized by a high cost of time. In terms of cultural norms, the majority of the Swedish homeowners believe that it is important to reduce their household energy use (Ibid). In a survey conducted in 2008, 73% of the respondents had taken some measures (e.g. switching off lights or appliances when not needed) to reduce household energy use (Eurobarometer 2008). Nevertheless, Swedish homeowners are more likely to adopt energy efficient appliances compared to building envelope measures (SCB 2009): 'energy efficient windows and doors as well as insulation improvements in the attic, basement and external walls.' (Nair, Gustavsson & Mahapatra 2010, p. 2959) Adding to the rebound effects types are the transformational effects, e.g. alteration of social institutions. It is argued that the realization of energy efficiency improvement will be low due to the policy interventions and current prices (Ibid). Transformational factors are the most intricate as they are associated with complex dynamics of social and organizational structures.

# Appendix C: Rhetorical Figures and Persuasive Moves

## 1. Hyperbole

'…the targets…to fight climate change [radically reduce GHG emissions] and reduce the energy–intensity of our society are technologically and economically possible and provide a unique business opportunity for thousands of European companies.' (ISTAG 2008, p. 1)

'There is no doubt that a large number of the solutions to fight climate change will be made possible only by ICT.' (Ibid, p. 2)

'The EEB vision is a world in which buildings consume zero net energy.' (WBCSD 2009, p. 3)

'This rigorous assessment underlines that the world can realize a green economy and makes the transition to a low carbon economy…

'This important report makes clear the exciting opportunity that exists for industry to significantly contribute to climate change abatement…and gives a clear picture of the key role that the ICT industry plays in addressing climate change globally and facilitating efficient and low carbon development.' (GeSI 2008, p. 3)

'The ICT sector has…a critical role to play with other sectors to design and deploy solutions needed to create a low carbon society. I urge you to review this report and focus your efforts on improving energy efficiencies wherever possible, to…move boldly forward with technologies to improve our global climate. Acting now will be good for business, good for the economy and good for the world.' (GeSI 2008, p. 6)

'Recently, Lord Stern revised his targets for safe levels of GHG emissions reductions to 2 tonnes per capita by 2050 (20 GtCOe). The ICT–enabled solutions in this report would make possible savings of 1 tonne per capita in 2020, a significant step in the right direction… ICT solutions can unlock emissions reductions on a dramatic scale.' (Ibid, p. 7)

## 2. Rhetorical Mitigation and Understatement

'…the academic literature points to some uncertainty in the net impacts of increased efficiency. In theory, greater efficiency should lead to less energy use and fewer emissions. However, many are concerned that these gains will not be secure… However, prevention of the rebound effect requires an emissions–containing framework…to encourage the transition to a low carbon economy.' Without such constraints there is no guarantee that efficiency gains will not lead to increased emissions.' (GeSI 2008, p. 50)

Behavioral, organizational and financial barriers stand in the way of immediate action, and three approaches can help overcome them: Encourage inter dependence…, Make energy more valued…, [and] Transform behavior…' (WBCSD 2009, p. 1)

The ICT sector's own emissions are expected to increase, in a business as usual (BAU) scenario… But specific ICT opportunities identified…can lead to emission reductions five times the size of the sector's own footprint…by 2020.' (GeSI 2008, p. 6)

'While the sector plans to significantly step up the energy efficiency of its products and services, ICT's largest influence will be by enabling energy efficiencies in other sectors, an opportunity that could deliver carbon savings five times larger than the total emissions from the entire ICT sector in 2020.' (Ibid, p. 10)

'Building professionals tend to underestimate the contribution of buildings' energy to climate change…Know–how and experience are lacking in these professions...' (WBCSD 2009, p. 12)

'The buildings sector is slow to adopt new technology… (GeSI 2008, p. 45)

