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Use of Cradle to Cradle Design in Landscape Architecture

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ABSTRACT

There is much talk and focus on the green shift and a more sustainable future in the contemporary society. World leaders, the media and common people are thinking, talking and focusing more and more on sustainable solutions to every problem. Climate change, waste reduction, local consumption, and biodiversity is some topics that are subjects for many heated debates. Within the issues of architecture, urban planning and landscape architecture the sustainability notion is present as well. How can we plan and design sustainable? And what does sustainable mean?

This thesis takes on the notion of sustainability in landscape architecture through the theory of Cradle to Cradle. The goal is to figure out how to use Cradle to Cradle in landscape architecture, and if the practice will then become more sustainable. The thesis aims to make Cradle to Cradle more defined and applicable, by combining it with more defined topics from other theories.

The outcome of the thesis is a handbook for use of Cradle to Cradle in landscape architecture. It is not a certification method, even though some of the inspiration is from the sustainability certification methods LEED, BREEAM and SITES.

The theoretic scope of this thesis is threefold; on sustainability, certification methods, and Cradle to Cradle. The handbook makes the main part of the thesis, followed by a case study where the handbook is tried through a conventionally planned project; the case of Kløftahallen kindergarden.

PREFACE

This master thesis is marking the end of a five-year long study of landscape architecture at the Norwegian University of Life Sciences (NMBU) at Ås, Norway. The theory of Cradle to Cradle is something that I was introduced to during an exchange stay at the Dutch university in Wageningen in the fall of 2013. I found the Cradle to Cradle theory interesting and as it was not vastly used within landscape architecture I wanted to focus on making it useful for this discipline.

In addition to using the theory of Cradle to Cradle, I wanted to figure out if there was a need of focusing more on sustainability in landscape architecture in Norway and if certifications were the way to go.

I would like to thank my supervisor from NMBU, Ingrid Merete Ødegård and Deni Ruggeri, who tried their very best to direct me in the right direction, and for all the long and interesting conversations.

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Everyone who participated in the survey

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DEFINITIONS

BIOMASS
Biomass is biological material derived from living, or recently living organisms. Biomass also describes plant based material as an energy source, but biomass can equally apply to both animal and vegetable derived material (What is BIOMASS?, 2015).

BIODIVERSITY
Biodiversity is the variety of life. It can be studied on many levels. At the highest level, you can look at all the different species on the entire Earth. On a much smaller scale, you can study biodiversity within a pond ecosystem or a neighborhood park (National Wildlife Federation, 2015).

BIOGEOGRAPHY
Biogeography is the study of the distributions of organisms in space and time. It can be studied with a focus on ecological factors that shape the distribution of organisms, or with a focus on the historical factors that have shaped the current distributions (Biogeography, 2015).

BIOREGION
Bioregions are relatively large land areas characterized by broad, landscape-scale natural features and environmental processes that influence the functions of entire ecosystems (NSW Environment & Heritage, 2015).

ECOSYSTEM SERVICES
Ecosystem services are described as functions in the natural environment that humans are dependent on. These can be provisioning, regulating, supporting or cultural (Ecosystem Services - TEEB, 2015).

BROWN FIELD
A brown field is an area or industrial or commercial property that is abandoned or underused and often environmentally contaminated, especially one considered as a potential site for redevelopment (Brownfield, 2015).

GREEN FIELD
A green field is an area that has not previously been developed or polluted (Greenfield, 2015).

LANDSCAPE ARCHITECTURE
In this thesis the term landscape architecture and landscape design is used interchangeably.

LIFE CYCLE ASSESSMENT (LCA)
Life-cycle assessment is a method to assess environmental impacts associated with all the stages of a product's life from cradle to grave (i.e., from raw material extraction through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling).

ENVIRONMENTAL PRODUCT DECLARATION (EPD)
An Environmental Product Declaration is an independently verified and registered document that communicates transparent and comparable information about the life-cycle environmental impact of products (What is an EPD - Environmental Product Declarations, 2010).

ISO 14025
ISO 14025 is an international standard which establishes principles and specifies the procedures for developing Type III environmental declaration programs and Type III environmental declarations (ISO 14025:2006, 2015).

DESIGN FOR DISASSEMBLY (DFD)
Design for Disassembly is the process of designing products so that they can easily, cost-effectively and rapidly be taken apart at the end of the product's life so that components can be reused and/or recycled (Information Inspiration, 2015).

LOW IMPACT DEVELOPMENT (LID)
Low Impact Development (LID) is an approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible. LID employs principles such as preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treat stormwater as a resource rather than a waste product (Us Epa, 2015).

REQUEST FOR TENDER (RFT)
A request for tenders is a formal and structured invitation to suppliers that can bid, supply products or services as requested (Request for tender - Wikipedia, 2015).

INTEGRATED PEST MANAGEMENT (IPM)
Integrated pest management (IPM) is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties (Integrated Pest Management, 2015).

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INTRODUCTION

This thesis aims to map the use of Cradle to Cradle design in landscape architecture. By using several research methods, like comparing different sustainability certifications, case studies, interviews and a literary review, the goal is to examine whether it is possible to consider a landscape project as sustainable.

The idea of sustainability is getting its merits tested. What is sustainability to us and current landscape architecture? The notion that the word sustainable is too diluted is a common thought today. Is it just pleasant formulations to sell products and projects or is the future actually going to become sustainable?

SCALE AND SCOPE
The scale and scope of this thesis is to assess different certification methods used in sustainable design, and to combine the most useful of these methods with the general idea of Cradle to Cradle design. The outcome is an inspirational handbook for sustainable landscape design based on Cradle to Cradle. The handbook can be used by practitioners within landscape architecture to assess topics and issues relevant to create sustainable projects.

The basic idea of sustainability is to reduce the use of energy and materials and to increase recycling, but the Cradle to Cradle theory reaches further.

THE LIMITATIONS OF THE THESIS
This thesis examines a large issue: sustainability. The thesis will therefore begin with an overall introduction to what sustainability can mean; in the common sense of the word, but also in relation to landscape architecture. The thesis then considers three sustainability certifications: LEED, BREEEAM and SITES. The LEED and BREEAM are used in the US, Europe and Norway, and SITES focuses on landscapes.

The thesis taken a theoretic approach to sustainability, meaning that the design section is smaller. However, chapter 4 will apply the handbook to a case study in Kløftahallen kindergarden.

The handbook is aimed at landscape architects, and focuses on what one should consider along the way. The handbook is well suited for smaller developments, such as Kløftahallen kindergarden. However, the handbook can also be useful for more disciplines such as urban planners, regional planners and others. The aim of the handbook is to encourage multidisciplinary design processes.

RESEARCH QUESTION

"Can we achieve more sustainable landscape projects by implementing the Cradle to Cradle theory? "

OBJECTIVES

"What does 'sustainability' entail in terms of landscape architecture?"

"How can THE Cradle to Cradle theory be used by landscape architects in Norway?"

"Does landscape architecture need a sustainability certification?"

METHODOLOGY

This thesis consists of different methodological approaches. For the theory part of the thesis I have read different articles, books and other dissertations on the theme of sustainability, performed some interviews on sustainability per se, and the different certification methods used.

To further map the issue of sustainability within landscape architecture I invited the members of the Norwegian Landscape Architecture Association to take part in a survey. With this survey I aimed to cover the three scales that I assess in this thesis; the sustainability in landscape architecture, the knowledge of the certification methods LEED, BREEAM and SITES; and the knowledge of Cradle to Cradle. The survey results are available in the Appendix.

RONNEBY

I went to the Swedish town Ronneby to see an example of Cradle to Cradle landscape architecture in practice. The town is located in Blekinge in Southern Sweden, and the Cradle to Cradle method was applied in the municipal plans and to construct a kindergarden. Findings from the project visit have been used to create the handbook and to assess Kløftahallen kindergarden in Norway.

I assessed the kindergarden during a field visit and assessed the material for the original plan, made by Pir II Arkitekter and Asplan Viak.

SURVEY RESULTS

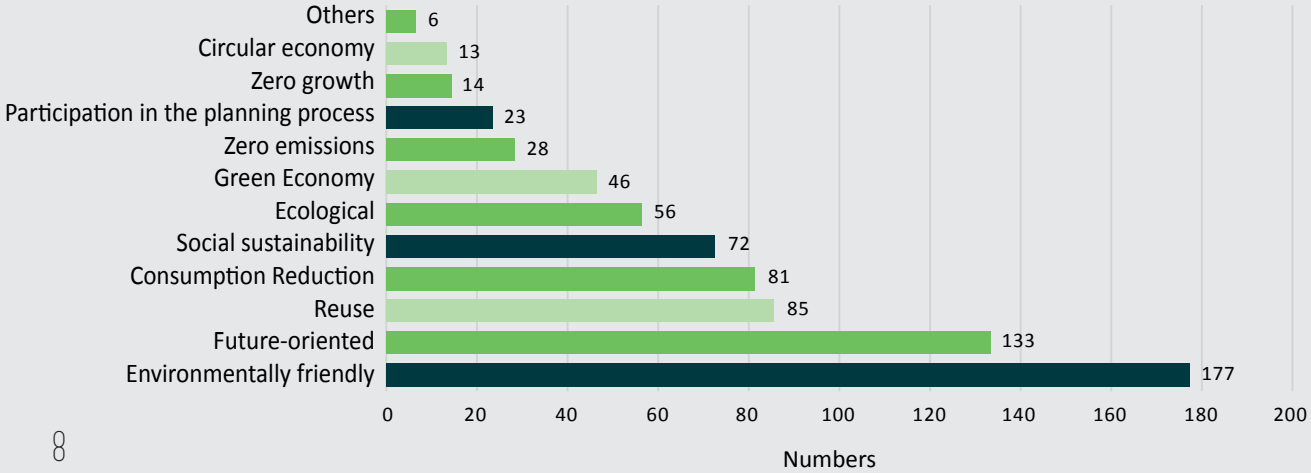
From the 22nd to the 29th of September 2015, I published a survey to all members of the Norwegian Landscape Architects Association (NLA). A total of 711 people were invited to participate in the survey, and 251 replied, a reply rate of 35 per cent. The goal of the survey was to get an overview of what Norwegian landscape architects considered to be the most important topic within sustainability. This would show what types and ideas other landscape architects have and if they want to contribute to more sustainable urban planning. The survey would also identify what demands professionals would have when assessing sustainability. This would in turn help me assess the need for a certification method, an inspirational theory, a guide or a handbook. The survey asked participants to express their interest, ranging from the topic for this thesis; sustainability in general; certification methods and finally the Cradle to Cradle theory. This would illuminate how landscape architects understand sustainability and related concepts.

The first questions presented several topics that can be said to be part of the sustainability discussion. These topics is derived from the American Landscape Architecture Foundation (Landscape Architecture Foundation, 2015). The thoughts about the importance of these different topics, is interesting because it says something about what landscape architects consider the main issues in the society today, and what they themselves need to focus on. Ideas of being environmentally friendly, ecological, future-oriented, to reduce consumption, to reuse waste, to establish more green economies, circular economies and more social sustainability are some of the ideas.

What all of these topics involves is not the scope of this thesis, but it is still implemented into this survey to get an overall view on the understanding of these topics within the discipline of landscape architecture.

FROM THE SURVEY

"What terms do you think are most important within 'sustainable'? (select three)"



PROCESS

The initial idea was to use Cradle to Cradle design in a landscape project. But as this theory does not go deep into detail, the theory could then make use of some additional features from other theories, to make it more defined.

One idea was to make a certification method for sustainable landscape design based on material from LEED, BREEAM and SITES. However, survey results did not show demand for a strict certification method. Instead the survey highlighted the need for an inspirational handbook. The survey also identified which sustainability issues that should be addressed by landscape architects. These issues are biodiversity, ecosystem services, water treatment, social sustainability, participation and local resilience.

Experiences from using Cradle to Cradle in Ronneby and the manual of Cradle to Cradle in the Danish building industry make up a more concrete Scandinavian version, still based on the original theory. The theoretical part of this thesis presents the concept of Cradle to Cradle, before using the manual used in the Danish Building Industry and the Ronneby case.

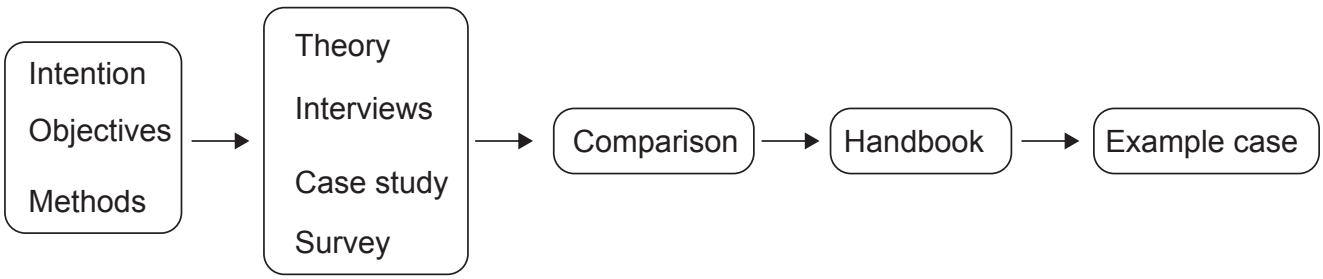
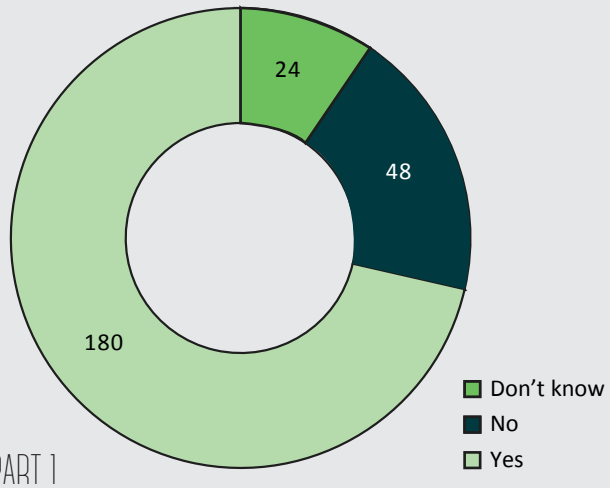
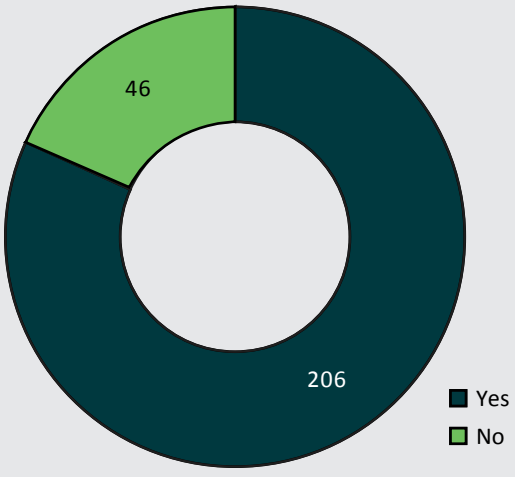


Figure 1: The process

"Have you in your profession been working with one or more projects where 'sustainable' has been part of the description?"



"Have you ever discussed with colleagues what sustainability means?"



PART 2: THEORY

SUSTAINABILITY
CRADLE TO CRADLE
LEED
SITES
BREEAM

WHAT IS SUSTAINABILITY?

The term 'sustainability' is often considered to contain three facets: the social, the economical and the environmental; the three pillars of sustainability. The definition of sustainability and sustainable development was formulated by the World Commission on Environment and Development (WCED) in the report 'Our Common Future', commonly known as the 'Brundtland report' from 1987. It is defined as development that 'meets the needs of the present without compromising the ability of future generations to meet their own needs' (UNWCED, 1987).

The policy of sustainable development is a combination of people's stories, indigenously based economic wealth and sensitive use of natural resources. This is extended by Paul Selman as the social 'liveability': the need for aesthetic surroundings, safety and wholesome air, water and food; the economic 'prosperity': the development of an economically viable landscape supported by farming, forestry, indigenous manufacturing and services, water and leisure; and the environmental 'biodiversity': the provision of viable core and matrix areas in which nature can thrive and extinctions be avoided (Selman, 2000).

Everything we do affects the environment and our self in one way or another. The extraction, manufacturing, use, reuse and wasting of materials is telling the story of human history. We use water as the universal solvent and carrier, which is not very rational. The great hydrologic cycle is in itself a vast purification scheme of water. Yet we need to invest large amounts of energy and resources in local purifying our water. For the consumers this water resource is often free, but clean air is very costly. Almost nowhere on the globe is the air unadulterated by human effusions (Lynch & Southworth, 1990).

The current society is based on consumption, waste, and exhausting. But can we accept that we are part of a universal wasting stream? To be sustainable, we must understand what waste and pollution is. Pollution occurs when the nutrient cycle is disturbed: when waste products are introduced that by their type, or their rate of production, cannot be used by the organisms that are present. Waste is substances sealed in a useless state; substances that could have been utilized further (Lynch & Southworth, 1990).

"We do not know what the future generations' tastes will be. Mortality progressively wipes the slate clean: new generations form their associations and their norms of design from whatever landscapes they are born into".

- Colin Price (2000)

THE SOCIAL ASPECT OF SUSTAINABILITY

"It is important not to confuse nature conservation with landscape. While the two are often complementary, there are differences of emphasis and, occasionally, conflicts"

- English Nature (1994)

Socially sustainability is evolving in time and space; including future generations and the pattern of current needs and trends (Selman, 2000). Social sustainability talks about equity, across the population today, and the future populations. This equity is based on supporting the disadvantaged, liberate human potential and build social cohesion (Thompson, 2000). But the sustainability debate must not divert our attention from resolving the inequity existing within our own generation (Price, 2000).

INCLUSIVENESS

Social sustainability is divided between participation and the feeling of inclusion; the sense of community. To be able to say that a project is socially sustainable one need to consider those who are the stakeholders; who are going to use it. The project need to be socially inclusive, rather than the exclusive. Both women, children, and the elderly need to be considered and included as stakeholders, as they are the most likely to participate through community projects (Roe, 2000). When talking of sustainability many people think of the process of reducing their physical comforts, convenience and freedoms, but as Roe argue, this might just be in the short term (Roe, 2000).

Some centuries ago the increasing dominance of the car and transport policy had severe effect on the structure and use of the landscape and the communities. This focus on freedom and choice led to feelings of disconnection and isolation (Roe, 2000). Now the reaction of the growing globalization has been to re-examine the significance and potential of the 'local' (Roe, 2000). Local food, goods and services is underpinning this feeling of community.

PARTICIPATION

Agyeman and Evans (Agyeman and Evans, 1997, in Roe, 2000) argue that "more community involvement or participation in environmental decision making is regarded as a necessary prerequisite for sustainability".

What is social sustainability in Norway in 2015? From several positions the notion of participation and inclusiveness is highlighted. The Norwegian Planning and Building Act the fifth chapter states that "§ 5-1: Anyone who promotes plan proposal shall facilitate participation. (...) The municipality has a particular responsibility to ensure the active participation of groups that require special arrangements, including children and adolescents. (...)." ("Lov om planlegging og byggesaksbehandling," 2015, own translation)

The idea of including different stakeholders in society and letting smaller communities have a saying in the plans being made. As well as the debate on how to provide an inclusive participatory process, there is also an ethical question of who to include from the community. Community participation can be generally defined as 'where people living in an area are able to articulate their desire for change by being involved in the planning and enactment of that change and maintaining and building on that change in the future' (Rowe and Wales, 1999, in Roe, 2000). The sustainability agenda has a strong interest in participatory methods of policy development and implementation, merging expert voices with lay knowledge (Selman, 2000).

As well as participatory incentives, the social sustainability raises the topics of delight and beauty, regarding human quality of life and enjoyment of the landscape, providing recreational activity, tranquil relaxation, visual stimulation, and attachment to place (Selman, 2000).

PUBLIC AND PRIVATE INITIATIVES

The public initiative of sustainable development is important since it can create trust, participation and inclusion through society on a higher level than individual initiative can. This might attribute to a new conception of citizenship, which changes social behavior, values and equality into a sustainable lifestyle. But what systems, structures and institutions will provide a more sustainable development and is democracy decisive for sustainability? This again is determined on the definition of democracy (Roe, 2000).

But governmental actions are not the only alternative to sustainable change. We need both top-down, global, and collective initiatives in addition to bottom-up, local and individual. The level of action that is appropriate is the one closest to the source of the problem, since landscapes do not always comply with politically or culturally imposed borders (Irvine, 1999 in Roe, 2000).

Sustainable development is dependent on empowering the powerless, by addressing poverty and extending civil rights (Selman, 1996, in Roe, 2000). Sustainable development is not possible without considering all stakeholders, views and values.

The private initiative and attitudes are important when considering a turn to more sustainable policies in our society. The way we consume, exhaust resources, pollute and discard things, is something that each of us must be open to. In that way we can learn more about our self, followed by change of attitudes (Lynch & Southworth, 1990).

THE ENVIRONMENTAL ASPECT OF SUSTAINABILITY

"Such vegetation is also the habitat of wild bees and other pollinating insects. Man is more dependent on these wild pollinators than he usually realizes."

-Rachel Carson (1962)

The idea of the environmental aspect of sustainability is interconnected to the notion of sustainable landscapes, whereas the definition of landscape is rather wide and appears as many different scales. There is difficult to point at what sustainability needs to address when considering landscapes, but at any level of detail the landscape should be ecologically viable, biologically diverse and physically accessible (MacFarlane, 2000).

ECOSYSTEM SERVICES

The last couple of years the notion of ecosystem services has achieved much attention. In this approach one has tried to rate some of the services that the natural environment is providing us with, and tried to put an economic value to those services. Ecosystem services can be water treatment, regulating climatic features, noise reduction, better air quality, biodiversity, recreational features, educational features, and food production (TEEB, 2010). The traditional way of conceiving the economic value of nature has been to measure the amount of resources or the energy it provides, like raw ore, timber, oil and gas. But now all the other 'services' nature provide us with have gotten higher recognition. These services have no substitutes and both the human race and other life is critically dependent on these services (Benson & Roe, 2000).

There has been a change of perspective - from protecting particular environmental capital to identifying environmental services (Price, 2000). This can be seen as a shift from admiring a landscape that is ornamental, paved, groomed, and relatively static, to start emphasizing diversity and complexity (Ann Rosenberg, 1986, in Thompson, 2000).

In the Official Norwegian Report 'Nature's benefits - about values of ecosystem services' (NOU 2013: 10) there are examples of how different elements of biodiversity contributes to ecosystem services and new values for human health and welfare.

Table 4.1 Examples of how different elements of biodiversity contributes to ecosystem services and new values for human health and welfare

Elements of biodiversity	*As ecosystem service*	*As benefits*
Wild plant and animal species that are related to crops and livestock	Can help to ensure food production today and by future climate change, pests and diseases	Food safety
Organisms which produce chemical compounds that protect them from their natural enemies	Can help develop chemical compounds which can be used in drugs and other products (option value)	Greater ability to fight diseases
Wild predators that feed on insect pests	Helps to reduce damage to crops	Food safety and reduced health through internal use of chemical pesticides
Wild pollination insects	Production of flowers and foods, particularly fruits, berries and vegetables	Food safety
Big charismatic vertebrates (birds, mammals) and remarkable plants	Contributes to the aesthetic experience of beauty, inspiration and knowledge about nature	Wellbeing and inspiration for those who appreciate these organisms
Endangered species	Maintenance of biological and genetic diversity	Aesthetics and option value and direct benefits (eg. Genetic resources and semi-natural areas as habitat), depending on context

Figure 2: The benefits of ecosystem services

THE ECONOMIC ASPECT OF SUSTAINABILITY

BIOGEOGRAPHY

Considering environmental sustainability, the extent and connectivity of the biosphere is important to assess. We must consider the landscape as a whole and plan for connected landscapes of patches and corridors, where there is a network of habitat and buffer zones. We should not continue creating 'islands' of protected landscape (Philips, 2000; Roe, 2000).The theory of considering the patches, corridors and networks was generalized by Wu and Levin (Wu and Levin, 1994 in Selman, 2000) as 'patch dynamics' and the more specific notion of island biogeography.