### 3. Storylines/Narratives

'In 1961, in his farewell speech, US president Eisenhower identified the dynamic set of drivers that characterized the American society at the time as the Military Industrial Complex. The term covered the close cooperation between the Military's needs (and the corresponding big budgets) and the innovative companies who worked closely with universities to develop hitherto unseen solutions to the military problems. The result was a strong US industry and military that still remains today. Presently Europe is in a unique position to create the same dynamic exchanges between large state budgets, innovative companies and top–class universities with a focus on climate and energy issues (instead of military issues) and thus create a European Climate Industrial Complex. This report addresses the most important **topics** that are expected **to drive ICT progress in the context of Climate Change** and its corresponding **Energy Targets**.' (ISTAG 2008, p. 2)

'Putting a man on the moon was one of the greatest technological challenges of the 20th century. In the 21st century we face an even greater test – tackling climate change. In contrast to the space race, the solutions required today must encompass us all. This is not just about one man walking on the moon, but about 7 or 8 billion people, the population of 2020, living low carbon lifestyles in harmony with our climate. How can a mission of this size be achieved? This report illustrates for the first time the scale of the opportunity for ICT to drive efficiency across the economy and deliver emission savings of 15% – 7.8 GtCO e – of global BAU emissions in 2020… Putting a man on the moon was once thought impossible. The next "giant leap for mankind" is within our reach, but only if we act now.' (GeSI 2008, p. 7)

### 4. The Persuasive Effect of Rhetoric

In the context of European society, the object of rhetoric is to influence social knowledge configuration and change social representation models. ICT4SUD discursive constructions are given meaning and form in the context of European culture. The ICT4SUD discourse is more likely to persuade European people than others. As van Dijk 1998, p. 357) states: '…given a specific context, certain meanings and forms of discourse have more influence on people's minds than others, as the very notion of "persuasion" and a tradition of 2000 years of rhetoric may show.' Moreover, given the involvement of many scholars, experts, and professionals as sources in the formation of the ICT4SUD discourse, the recipients, urban planners, citizens, communities, and organizations accept, through discourse from what they see as these trustworthy or credible sources, beliefs, knowledge, and opinions, to draw on Nesler et al. (1993), as

long as they are consistent with their beliefs and experiences, which holds true in this case, considering the social construction of ICT in European society. Overall, packaging of rhetoric elements aims to encourage particular interpretations while discouraging others pertaining to the potential of ICT in achieving SUD. The underlying assumption is that discourse and its strategies can be deployed in a subtle way to achieve intentional effects, once having basic insights into some of the structures of the minds of the targeted groups and what it means to shape their minds, to draw on van Dijk (1998).

# Appendix D: Critical Views on Sustainability Indicators

Although they are necessary to enable the kind of sustainability criteria to function in real–world politics, sustainability indicators have been subject to criticism. Applicable to all sustainability indicators, it is a no easy task to determine and gather the data necessary to actually measure the selected environmental indicators – GHG emissions per GDP and the Ecological Footprint – once established with respect to urban sustainability planning. Moreover, the contested nature of the approach to the sustainability concept has implications on the researchers involved in the creation of sustainability indicators. As a corollary, researchers may happen to work with a perspective different from that on the basis of which the indicators have been created. Different researchers define their indicators in a way that provide arguments to support their approach to defining the sustainability concept and their related goals (Kasemir et al. 1999). Furthermore, in relation to wielding of power in society, sustainable indicators may serve to, on the one hand, increase the power of the organizations that create them, and on the other hand, legitimate the actions of those that use them to promote societal discourses and affect political decision–making processes, to draw on Foucault (1980, 1991). As argued by Foster (2001, p. 157) 'indicators do not read themselves – nor do they simply *register* whether particular forms of development are `sustainable' or not…The processes of constructing and interpreting them rely on collaborative judgment – and this has to be exercised in a variety of relevant ways, as regards for instance the trustworthiness of the institutions involved, the acceptability of the assumed scientific framings, and validity of the various statistical measures in relation to people's lived experience.'