This theory advocates for the governance of environments based on bioregional landscape units, rather than on the administrative boundaries that are defined. This can be a good strategy for achieving sustainable environments, or maybe preferably called 'quality of life' or 'liveability' (Selman, 2000).

LANDSCAPE ECOLOGY

The synthesis of this is called landscape ecology. Deriving from biogeography and path dynamics, landscape ecology needs a framework based on extensive geographical areas. Theses bioregions use ecological boundaries that can be used to rescale communities and encourage sustainability (Kidd, 2000; Selman, 2000). These geographically identifiable boundaries are important in defining patches, mosaics and whole landscapes; both on ecological and aesthetical functions. The natural phenomena of spatial division are for the most part a gradual shift, but the human made 'fence effect' is spatially immediate, creating a spatial framework of dissection and fragmentation.

According to Satterthwaite (Satterthwaite, 1999 in Kidd, 2000) the bioregional perspective can help in understanding sustainability by highlighting conflicts within the self-sufficiency or parasitic tendencies of the different regions economic, social and ecological resources.

"The policy frameworks which promoted output at the expense of biodiversity, local and national cultural heritage and the integrity of regional landscapes have been subject to an extensive critique."

- Robert MacFarlane

The economic aspect of sustainability is an interesting position, being the least written about aspect of sustainability. As both the environmental and social part of sustainability is two agreed upon faces of the sustainability discussion, not all economists agree that sustainability should be an overriding, or even interesting, goal. As Beckerman claimed in 1994, that we should favor 'optimal development', where neither environment nor future generations have any special claims (Price, 2000).

In traditional economics, consumption is that use of goods that results in a loss of their utility. It is the legitimate, universal process of ensuring survival and satisfaction, which must be balanced by continuous production of new utilities (Lynch & Southworth, 1990).

Today sustainable economy is divided into green economy, environmental economy, ecological economy, deep economy and circular economy, to name a few. What they all have in common is the notion of quality of growth rather than quantity, and the attitude towards natural capital. An UNEP (United Nations Environmental Programme) report defines green economy as one that "improves human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. (...) It works to minimize excessive depletion of natural capital" (UNEP, 2011)

The field of ecological economics was founded in the 80s, aiming at an interdisciplinary approach to the traditional economics, and treating the economy as a subsystem of the ecosystem. This theory emphasizes the preserving of natural capital (van den Bergh, 2001).

In his book 'Deep Economy' Bill McKibben questions the notion of 'more' equals 'better', and evaluates this in accordance to human satisfaction and happiness (McKibben, 2007). The solution to a number of negative tendencies in our western society is more community-based economies, whit local production, consumption and growth. The more extreme strategy for local resilience and growth is the idea of local currency, which also is presented in the 'Transition Town' movement, advocated by Rob Hopkins (Hopkins, 2008).

David Lynch states in his book 'Wasting Away' that nobody designs for how their product are going to be disposed when they wear out. He advocates for more resilience of material use through remanufacturing as a radical approach, including disassembly, repair of replacement, and reassembly of separable components on a regular production line (Lynch & Southworth, 1990).

SUSTAINABILITY IN LANDSCAPE ARCHITECTURE

What it the role of the landscape architect in the discussion of sustainability? Some might claim that the profession of landscape architecture is in itself a sustainability and environmentally friendly profession. But maybe are landscape architects as capable to do harm as to maintain the environment. As landscape work is related to development, either as repairing after development, planning for development or designing to accommodate development. Through environmental assessments, visual impacts assessments and mitigation works, the landscape architects might actually facilitate for non-sustainability projects, like car parks (Thompson, 2000).

To be able to do solve problems that traditionally has been considered as outside the profession, both on landscape and communities, we need intellectual flexibility and visionary creativity, as well as a new set of tools, that the new sustainable agenda is providing, like new knowledge, experience, certification methods and public incentives (Roe, 2000).

The contemporary landscape architects need to follow trends like technocentrism and ecocentrism on the same time. The tecnocentrism meaning a 'belief in the retention of the status quo in the existing structure of political power, but a demand for more responsiveness and accountability in political, regulatory, planning and educational institutions' and ecocentrism meaning a 'demand for redistribution of power towards a decentralized, federated economy with more emphasis on informal economic and social transactions and the pursuit of participatory justice' (O'Riordan, 1981, in Thompson, 2000).

There are several parts within the landscape profession that constitutes an economical thought; the already mentioned ecosystem services, the landscape as a 'product'; the experience of the landscape with its landform and biotic cover. This natural capital is different form the resource extraction that supports the development of human use, consumption and enjoyment. There is a dichotomy of growth and development, being either quantitative or qualitative. The qualitative economic development requires policies for sustaining the capacity of productive environments (Benson & Roe, 2000; Price, 2000).

We still need to address this issue of economic growth on the expense of the environmental and social sustainability. As Robert MacFarlane states: 'The policy frameworks which promoted output at the expense of biodiversity, local and national cultural heritage and the integrity of regional landscapes have been subject to an extensive critique' (MacFarlane, 2000).

To price landscapes while considering the sustainability of it, needs to address the state of the landscape for future generations. The experience of the landscape and the environment can be seen as a kind of consumption that we share with the generations to come, and we must not compromise their ability to do so. So the cost of development, human prosperity and restoration is something we share, across generational boundaries, securing valid landscapes, tourism that respects environmental capacities, called inward investment (Price, 2000; Selman, 2000).

The sustainable landscape is a landscape that allows species movement and behavior without being constrained by linear or areal features such as roads, polluted water bodies or intensively managed farms. These landscapes provides connectivity and coherence as well as visual and ecological structure (MacFarlane, 2000).

The social aspect of sustainable landscapes is about viewing the environment as more than objective science; it is both its nature and human aspects. Such as landform, soils, land use, archeology and human settlements, and the more personal values of cultural associations, social valuation and aesthetics which is more temporal and ephemeral. Social sustainability gives resonance to the landscape perspective by considering quality of life and the importance of connections with cultural heritage (Kidd, 2000).

"Nowhere is nowhere, and everywhere is somewhere"

- Adrian Philips

CRADLE TO CRADLE

"Our goal is a delightful diverse, safe, healthy and just world – with clean air, soil and power – economically, equitably, ecologically and elegantly enjoyed".

– William McDonough & Michael Braungart

The Cradle to Cradle theory was conceived by the American architect William McDonough and the German chemist Michael Braungart, first in 1992, through a number of articles on the substances that we in the modern world uses for different purposes. Since then several books and projects have used Cradle to Cradle theory to aim for more sustainable and future oriented systems. The main difference between Cradle to Cradle and 'conventional' sustainability theories is the notion of less bad isn't good; only more good is good. This constitutes the idea of eco-effectiveness rather than eco-efficiency.

THE HISTORY OF CRADLE TO CRADLE

The Cradle to Cradle theory emerged in1992 with the EPEA Intelligent Product System and the Hannover Principles. The Environmental Protection Encouragement Agency (EPEA) was founded in1987 by Michael Braungart, as a branch of German Greenpeace. The Hannover Principles was some ideas on how to design buildings and products, with focus on their impact on the environment, sustainable growth and the society. They were formulated to the planning of the year 2000 Hannover Expo, in 1992.

The principles are:

- Insist on the right of humanity and nature to co-exist in a healthy, supportive, diverse and sustainable condition.
- Recognize interdependence.
- Respect relationships between spirit and matter.
- Accept responsibility for the consequences of design decisions upon human well-being, the viability of natural systems and their right to co-exist.
- Create safe objects of long-term value.
- Eliminate the concept of waste.
- Rely on natural energy flows.
- Understand the limitations of design.
- Seek constant improvement by the sharing of knowledge.

Late, in 1998, the article 'The NEXT industrial revolution', written by McDonough and Braungart, took on the notion of eco-efficiency and the need of changing out mindset and behavior on how to be sustainable. But the real eye-opener of Cradle to Cradle came in 2002 with the book 'Cradle to Cradle: Remaking the way we make things'. In this book McDonough and Braungart gathers all the theories of what then became the Cradle to Cradle theory (McDonough & Braungart, 1998).

Of new ideas they seek to give foothold in our society, are the ideas of leasing products as services, materials passports and tracking, design for disassembly, anticipatory design and nutrient recovery. What is important to know is that the Cradle to Cradle theory is that it is not a certification method, with checklists and rigid standards. It is rather an open platform

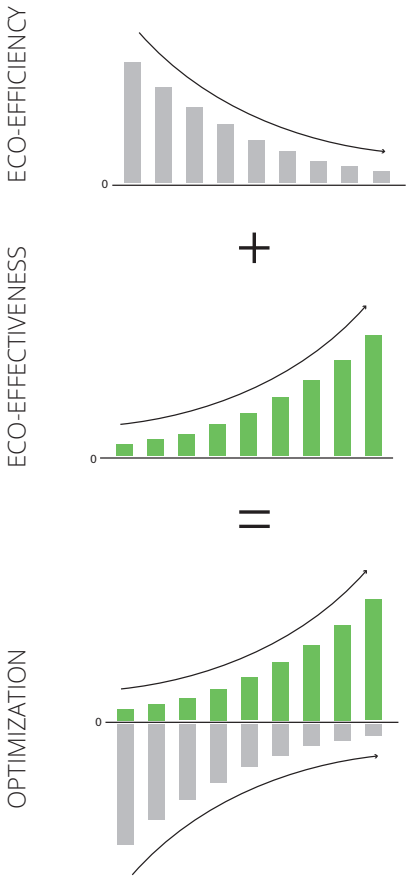


Figure 3: Eco-efficiency and Eco-effectiveness

for innovation, within new design solutions and circular economies, with a focus on resource cycles.

Cradle to Cradle is a brand based on the conventional 'Cradle to grave' concept of the contemporary society, starting with the industrial revolution. The old way of detaching human production from the ways of nature, and to view resources as an ingredient of making temporary goods, which in the end is bound to end their lives as waste in a 'grave', is something the Cradle to Cradle theory is aiming to change. The inspiration to this is the integrated systems of nature; the never ending cycles (Braungart & McDonough, 2008).

The theory of Cradle to Cradle is based on three major features: waste equals food, use renewable energy and respect diversity.

WASTE EQUALS FOOD

The 'waste equals food' notion of Cradle to Cradle is based on the idea that waste is a human made concept, and that in nature there is no such thing as waste; everything is useful, everything is part of an everlasting cycle. That means that whatever we make, use and throw away, should be guided back as nutrients to a cycle, and not be locked within unusable components. Waste is a resource.

USE RENEWABLE ENERGY

To use renewable energy is a quite familiar concept, and is something that is impossible to walk around when talking of sustainability. Almost all energy sources are in some way related to the most effective generator of all; the sun. To use solar panels, wind farms, water power or wave power; all is related to the sun.

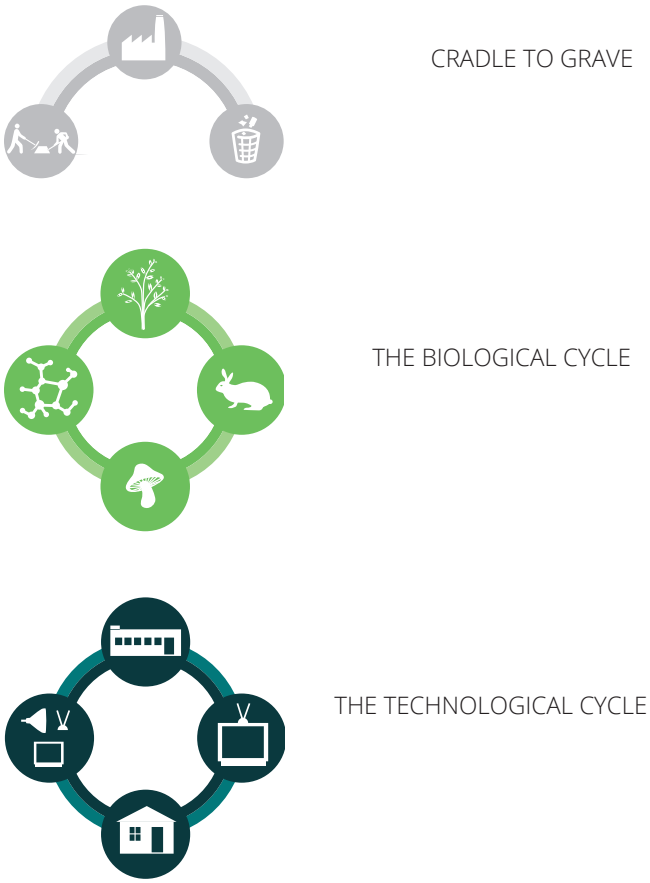
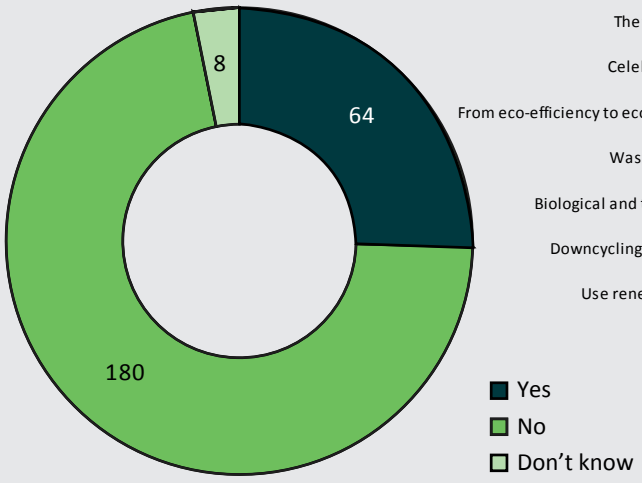


Figure 4: The biological and technological cycle

FROM THE SURVEY

"Have you heard of Cradle to Cradle?"



"What themes within Cradle to Cradle have you heard of?"

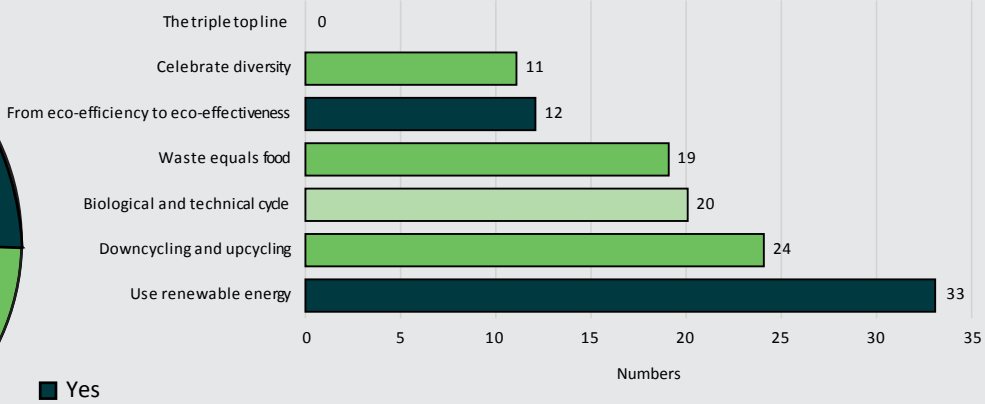


Figure 5: Cradle to Cradle

RESPECT DIVERSITY

To respect diversity is in this meaning a very broad notion of the concept diversity. It includes diversity of species, both plants, insects, animals, but also diversity of cultures and systems.

This is the fundament of Cradle to Cradle, and it seeks to support the two metabolisms of everything; the biological cycle and the technological cycle.

THE BIOLOGICAL CYCLE AND THE TECHNOLOGICAL CYCLE

To distinguish between what is a biological nutrient and what is a technological nutrient is the key in a Cradle to Cradle project. The notion of the biological and the technological cycle was first formulated in 1992 by EPEA. The basic idea is that everything is nutrients that should be used over and over again. This might not be any news; the idea of recycling has been around for decades, but what is new in Cradle to Cradle is how we see this wastes, or nutrients as they should be defined as. We should make products and components that is not harmful to the environment since we have the opportunity to do so.

UPCYCLING AND DOWNCYCLING

In today's society the focus on recycling is everywhere. One should recycle paper, plastics and food wastes, to name a few, in designated bags and garbage cans. More and more commodity goods have their own escape route from our households, where some are reused, some are burned to become energy and some deposited.

All of these elements are some of the intentions behind the Cradle to Cradle idea, and something that I will further present in the following part, from the manual from the Danish building industry. The topics of materials used, biodiversity, air and water, renewable energy, social equity and processes, and local economy are all something that needs to be addressed (Braungart & McDonough, 2008; McDonough & Braungart, 2000).

CRADLE TO CRADLE I DET BYGDE MILJØ
manual for the Danish building industry

As inspiration and a guide in assessing Cradle to Cradle for Norwegian landscape architecture, I have used the manual from the Danish building industry 'Cradle to Cradle i det bygde miljø' ('Cradle to Cradle in the built environment') from 2013. It has been developed by GXN and Vugge til Vugge Danmark, with support from Realdania. The editors have been Kasper Guldager Jørgensen, from GXN and Søren Lyngsgaard from Vugge til Vugge Danmark (Jørgensen & Lyngsgaard, 2013).

THE SCOPE OF THE MANUAL

What this manual is aiming at is to create a foundation for implementing Cradle to Cradle design in the Danish building industry. To place some thoughts on process, elements of focus and show some exemplary projects. It is not a certification method, nor is it an environmental check list. It is an innovation platform. There is a long way to go before the built and manmade environment is contributing positively to the natural environment, and at the same time raising the social-economic values. There is today still depletion of resources and discharge of toxic waste, as this has become the default design feature. That's why the Cradle to Cradle process starts with an intention for the project that is defined as being 100 % positive; such as cleaning the water, producing energy or to increase the biodiversity. This method of work is divided into three steps:

1. The positive intention
2. The intention formulated as a couple of objectives
3. Define some measurable steps, either qualitative or quantitative

An example on these theoretical steps could be if the intention is the Cradle to Cradle mantra of 'Waste equals food'. Then the objective for this intention would be to use safe materials, so that these materials could be recycled and not represent any hazard. A measurable step in this process would be to identify the producers of the most advanced products that are closest to the Cradle to Cradle standard. Following the intention, objectives and measurable steps, there are some strategies and tools to make use of. This could be to avoid materials that are harmful, for example down to the 100ppm level , and that those materials can be separated; either as being biodegradable or being safely reused within new products without loss of quality. When the early processes are done and the project has come into existence, one needs to define some examples of increase in value. This could mean a more resilient building, to preserve the value of the resources, or to optimize the resource use.

In this case of landscape architecture and landscape projects and issues, the intention of 'respect diversity' comes closer to mind. Then a good objective is to develop the site to increase the biodiversity. A measurable step is to measure the biodiversity after a certain set of years. To achieve this, some strategies and tools can be on the detailed level of green walls and roofs, and to focus on facilitating for micro-habitats. Examples of increase in value can be the pleasurable experience for the users, and ecosystem services; like clean water, clean air and food production.

As in every other design process the Cradle to Cradle process is defined into three phases: analysis, strategies and measurable steps. The analysis stage is where the intentions, values and objectives are formulated. The site is assessed and an aim for a 100 % positive goal is defined. The strategies will not by themselves secure a Cradle to Cradle quality project, but they describe the road towards it. To measure the performance of the project, the components or the materials let us optimize the output that is the objective. Elements should continuously create higher value, economically, socially and environmentally.

This is where the optimization of eco-effectiveness and eco-efficiency make two different stances. To integrate value increasing components as biodiversity or water and air treatment is regarded as eco-effectiveness; an instance that by increase in quantity is a larger good. This is what Cradle to Cradle is all about, to plan for positive outputs and by-products. On the other hand we might need to minimize the negative effects, like energy and water consumption. This is called eco-efficiency and is what the conventional environmental movement is advocating. But being less bad is not being good. So as a transition process eco-efficiency can be integrated, to phase out negative elements. This is over time upgraded and optimized to the point that reducing is no longer needed.

The manual of the Danish building industry is focusing on some main elements from Cradle to Cradle:

- Materials
- Energy
- Biodiversity
- Air
- Water

The five elements are within the environmental aspect of sustainability. In addition to this the manual considers the social and economic aspects. I consider these seven topics as relevant for landscape projects as well, but with more focus on some features, like biodiversity, and less focus on others, like energy. This is to make the topics recognizable and to advocate the notion of multidisciplinary cooperation.

PROCESS
The framework of every project is an implementing process, a path of seven steps:

- Programming
- Sketching
- Planning
- Tendering
- Construction
- Use
- Reuse

It is important to incorporate the intentions and objectives as early as possible in the process, and to set the level of ambitions. The ambition of a Cradle to Cradle inspired process is that the project is improved over time; in a circular perspective.

In the programming phase the intentions, opportunities and challenges are mapped. Here one include all stakeholders and create a broader cooperation to enhance innovation.
In the sketching phase the objectives are set, and the parameters and goals for the design decisions are made, like the topics of form, disposal, economy and time.

During planning the measurable steps are sketched, qualitative or quantitative or a combination.

The tendering phase includes a request for tenders that define innovative models of supply and reuse of materials and components, like leasing and 'take back' agreements. This is defined as resource optimizing.

Then during construction, based on the demands to the subcontractors, there should be a business model that facilitate for improvement in the pace of the innovations, like replacement of materials and components. The tendering material might be some years old, so one must give space to implement the most innovative components there exists.

During the phase of use, there will be performed continuous measures, and Incitement structure that makes continuous enhancements attractive.

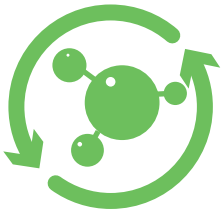
When some of the materials, components or the whole project is up for reuse, subcontractors could be responsible for improving and collection of their own materials, while being economically secured in form of a running engagement within the project. This leasing of materials and services means that materials become currency instead of waste.

I will now go through the seven topics used in the manual to present the Cradle to Cradle position on them.
<<

"If one must dump, and not recycle, then think of it as temporary storage. If not degradable, the wastes should be left in pure and accessible deposits, and not in hidden, chaotic mixtures. A standing building is easier to mine than is its debris in a landfill."

- Kevin Lynch

MATERIALS



Within material use there is a default method of downcycling today, meaning that the value and quality of materials deteriorates. The intention for healthy materials should be that the built environment acts like a material bank of products for future generations. In that sense what we build is only temporary. To be able to do this one need to define the materials; from extraction, and use to potential reuse. Are the resources renewable or are the materials reusable? The goal is to keep their value through the cycles or even to increase the value, called 'upcycling'. To do that, the materials need to be defined, either as biological or technological, they can't be both. If a wood product is coated with a substance that is not biodegradable it cannot be put into the biological cycle. A Cradle to Cradle inspired project uses methods so that biological materials can perform on the highest level in the period of use, and then be securely downcycled into the biological cycle. The materials need to be designed for disassembly, if not, they end up being dangerous hybrids.

Ever more products are designed for disassembly, and this stimulates to innovation, including new value-added synergies and reducing cost of new materials (Jørgensen & Lyngsgaard, 2013). A good strategy of reuse looks beyond the site. Working with the daily nutrient flows we get optimal utility of resources, higher value and quality of materials, and enhanced consciousness about resource use.

Cradle to Cradle inspired projects can increase value for several stakeholders in the process:

- For the developer – enhancing adaptive and changeable projects and buildings
- For the manufacturers – securing high quality resources and reduced responsibility and risk
- For the recycling industry and municipalities –it is easier to reuse products that are designed for disassembly
- In the long run it will also have positive effect on future generations – since the resources are maintained and the use is more effective
- And of course for the environment – being that the production and use becomes more secure, and nutrients are extracted and used more effective (Jørgensen & Lyngsgaard, 2013).

Considering the topic of materials within Cradle to Cradle design, what are the strategies on hand? The manual for the Danish building industry have used three main strategies:

1. Design for disassembly
2. Increase knowledge of materials
3. Material evaluation

If the built environment is supposed to be a bank of materials, this requires development of innovative components and business models, and facilitate for healthy materials cycles (Jørgensen & Lyngsgaard, 2013).