'To date, their success has been very limited, as many subjective choices are made in the aggregation procedure needed for the creation of these aggregated indicators. As a consequence, they are not perceived as "objective" and their capacity to be a link between the scientific discourse and the sustainability discourse is lost. We can see, therefore, that the "perception of objectivity" is a key element in the use of sustainability indicators.' (Ortega–Cerdà 2004, p. 10) Moreover, there are doubts surrounding the relevance of indicators, the assumption that the use of such indicators will shape decision–making (e.g. Ortega–Cerdà 2004).

# Appendix E: Political Ideologies

'Appropriate policies and regulations are essential to achieve market changes [towards energy efficiency]. (WBCSD, p. 17)

'…several types of interventions by governments are necessary to correct this market failure [climate change]:

• Establishing a carbon price, through tax, trading or regulation

• Technology policy to support low–carbon innovation….'

Businesses in the building industry need a supportive policy and regulatory framework to achieve dramatic improvements in energy efficiency….many building industry professionals only adopt new practices if they are required by regulation.' (Ibid)

'If we are to better use ICT technology to move away from existing energy intensive work habits and lifestyles, we need government policy innovations…' (GeSI 2008, p. 3)

In particular GeSI will: …Work with public policy makers to ensure that the right regulatory and fiscal frameworks are in place to move us all in the right direction.' (Ibid, p. 6)

'Mastering the next wave of ICT development and its use will require research to go hand in hand with regulation and policy.' (ISTAG 2006, p. iv)

If we are to better use ICT technology to move away from existing energy intensive consumption habits and lifestyles, we need policy innovations, incentives for companies and the active participation of consumers (GeSI 2008).

'The government and public authorities could and should play **a first–adopter role** and act as a role model (demonstrator effect) in view of the large amount of buildings they occupy.' (ISTAG 2008, p. 6)

'The regulatory framework is crucial for boosting or paralyzing developments' (Ibid, p. 11)

# Appendix F: Energy Conservation Approaches

There are many different approaches into achieving the main goal of energy conservation, which is to reduce the consumption of fossil fuels and increase the use of renewable energy sources. They are presented as follows, as adapted from (Sev 2009):

'*Low–energy urban development* improves the quality of life in a city, including ecological, cultural, political, institutional, social and economic components. Low–energy cities have zoning laws favorable to mixed use in order to develop energy–consciousness that depends not on transportation with motor vehicles, but on public transportation and pedestrian walkways. Integrating land–use, transport and environmental planning is important to minimize the need for travel and to promote efficient and effective modes of transport, including walking. According to Herala (2004), integrating land use planning promotes sustainable development and prevents environmental problems. Urban form and location of activities together with economic incentives and well organized public transport have a significant impact on traffic flows. The settlement formation of a city, which determines orientation and clustering of buildings, also affects the microclimatic conditions….

*Passive heating and cooling through orientation* maximizes the use of renewable resources from the site, such as solar energy and wind power (Karolides, 2002). When designing a building, the designer must look at the greater environmental impact and contextual implications of the building in relation to the site, and must search for alternatives to orient the building according to the sun path for passive solar gain and daylighting (Yeang, 1997; Gordon, 2005). Windows facing east allow for early warming of spaces during winter, while south–facing windows will aid afternoon warming. West–facing windows need to be carefully designed so they do not add to overheating the spaces. Vegetation can also be an effective solution for passive heating and cooling. For example, evergreen trees planted on the north of a building will protect it from winter winds, and trees on the south face will prevent summer heating…

*Using alternative energy sources* such as solar, wind, water and geothermal energy will eliminate dependence on fossil energy sources. While active energy generation is usually considerably more resource intensive than alternative power sources, sun and wind driven systems are renewable and eco–friendly since they do not emit pollutants, thus being sustainable…

*Avoidance of heat gain and loss through insulation and additional devices* reduces heating and cooling loads, resulting in energy consumption through the operation of the building. For example, high–performance windows and wall insulation prevent both heat gain and loss, so the building requires HVAC equipment with lower capacity, and the initial investment will be decreased (Yeang, 1997; Barnett *et al.* 1995). Adding devices for solar shading will also reduce the heat gains in summer, whereas wind wings protect the building from prevailing winds and heat loss in winter.' (Sev 2009, p. 165–166)