DESIGN FOR DISASSEMBLY

This strategy can be used on both materials and components. It is important to catalog the elements after the period of use. When you know the period of use it is easier to design from the beginning when and how the period of use is ended. Is the material intended for a new life as a nutrient in the biological systems, or is it a part of a new technological product? Here the joining system needs to be optimized. It is better using mechanical joining or gluing, or using joining substances that are weaker than the components they are joining, for instance mortar that is weaker than the bricks they connect (Jørgensen & Lyngsgaard, 2013; Krogh, 2014).

INCREASED KNOWLEDGE OF MATERIALS

In many projects there might be lacking an overall list of the quantity and quality of materials used. To secure the value of raw materials it is essential to increase the knowledge of the material. Databases for material information should be created for all projects. This can be included in the BIM models if that is relevant. It can be considered as a material passport, with defined content and intentional period of use, including disassembly, recycling and reuse. The project team can ask for information from the manufacturers and suppliers, and in this way create a Cradle to Cradle inspired material innovation, by demanding focus on ingredient list and innovation. In Norway this exists as CoBuilder and ProductXchange, which is used for buildings, but not so much for outdoor landscape projects (Fredenlund, 2015). These nutrient certificates describe defined features within materials in products, and can act as a market mechanism to enhance product design.

To get the information and knowledge about a product, from extraction of raw materials to the end of the user period, the use of Life Cycle Assessments (LCA) and Environmental Product Declarations (EPD) is a good strategy. The LCA describe and trace all the bounded energy that is needed and consumed in the making of a product; the bounded energy, the transportation distance and the resource use. The EPD is a declaration, not a certification based on ISO 14025 standard of Environmental labels and declarations, which acts as a catalog of the environmental consequences of a product (Jørgensen & Lyngsgaard, 2013).

MATERIAL EVALUATION

During a Cradle to Cradle inspired process the material evaluation is meant to figure out whether the materials are healthy for humans and the environment, and to uncover the materials properties in the period of use. This evaluation process is needed for products aiming to become Cradle to Cradle certified. This is performed as an ABC-X assessment; a chemical material assessment, where A is Optimal, B is Optimizing, C is Acceptable and X is Not Acceptable (Jørgensen & Lyngsgaard, 2013).

"The buildings shall deliver clean excess energy to its surroundings".

ENERGY

The objective for the energy topic is to produce clean energy. Usually the sustainable focus for buildings is to reduce the use of energy. According to the Cradle to Cradle idea that is a good start, but not a good enough strategy. The buildings total energy use (Life cycle assessment) in addition to the energy supply of the building needs to be assessed to give the total picture of the energy situation. This can be seen as four subtopics: optimizing the energy consumption, energy guidance, energy quality, and production of renewable energy (Jørgensen & Lyngsgaard, 2013).

The reason why the buildings energy consumption is relevant when considering the landscape, is that the natural and the built environment is never disconnected; they need to consider each other. Buildings consume much more energy than landscape projects, but some landscape projects have a need for energy, and there is also an opportunity of producing small scale energy within the landscape.

Optimizing the energy consumption is decided at large by the architectonic design, the orientation of the buildings according to the microclimatic situation and the sun. This will affect the landscape as well.

The energy guidance is meant to balance the relation between the demand and use of energy; to create transparency in the energy systems and measurements that can be analyzed. This can stimulate to sustainable energy use by making the energy consumption transparent for the users.

There are different energy qualities, from fossil to renewable sources. If one can within the project process help innovation and incentives to explore the possibilities of renewable energy sources, the change from fossil to green energy will go easier. If the projects are producing renewable energy, this gives both economic and environmental benefits, in addition to be visible and act as positive branding (Jørgensen & Lyngsgaard, 2013).

Strategies for a more sustainable energy use aims to find the balance between energy reduction and energy production. All the sunlight that reaches the earth in one day is sufficient to supply the earth with energy for one year. Ever more building project will be able not just to reduce its energy consumption, but also to supply the grid with excess power. Energy reduction is a way to achieve energy positive houses, but that should not be the final goal. Thermos active constructions are one strategy of energy reduction, using heavy constructions that can lead excess heat, for heating or cooling. Climatic zones are another strategy, using climatic buffers like atriums. There are different strategies of energy production that is relevant for the landscape project, and the kind of production will vary. Geothermal heat secures a stabile flow of heat. By pumping water down into the ground, where the temperature rises by approximately 20-30 degrees Celsius by each kilometer. The water can be connected to a district heating facility (Jørgensen & Lyngsgaard, 2013).

Solar collectors gather heat, either in water or air, to be used as hot water or room heating (Jørgensen & Lyngsgaard, 2013).

Photovoltaic panels, better known as solar panels, are getting cheaper and more effective. Depending on materials, size and sun intensity. There is much innovation on this topic, and might become effective energy producers even in Norway. Another method is to create bio gas from excess biological waste. This creates methane gas that can fuel energy production (Jørgensen & Lyngsgaard, 2013).

Intelligent installations can help to reduce the energy consumption, by using energy only when needed. (I.e. movement- and light sensors, intelligent climate systems and energy information.) Visible energy measurements can stimulate to behavioral change (Jørgensen & Lyngsgaard, 2013).

The process of energy planning demands differentiating between buildings, grounds and surroundings, and to integrate energy technologies in the building or on the grounds. An innovation scheme is to utilize excess heat from humans and machines. The objective should be that 'the buildings shall deliver clean excess energy to its surroundings'. What materials used, orientation of the buildings, and photovoltaic panels on the roofs and walls for energy production and shading, as well as use of vegetation for shading and wind breaks. The energy producing technologies should be derived using leasing agreements with suppliers, so that they are optimized over time. Life cycle assessments should be performed to reveal the total amount of energy used, and the material with the lowest energy demand should be picked. After a certain span of time, the building generates more energy than it uses, with help from the schemes used on the grounds. New innovations are installed, whatever is accessible (Jørgensen & Lyngsgaard, 2013).

"Guidelines for decay are as important as guidelines for growth"

-Kevin Lynch

BIODIVERSITY

The topic of biodiversity contains the objective of increasing the biodiversity and stimulates regional biotopes. The biodiversity is often sacrificed to make way for human projects. But human production is not separated from natural systems and functions. A Cradle to Cradle inspired project is about reintegrate the build environment with the natural system, to actively affects each other positively. Today we talk about ecosystem services. These services can be cleaner air, clean water, pollination of crops, shading and isolation. One can see nature as two things: biodiversity – the diversity of everything, and biomass – the total amount of living organisms. A high biomass is necessary for a high biodiversity (Jørgensen & Lyngsgaard, 2013).

This makes two points of focus: support diversity, and secure and recover biomass. The biomass is a measurable indicator. In the planning and construction phase of a project there should be integrated strategies to restore the biomass, and to support a measurable increase in plants, insects and animals. But as a rule of thumb one should seek to preserve as much untouched nature as possible. If we support continuous natural environments, the output is ecosystem services, recreational value and market value (Jørgensen & Lyngsgaard, 2013).

To support biodiversity can be done by facilitating for natural habitats for flora and fauna, both in the landscape and on building exteriors. Habitat creations combined with nutrient spots, biotopes and biological corridors is important to create strong and stable environments. Other qualities are that it increases health and wellbeing, grants experiences and reduces stress, and provides a potential knowledge of flora and fauna (Jørgensen & Lyngsgaard, 2013).

Supporting biodiversity should not just be done to meet current legislation and regulations, but in the end stimulates to reintegrate the built and natural environment.

Through five strategies biodiversity can be achieved:

- TO GIVE WAY – integrating the built environment and nature in each other.
- CREATE CONNECTIONs – create a continuous biodiversity of spatial connections. Like spreading corridors for animals and plants, in both natural areas, small biotopes and landscape areas.
- ESTABLISH CONTINUITY – analyze the existing fauna and find potential habitats for a broader fauna.
- GIVE PROTECTION - make niches, reservoirs and protrusions, which give access for some but not all.
- SECURE ACCESS - access for people to experience and appreciate the nature (Jørgensen & Lyngsgaard, 2013).

The use of water in achieving increased biodiversity, secures many outputs, like recreational opportunities, and treatment of rainwater. The scope of wetlands is important to consider, since the level of biodiversity is high and the development rate of these areas are too high. To establish and protect wetlands gives opportunities of retaining rainwater and nutrients (Jørgensen & Lyngsgaard, 2013). A good strategy for this is a stepwise maturation of the grounds to wetlands.

Measurable nature conservation is a scheme that should be included. This gives us information of the wellbeing of the nature. By involving professionals early on in the process this can be achieved. The specific matters can be bird counting, either the presence or absence of birds. The population development is a symptom of the biological consequences. Vegetation counting can be performed, within geographical limitations, species and time of year.

In the planning process one need to define what biotope it is reasonable to support, by analyzing the site, both today's situation and former states. Can the nature be beneficial for the buildings? Strategies for combination of nature and built environment can be green roofs and facades. During construction there should be integrated demands on the least possible negative effect on the current nature. When the site is in use the increase in value of the biodiversity is documented and communicated. Excess biomass is harvested and composted in the nutrient cycle (Jørgensen & Lyngsgaard, 2013).

An interesting notion on biodiversity within the Cradle to Cradle method is the temporary land use. The idea of cleaning former industrial sites and waste, using vegetation and biomass, called phytoremediation, is an important element. The planning process of the temporary phase should consider the opportunity to keep trees and other plants when new development kicks in (Jørgensen & Lyngsgaard, 2013).

WATER

The objective for a Cradle to Cradle building might be that the building shall discharge cleaner water than it takes in. Using this goal in landscape architecture is relevant, but in another way. To plan for a site that cleans the water on-site, includes wastewater, graywater and rainwater. An overload in the sewage system is a scenario that we need to address. Water is a valuable and vulnerable resource. We need to utilize both rain and used water. By considering scale, function and location, these water sources might be utilized within a decentralized system (Jørgensen & Lyngsgaard, 2013).

The issue of water can be divided into three topics:

- Rainwater treatment
- Water consumption
- Treatment of wastewater

RAINWATER TREATMENT
Rainwater can be used as a resource in an internal water system. This might support experience and recreational value, as well as branding, and reduce consumption and water fees.

WATER CONSUMPTION
Information on the water consumption should be communicated and stimulate to behavioral change.

TREATMENT OF WASTEWATER
We could separate the nutrients that the water contains and use it in healthy systems. What kind of separation depends on the scale, function and location. It can be used to produce energy, and nutrients to produce food. One can imagine exchange water between buildings to common green grounds. We get clean water for local use and surroundings, recreational value of the greenery.

Strategies for water treatment can be local drainage of rainwater, called 'low impact development' (LID), optimized water systems, and biological water cleansing. The built environment can use stormwater as a resource rather than creating problems. LID is imitating the natural cycle with a decentralized water way system that protect the central pipe system from acute overload. LID performs a catchment analyses that assesses different elements like terrain, soil, water flow map, to find the correct tools. Like green roofs, bio retention areas, permeable surfaces. Green roofs infiltrates, improve the air quality, have an aesthetical value, and create biotopes. Using permeable surfaces water can infiltrate. It can be either reinforced grass or permeable paving. Establishing raingardens and swales, or reed beds, can be used to lead the water from the building and let it percolate and be retained in the ground, using vegetated gravel filters. Microorganisms in the filter use the degradable nutrients in the water and cleanse it (Jørgensen & Lyngsgaard, 2013).

To optimize the water system we need to rethink the water system as a more circular system. Water consumption can be minimized through better sanitary systems. There are water saving products and installations, which can be used to reuse rainwater on a high-technological level, or we can use more low-technological solutions, like open stormwater management solutions to retain and also clean the water. This biological water cleaning is inspired by nature, by utilizing nature's own biology so that organic materials can be decomposed, and the output is clean water. These processes are best integrated locally.

One concept is the living machine, an ecological water treatment scheme, using intensive bioremediation systems. Several basins where wastewater is gathered, uses the metabolism of natural organisms; microorganisms, plants, animals, soil and geology. They can be configured and optimized to solve specific tasks. They are self-healing and has a long lifetime, as well as a recreational value (Jørgensen & Lyngsgaard, 2013).

Other methods are bio membranes that utilize nature's method of cleaning water, like aquaporin; the water exchanger in all living cells. This innovation is still quite new, but might become more used and less expensive in the future (Aquaporin - Aquaporins, 2015).

The process of planning with Cradle to Cradle on the issue of water demands to minimize the water consumption, and to gather and treat water locally, by using green roofs, permeable surfaces, living machines and reed beds. The strategies chosen must be continuously optimized and the maturation of the natural surroundings must be documented and communicated. In the end rainwater and all waste water that is accumulated either by human consumption in buildings or by natural processes outdoors, is treated on site (Jørgensen & Lyngsgaard, 2013).

AIR

The Cradle to Cradle objective on the topic of air is to create healthy air and improve air quality. This is very relevant for buildings and when considering indoor climate. Depending on materials used the indoor air might be 3 to 8 times as polluted as outdoor air. Using architecture and landscape in a crossover, where the use of plants in architecture have both recreational and environmental benefits. Vegetated walls that bind CO2 and clean the air in the plants metabolism. Using photo catalytic surfaces is another option, where surfaces coated with titanium dioxide disintegrates microorganisms using sun light (Jørgensen & Lyngsgaard, 2013).

SOCIAL

Within a Cradle to Cradle process social sustainability should be viewed as an integrated part of the environmental sustainability. A healthier environmental practice has social benefits. On three different scales, the social aspect can be included.

- On making components it is important to consider global manufacturing of materials; how is it produced, how are the working conditions?
- Considering the project itself, it needs to stimulate for diversity and to create social values; is the project supporting positive social conditions?
- On a community level, we must stimulate to positive social relations to the surrounding area. One can combine recreational value with for instance rainwater treatment.

A society can be seen as humans' dependence of each other. This dependency can be described as a responsibility, is time and space. Crossing the span of 'time' we must hand over healthy, biological and technological systems for future generations. Currently we are limiting future generations' possibility of living productive and healthy lives. This is a basic injustice. Societies are changing, and new needs emerge, so urban structures and buildings need to be able to take this challange. They must be planned to be flexible and adaptive.

Considering 'place' the building industry is part in defining the social conditions, both for those who use the project in question and for those around it. The ambitions are on creating a holistic building practice, which stimulates to positive relations, between humans and between human and system.

ECONOMY

Economic profit is often the driving parameter in a building project, and therefore an important focus for the actors of the building. Economic profit isn't the only thing to consider the quality of a building, but should be seen in relation to a broader array of values, where all values take part in securing an economical functional project. The 'Cradle to Grave' notion is a bad business model. Cradle to Cradle inspired economic models support a 100 % circular use of resources and seek to get rid of all waste through a smart design of materials, products, systems and business models, so that the raw materials never lose their value (Jørgensen & Lyngsgaard, 2013).

A Cradle to Cradle inspired economy contains four topics on sustainable economics:

1. Material leasing
2. Total economy
3. Energy optimizing
4. Material communities

MATERIAL LEASING
There are many products that we are using in the daily life, which we don't need to own. We rather need the service they provide. If we buy the service rather than the product, the product can be continuously optimized by the supplier, and we as the consumer don't end up with the responsibility for the material; we need a light instead of a lamp, the service of leasing a car rather than owning one. This is an incitement to develop quality products that minimize the need for repairs and change, since this is now the producer's responsibility (Jørgensen & Lyngsgaard, 2013).

TOTAL ECONOMY
If we consider the designing, constructing and operation of a project under one, we can gather the cost in a more reasonable way. New innovative solutions might cost more at construction point but will provide advantages during the operation of the project. By including factors like these higher quality products can be profitable, environmental friendly and social stimulating. A public-private partnership (OPP) is an economic strategy for lowering the total costs. A private business plan, construct, operates, maintains, and sometimes finance a public building. One agrees on the rental period, say 20-30 years. The gains are increasing performance of public investments; dividing the responsibility, gives a shorter construction period, lower the construction- and operation costs, and gives higher quality (Jørgensen & Lyngsgaard, 2013).

ENERGY OPTIMIZING
There is economical incitement for renewable energy sources. The first investment is rather high, but the operational costs are low, and optimization leads to shorter recoupment. If the contractor cooperates with a partner to find energy saving methods. The partner issues a guarantee to reach the defined goals, and will cover the loss if they don't. The gains are security for the contractor, increased economic incitement, security that the project is completed in a politically changing world, work in the same direction, economical savings for the users.

MATERIAL COMMUNITIES
It is a community of businesses that that makes agreements on common deliverance of high quality materials. Organizes material banks; healthy materials that can be withdrawn after the service time, and be reused. This is good for small and medium businesses, that can't perform a vast purchasing organization on their own. The gains are economical savings on materials, savings on depositing fees, deliverance security, reduce CO2 emissions, keep the value of materials.

RONNEBY

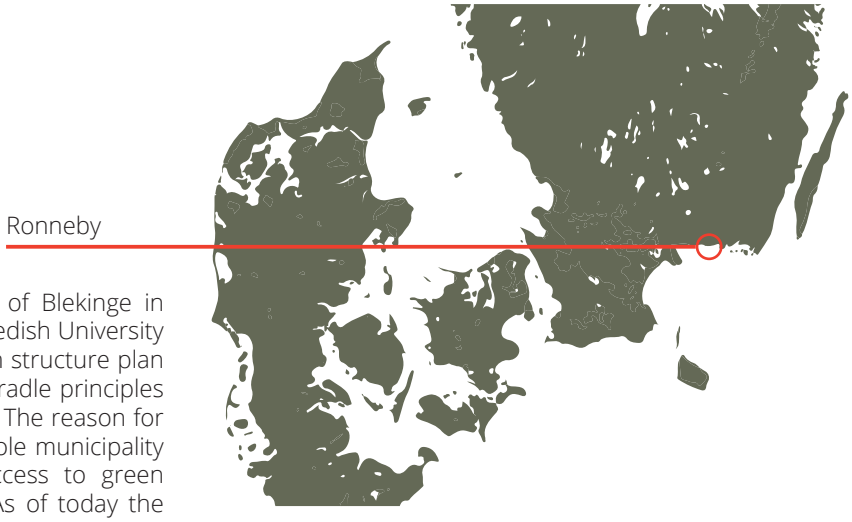


Figure 6: Ronneby in Sweden

The municipality of Ronneby in the county of Blekinge in southern Sweden, has with help from the Swedish University of Agricultural Sciences (SLU) created a green structure plan based on landscape identity and Cradle to Cradle principles (Grönstrukturplan Ronneby kommun, 2015). The reason for this plan is to create a plan covering the whole municipality and to secure the coming generations access to green recreational areas and livable ecosystems. As of today the plan is not ready enacted. The plan is thematically divided into two parts. The first covering the themes of landscape identity, biodiversity, ecosystem services, and recreation and health. The second part is covering the themes of waterways, the outdoor life, footpaths, and natural values.

The intention of the plan is to describe the existing situation and to be an inspirational document for development in the municipality. The process of making the document has included participation from different stakeholders, with extra focus on some less resourceful groups, like school children and elders. The documentation underpinning the sustainability notion in the plan, is Swedish building law of sustainability, but it is also based on the European Landscape Convention and the Convention on the Rights of the Children. This is an interesting notion, to combine laws on environmental sustainability, with landscape and children's rights.

The health and wellbeing notion in the plan is underpinned by the focus on participation and influence, the childhood environment, physical activity; all parts within social sustainability. The plan is based on a promise to future generations of providing clean air and water, good nature experiences and a healthy and wholesome environment.

Environmental quality objectives:

- Decrease the negative effect on the climate
- Non-toxic environments
- No excess fertilization
- Living seas and waterways
- An ocean in balance and a living coast
- Living forest areas
- Good built environments
- A rich flora and fauna

All these objectives are within the scope of the Cradle to Cradle idea; The need for stabile ecosystems to provide the ecosystems services we are dependent on.

The way Ronneby municipality have implemented the Cradle to Cradle idea, is through the notion of sustainable building and management, questions of human health, diversity of biological and cultural source, ecosystem services, and landscape identity. The idea is that the environmental and the social management of the landscape entails optimization, reuse, and circular economy in the outdoor environment.

Within the social aspect the participation idea is important; one should build based on local needs and with a broad view of needs, like facilitating for bicycles the whole year. Include children, and focus on the topic of pedagogic environments. For example, by facilitating play and letting the children create their own environment rather than designing everything for them, combined with pedagogic based on natural processes and local food production.

Figure 7: Canal in Ronneby

Figure 8: The new city development area of Kilen

There should be a focus on maintaining craftsmanship and use local traditions in the planning process. As well as local materials and plants, and create incitement for local gardening and food production.

Nature should not be marginalized in the planning, but be an integrated part of our places. The goal is to not have to restore biological systems, but to build further on the existing so that the environmental and experience value is generated over time. Complexity is in itself an objective for sustainable ecosystems; being robust and with great ability of renewing itself, and to adopt to changes; this is called resilience. Thus the biodiversity should be as great as possible. The Convention on Biological Diversity from 1992 sets the stage for all nation to pursue this, including Sweden and Norway (CBD Home, 2015).

It is claimed that the current simplification of our green environments are hurting natures ability to meet changes through time. We should strive to use the whole gradient of plants, and create environments where there is a vast diversity of plants; meaning we should pursue to facilitate for the small herbs and shrubs as well as the larger trees. And describe the action of leaving the fallen leafs on the ground to encourage more species of plants and insects to find habitats and shelters. This can also positively affect the play of children. Use trees and vegetation with the idea of succession; that changes will happen and that this is nature's own way of maintenance.

Another important element from the Cradle to Cradle idea is flexible planning. Leave some areas for later use and planning, instead of blocking future development and use by designing everything from the start (Ronneby komun, 2015a).

The 24th of August 2015 I went for a field trip to Ronneby. The reason was their involvement into Cradle to cradle in the

Figure 9: The location of Backsippans and Kilen in Ronneby municipality

municipal master plan. I had a meeting with Martina Lindgren from the organization CEFUR, Helena Sandberg from the municipality of Ronneby and Roland Gustavsson, former professor at the SLU University in Alnarp.

What was interesting in Ronneby was the implementation of Cradle to Cradle into their planning policy. This were shown through the planning of the new development of the central part of Kilen in Ronneby; an old industrial site, and the projects of Backsippans Förskola; a kindergarden just outside of Ronneby (Ronneby komun, 2015b).

GENERAL INTENTIONS OF THE MUNICIPALITY:

- Clean air and comfort (including noise) and healthy materials
- Clean water and recycling of nutrients
- Increase the biodiversity
- Renewable energy
- Cultural diversity, quality of life, social diversity, and design
- A balanced economy, and a circular economy
- Enhanced mobility and infrastructure

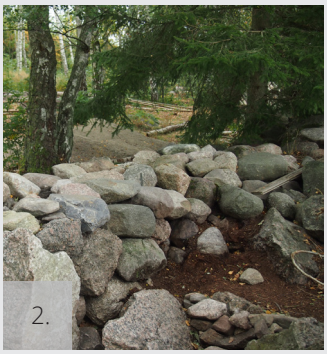
The city planning process of Kilen was performed thorough the general intentions of the municipality, becoming project specific intentions and objectives, which further will be used to define specific objectives for every part of the project. This was combined with the ambitions of the local stakeholders. The objectives made here was to enhance the mobility and infrastructure, and to enhance a circular economy in balance. A total of 27 goals have been defined, all of which are within the scope of Cradle to Cradle of doing more good than less bad.

In cooperation with CEFUR the municipality made a set of intentions and objectives that should be meet when developing Kilen.

WHY?
To create a better future (for all generations, of all species for all eternity), strengthen the identity and profile of Ronneby, to enhance the pride of the distinctiveness, and develop Ronneby, and increase the tax base and the number of jobs.

Figure 10: Backsippans kindergarden, Ronneby municipality

1.



2.

3.

4.

5.

6.

7.

8.

HOW?
By developing a Cradle to Cradle inspired district that gives back more than it demands.

WHAT?

INTENTIONS FOR KILEN

- Appealing, functional and healthy indoor and outdoor environment
- Materials that has a positive effect
- Water that is cleaner as discharge than as intake
- Increased biodiversity in the area
- Optimization of the energy system and use of natural energy flow and storage
- Flexible energy systems
- Generate more energy than what is needed
- Flexible design
- Attractive areas over time and for as many user groups as possible
- Drive for innovations
- Flexible use of time and space
- Involve local businesses
- Long term sustainable management
- Available, safe and attractive infrastructure
- Strengthen the link between the center and Brunnsparken

These intentions were then formulated into a set of objectives. to make it easier to see the extent of the process and ambitions, I have chosen to include all the objectives here.

OBJECTIVES FOR KILEN

- Cleaner air indoor and outdoor
- Optimal noise environment indoor and outdoor
- Optimal and innovative use of daylight
- Healthy and positive materials
- Cleaner storm water and river water

1. *From the Backsippans kindergarden*
2. *Use of existing agricultural stone fence as play equipment*
3. *Made path through existing element*
4. *Mass planting in circles, of blackberry (Rubus) and linden (Tilia)*
5. *Leaving existing vegetation be, implemented in the play area*
6. *Path and small cabin with fireplace*
7. *Use of excess materials from the area. Formerly used for construction, now seating and play area*
8. *Photovoltaic panels on the roof of the building*

2014

After 3 to 5 years

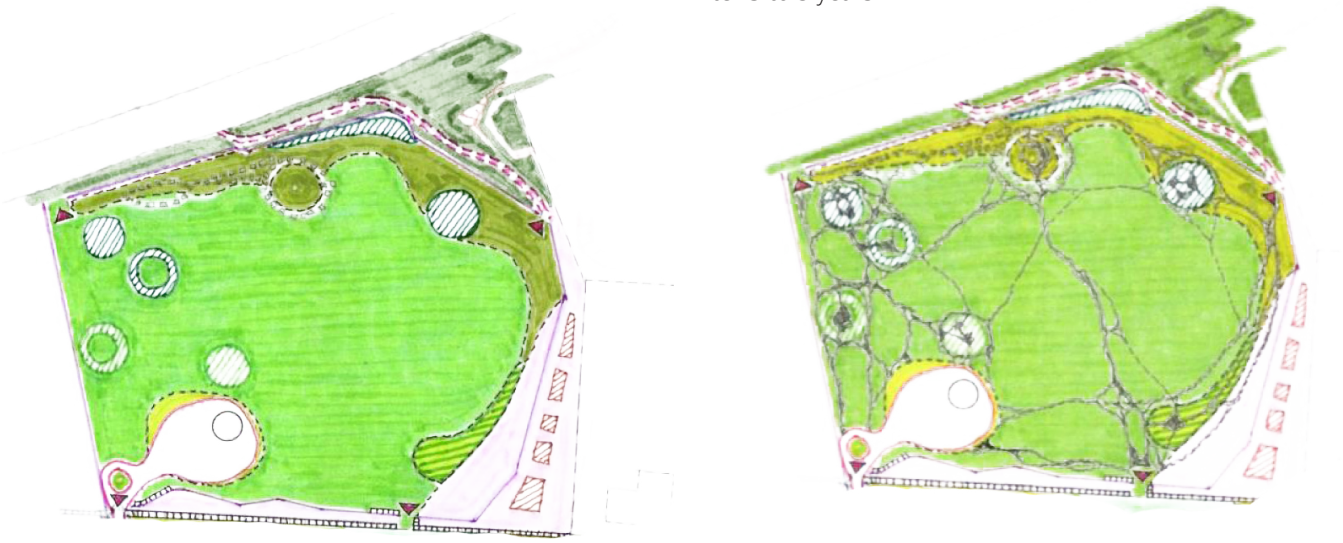


Figure 11: Example on dynamic planning. Part of the kindergarden play area that was planned with mass planting and paths made with the children. (Source: Roland Gustavsson)

- Increased biodiversity
- Green link between the center of Ronneby and Brunnsparken
- Flexible and smart energy systems based on natural energy flows
- Utilize excess energy and heat
- Generate more energy than what is used
- Flexible detail planning
- Research affiliation to communicate knowledge, innovation and dissemination
- Test new methods, materials and products
- Flexible buildings
- Buildings as material banks
- Access and safety for everyone
- Attractive during construction
- Surfaces that fill many functions
- Diversity of meeting places
- Encourage to sustainable innovations with local businesses
- Promote products as services
- Vulnerable road users in focus
- Promote vehicle pooling
- Pedestrian and bike paths along the river

Several of these objectives are implemented in the handbook presented later in this thesis.

ELEMENTS IN A CRADLE TO CRADLE INSPIRED KINDERGARDEN

VARIATION IN THE DAILY ROUTINE
- Glass covered porch for sleeping outside
- Hut with fireplace to make food and to eat outside

FOOD FROM THE GARDEN
- Growing boxes
- Fruit trees
- Berry bushes

INCREASED BIODIVERSITY
- Cooperation with SLU
- Planting of fruit trees and bushes
- Growing boxes and compost
- Protect the existing forest
- Birds nest to increase the presence of birds

OUTDOOR ACTIVITIES
- Fenced forest area adjacent to the playgrounds, with opportunities to build cottages, study insects and bird watching
- Harvest and composting
- Cycle path, area for ball play, forest play area, scene, play tools, sledding slope, growing, sleeping, eating

These bullet points are some of the Cradle to Cradle inspired elements implemented in the kindergarden planning. The example of the Backsippans kindergarden is the first of it's kind in Sweden, and has attracted much attention. As of today there is plans for a similar kindergarden in the center of Ronneby; the new Hulta kindergarden.

The case of the new Kilen development and the Backsippans kindergarden has been inspirational when working on this thesis, and some of the elements are included in the handbook presented later.

LEED

The Leadership in Energy and Environmental Design (LEED) certification method was introduced in 1994, by the U.S. Green Building Council (USGBC). The current forth version from 2014, is based on the former from 2009. The aim of the certification method is to rate the design, construction, operation, and maintenance of green buildings, homes, and neighborhoods.

There are five different manuals:
- Green Building Design & Construction
- Green Interior Design & Construction
- Green Building Operations & Maintenance
- Green Neighborhood Development
- Green Home Design and Construction

Of these five the manual for building design and construction, and the one for neighborhood development are the most relevant for landscape architecture and the two considered in this thesis. The scope of the certification method is to inspire to sustainable building practices, either for single buildings or groups of buildings, called campus projects. The integrated design process prioritizes cost-effectiveness over both short and long term, which integrates technical and living systems.

The LEED credits assess the whole rather than separate components, in an integrative process where the whole design team identifies overlapping systems and synergies to increase performance.

The process is described as three phases:
- Discovery
- Design and construction
- Occupancy, operations, and performance feedback

The coordination between building and site should be addressed as early as possible, to integrate design and construction with each other. This enhances building performance, human performance and environmental benefits. The team members should be included from the start, to encourage synergies of interdisciplinary benefits. This research, analysis and workshops can be conducted by clients, designers, engineers, constructors, and operators in teams, to all synergies are identified and implemented.

Within the LEED process it is important to formulate a set of goals to reach and to have a defined project boundary. This defined boundary determines what criteria and what scope the project can include. Something outside the site cannot be assessed. This is something that is a distinct difference from the Cradle to Cradle method. Further the goal setting in the process need to address what credits to achieve and to identify adjacent credits that could be included. This is then used to determine the grade of certification that is aimed for: Certified, Silver, Gold or Platinum.

The LEED method is focusing allot on the process of developing consistent documentation. This for the quality assurance review and so that the certification is controlled and to avoid errors.

The LEED method is designed to be applicable on different types of projects. Special situations of buildings, like mixed use, multitenant complex, incomplete spaces, projects with several physical distinct structures, renovations and additions, lease agreements, previous developments, and difference in occupancy and footprint. This ensures a broad applicability of the method to fit with almost every thinkable building project.

Within LEED there are some Minimum Program Requirements, from several of the categories within the different manuals. The categories in the Green Building Design & Construction manual are:

- Integrative process (IP)
- Location and transportation (LT)
- Sustainable sites (SS)
- Water efficiency (WE)
- Energy and atmosphere (EA)
- Materials and resources (MR)
- Indoor environment quality (EQ)
- Innovation (IN)
- Regional priority (RP)

Of these nine categories there are 68 criteria, of which 16 is prerequisites.

The Minimum Program Requirements define that the project must be in a permanent location on existing land, must use reasonable LEED boundaries, and must comply with project size requirements, which for Building Design and Construction is minimum 93m2 gross floor area, and for Neighborhood development ranges from two habitable buildings to no larger than 6km2. This makes up a rigid framework, and makes it unsuitable for landscape design.

There are several of the criteria that are relevant for landscape architecture and site development, but the focus is still on the building performance. From the Building Design & Construction manual the categories of Sustainable sites (SS) and Location and transportation (LT) most relevant. But there are still some criteria within the Water efficiency (WE) and Material and resource (MR) categories that are applicable. From the LT category there are no prerequisite criteria, and from the SS category there are two: Construction Activity

Pollution Prevention, and Environmental Site Assessment

THE SCOPE OF THE DIFFERENT CATEGORIES

LOCATION AND TRANSPORTATION (LT)

To encourage compact development, alternative transportation, and connection with amenities. Considers the existing features of the surrounding community and how this infrastructure affects occupants' behavior and environmental performance. Public transit, street networks, pedestrian paths, bicycle networks, services and amenities, to encourage robust and realistic alternatives to private automobile use. Enhance health, increase happiness and productivity. Reusing previously developed land, cleaning up brownfield sites, and investing in disadvantaged areas conserve undeveloped land and ensure efficient delivery of services and infrastructure. Limiting parking, enhance bicycle storage, alternative-fuel facilities, and preferred parking for green vehicles

SUSTAINABLE SITES (SS)

This is the LEED category that the following 'Sustainable SITES Initiative' is based upon. It emphasizes the vital relationships

Example project LEED

VANDUSEN BOTANICAL GARDEN VISITOR CENTRE

- *Completed 2011*
- *Designed by Perkins+Will*
- *LEED Platinum certification*
- *Producing enough energy on an annual basis to meet its own requirements*
- *Addresses development at seven performance areas: Site, Water, Energy, Health, Materials, Equity, and Beauty*
- *Inspired by organic forms and natural systems; the form of an orchid leaf*
- *Solar thermal panels mounted on the roof*
- *The roof sections beneath scupper rain water to recharge a natural stream.*
- *The green roof sections encourage flora and fauna*
- *The solar chimney serves as lungs to the building*
- *The building's materiality was also designed to create a sense of belonging with the environment.*

(*source: http://perkinswill.com/work/vandusen-botanical-garden-visitor-centre.html)*

Figure 12: VanDusen Botanical Garden Visitor Centre

among buildings, ecosystems, and ecosystem services. It focuses on restoring project site elements, integrating the site with local and regional ecosystems, and preserving the biodiversity that natural systems rely on. It focuses on natural capital because it provides regenerative services; the ecosystem services. Further it seeks to protect sensitive ecosystems by completing an early site assessment and planning the locations of buildings and hardscape areas to avoid harming habitat, open space, and water bodies. They also remediate areas on the project site that are already in decline. Criteria that is adopted into the SITES Initiative is the light pollution reduction, protect and restore habitat, rainwater management, and heat island reduction.

THE WATER EFFICIENCY (WE) category is in some way relevant for landscape architecture. Considering outdoor water use, as irrigation, and water treatment for rainwater and wastewater. The notion of addressing water in a holistic way is the same as in Cradle to Cradle. The credit of alternative water sources is an important approach.

THE ENERGY AND ATMOSPHERE (EA) category is relevant on the notion of holistic approach of reducing energy consumption, energy-effective design, and renewable energy sources on site. The use of vegetation to affect building heating and cooling is also addressed, in addition to the building orientation and material use.

Following the Location and transportation and the Sustainable sites categories the MATERIALS AND RESOURCES (MR) category is the one closes to the scope of landscape architecture. This category contains several topics that is included in Cradle to Cradle as well as other sustainability methods. Like the waste hierarchy, life cycle assessment, the definitions of products, use of local products, and disassembly and optimization. Focuses on minimizing the embodied energy in extraction, processing, transport, maintenance, and disposal of materials. Implementing innovative construction strategies and reusing existing materials grants credits. States that with air quality measures the burning of wastes for energy is fair. Alleges that a growing number of manufacturers are ready to document and publicly disclose the environmental profiles of their products, and that the design team should support this. In this category the materials used for temporary use or furniture is not assessed. This is a weak spot, since it then leaves out a part of the total materials.

Adds value to locally produced products and materials, and supports the local economy. But the point of purchase is considered as the location of the purchase transaction. This can give a skewed picture of the locality of products. Another down side is that some criteria apply only to a portion of the product. There should be a more total consideration.

The category of INDOOR ENVIRONMENTAL QUALITY (EQ) is the least applicable one for landscape projects. But it is one that assesses the issue of human comfort and productivity, topics needed to be addressed in the outdoor environment as well. The issues of contaminants and lighting is something that is as important for the landscape too. Another topic is the use of space. Of occupied or unoccupied space, regularly or not, and the intersections between spaces and the creation of spaces for people. This space categorization is something that needs to be addressed on every site.

The last two categories are the INNOVATION (IN) AND THE REGIONAL PRIORITY (RP) categories. These categories consist of three criteria in total. The scope is to recognize projects for innovative building features and sustainable building practices and strategies, that results in building performance that greatly exceeds what is required in an existing LEED credit. The Regional Priority credit encourage project teams to focus on their local environmental priorities. The issues could be naturally occurring or man-made and could reflect environmental concerns or environmental assets. The ultimate goal of RP credits is to enhance the ability of LEED project teams to address critical environmental issues across the country and around the world.

(LEED Reference Guide for Building Design and Construction,2013; LEED v4 for Building Design and Construction, 2015)

SITES

The Sustainable Sites Initiative (SITES) is a program based to create sustainable functioning landscapes, with or without buildings. It is a common project by the United States Botanic Garden, the Lady Bird Johnson Wildflower Center at the University of Texas, and the American Society of Landscape Architects, since 2006. The U.S. Green Building Council (USGBC) has been a long-time supporter and some of the credits from the SITES method has been adopted into the LEED method and vice versa.

The SITES method is a set of guidelines and a rating system for defining a sustainable site, measure the performance, and evaluate the value of the landscapes. The scope is to create ecologically resilient communities that are better able to withstand and recover form catastrophic events. Landscapes and green infrastructure have the capacity to protect and even regenerate natural systems, thereby increasing the ecosystem services they provide. Their economic value is highly significant, yet the cost of replacing these functions is rarely reflected in conventional decision-making.

The focus on the ecosystem services is a major scope in SITES. This by utilizing the best practices in landscape architecture, to help professionals fulfil their health, safety, and welfare responsibilities. The use of the SITES criteria list can assure clients that their project has achieved a rigorous standard for sustainability, with the branding of a SITES certificate. The central message of the SITES program is that any project holds the potential to protect, improve, and regenerate the benefits and services provided by healthy ecosystem (Sustainable Sites Initiative, 2015 p.VI).

The SITES Guiding principles are something that is quite similar to the initial Cradle to Cradle idea.

- Do no harm
- Apply the precautionary principle
- Design with nature and culture
- Use a decision-making hierarchy of preservation, conservation and regeneration.
- Provide regenerative systems as intergenerational equity.
- Support a living process
- Use a systems thinking approach
- Use a collaborative and ethical approach
- Maintain integrity in leadership and research
- Foster environmental stewardship

These guide lines make a framework for threating the environment with respect; respect for nature, fellow humans, and future generations.

The SITES method focuses largely on the ecosystem services as site-specific entities, that are natural processes, but therefore largely unseen and difficult to measure. A growing body of research suggests that natural elements within cities and other areas generate ecosystem services that can substantially protect and improve a community's resiliency and quality of life in a variety of ways. This concludes to landscape architecture being related to ecological restoration. The scope of ecosystem services is supporting, provisioning, regulating, and cultural. The gains from these services are then:

- Global climate regulation
- Local climate regulation
- Air and water cleansing
- Water supply retention
- Erosion and sediment control
- Hazard mitigation
- Pollination
- Habitat functions
- Waste decomposition and treatment
- Human health and well-being
- Food and renewable non-food products
- Cultural benefits

Within the SITES v2 Rating system there are 200 potential points on 48 credits in 10 categories. There is a minimum size to be considered of 185 m2. The use of SITES can be for different typologies, like Open spaces, Streetscapes and plazas, Commercial, Residential, Educational, Infrastructure, or Industrial, but just from the building skin outwards.

Not all credits from the 10 categories apply to every project, but there are multiple opportunities to be certified. The different categories are:

1. SITE CONTEXT
- Location
- Unique, critical, sensitive, or threatened features
- Developed or undeveloped land
- Looks beyond the site boundary

2. PRE-DESIGN ASSESSMENT AND PLANNING
- Comprehensive site assessment of existing physical, biological and cultural conditions

3. WATER
- The goal is to incorporate strategies and technologies that restore or mimic natural systems

4. SOIL AND VEGETATION
- Filtering of pollutants, excess runoff, erosion,

sedimentation, and flooding
- Landscape irrigation, increase the quality of wildlife habitat, promote regional identity, and reduce maintenance needs.

5. MATERIAL SELECTION
- Selection and procurement of materials
- Demolition materials
- Materials in design and construction, to decrease deposition of materials

6. HUMAN HEALTH AND WELLBEING
- Better mental health, social connections, and social interactions
- Enhance physical activity, restorative and aesthetic experiences.
- Advocate social equity, stronger communities, and environmental stewardship.

7. CONSTRUCTION
- Involve contractor in sustainability goals.
- Use low emitting equipment
- Create a net-zero waste site.

Example project SITES

THE CENTER FOR SUSTAINABLE LANDSCAPES (CSL) AT PHIPPS CONSERVATORY AND BOTANICAL GARDENS

- *Built on a previously brownfield*
- *Manages all sanitary waste*
- *Scaled for 10-year storm event*
- *Has successfully reintroduced 150 native plant species*
- *Designed to be net-zero energy and water*
- *Open to the public*
- *Its building and landscape performance is being extensively researched and monitored to inform the design and construction of similar projects that restore ecosystem services, generate their own energy, and clean and re-use their own waste water.*

(source: http://sitesweb.gbci.org/phipps-center-sustainable-landscapes)

Figure 13: Phipps Conservatory and Botanical Gardens

8. OPERATIONS AND MAINTENANCE
- Material disposal
- Long-term health of soil and vegetation
- Reducing pollution
- Conserving energy
- Renewable energy

9. EDUCATION AND PERFORMANCE MONITORING
- Inform and educate the public
- Monitor, document and report the performance

10. INNOVATION OR EXEMPLARY PERFORMANCE
- Creativity
- Innovation

Of the 48 credits, 18 is prerequisites, meaning that all 18 must be fulfilled to be certified. The additional 30 credits define if the project is Certified, Silver, Gold or Platinum. For every credit on must define the intention of the credit; the benefit it will provide, either economic, social or environmental.

In the SITES method the integrated design process is a critical component. By including different disciplines in the initial review of the rating system, one can achieve a high-performance design. The team should create scorecards and punch lists to track the initial goals and to assess the site. Then Vegetation and soil protection zones (VSPZ) should be defined, as well as a Soil management plan and a Site maintenance plan.

The method of certifying a site demands strict project boundaries, to be able to distinguish what to assess and not. There are some issues on what to include:

- All contiguous land that is associated with and supports normal site operations must be included.
- All activities within the SITES project boundary must be included
- Existing land uses and buildings may be included
- The land must be held by the same ownership.
- SITES certification generally concerns the area from the building skin outward
- Exterior building materials must be included if they are part of an area (e.g., green roof, living wall) being used for SITES credits.

The SITES method is a useful tool to achieve a more sustainable landscape planning, but might come out as too strict and rigid. As the survey amongst Norwegian landscape architects showed there is not a wish for a strict certification method, but rather an inspirational handbook. That's why I consider the SITES method to be useful if one wishes for branding of a project, but for the day to day planning in Norwegian cities and towns, I think that an inspirational handbook is better.

When assessing the theories of LEED, BREEAM and SITES, I consider the SITES toolbox to be the one closest to the Cradle to Cradle theory, in scope and scale. Some of the credits form LEED and BREEAM is also applicable for landscape architecture per se, and would be useful to include in the following handbook, but for the most part these credits are already present in SITES.

(Sustainable Sites Initiative, 2015)

BREEAM

The BREEAM (Building Research Establishment Environmental Assessment Method) theory was first conceived in Britain in 1990, and has later been adopted for the Norwegian market as BREEAM NOR by the Norwegian Green Building Council (NGBC). The scope of BREEAM is a sustainability certification method for buildings, but later the BREEAM Communities has been developed as a certification method for larger developments and master planning. With the goal of developing a building practice that has a positive effect on the environment and on human health, the BREEAM method assesses ten categories with a potential of XXX points, to achieve either the rating of Pass, Good, Very good, Excellent, or Outstanding.

The aims of BREEAM NOR are to mitigate the impacts of the buildings in the environment, to provide a credible, environmental label for buildings, and to stimulate the demand for sustainable buildings. Based on these aims the objectives for BREEAM is:

- To provide market recognition to low environmental impact buildings
- To ensure best environmental practice is incorporated in buildings
- To set criteria and standards surpassing those required by regulations and challenge the market to provide innovative solutions that minimize the environmental impact of buildings
- To raise the awareness of owners, occupants, designers and operators of the benefits of buildings with a reduced impact on the environment
- To allow organizations to demonstrate progress towards corporate environmental objectives
- oo allow organizations to demonstrate progress towards corporate environmental objectives

The planning process for a BREEAM projects requires the use of an Accredited Professional and a Qualified assessor, trained by the NGBC. the intention of BREEAM NOR is to encourage innovation, better performance, and to engage the whole industry.

The credit list of BREEAM NOR is based on the BREEAM Europe Commercial 2009, but Norwegian standards and regulations is applied. The ten categories used are:

- Management
- Health and wellbeing
- Energy
- Transport
- Water
- Materials
- Waste
- Land use and ecology
- Pollution
- Innovation

These categories contain some topics that one can get credits for:

MANAGEMENT
- Commissioning
- Construction site impacts
- Building User Guide

WASTE
- Construction waste
- Recycled aggregates
- Recycling facilities

HEALTH AND WELLBEING
- Daylight
- Occupant thermal comfort
- Acoustics
- Indoor air and water quality
- Lighting

POLLUTION
- Refrigerant use and leakage
- Flood risk
- NOx emissions
- Watercourse pollution
- External light and noise pollution

ENERGY
- CO2 emissions
- Low or zero carbon technologies
- Energy sub metering
- Energy efficient building systems

LAND USE AND ECOLOGY
- Site selection
- Protection of ecological features
- Mitigation/enhancement of ecological value

TRANSPORT
- Public transport network connectivity
- Pedestrian and Cyclist facilities
- Access to amenities
- Travel plans and information

MATERIALS
- Embodied life cycle impact of materials
- Materials re-use

- Responsible sourcing
- Robustness

WATER
- Water consumption
- Leak detection
- Water re-use and recycling

INNOVATION
- Exemplary performance levels
- Use of BREEAM Accredited Professionals

The structure of each project specific process, need to address some steps in issuing an application for becoming BREEAM certified. This is the information of the project, the aim, what criteria that is planned to be assessed, to schedule what evidence that is required, in the design stage and in the post-construction stage, and if there is some additional information needed. This process can be used for different projects:

- Whole new buildings
- Major refurbishments of existing buildings
- New build extensions to existing buildings

Example project BREEAM

SCHWEIGAARDS GATE 21-23

- *Completed 2013*
- *Designed by Lund & Slaatto Arkitekter AS*
- *BREEAM-NOR Excellent*
- *Focus on multimodal transportation and bicycles.*
- *Green building site*
- *Energy and water efficient*
- *Renewable energy production*
- *All materials are Nordic Ecolabel and emission controls are performed*
- *Waste reduction and composting*

(source: http://www.romeiendom.no/schweigaards-gate-21-23)

Figure 14: Schweigaards gate 21-23

- A combination of new-build and existing building refurbishment
- New build and/or refurbishments which are part of a larger mixed use building
- Existing building fit-out

The BREEAM NOR method advocates the Green Lease Agreements, which is a tenancy lease agreement. This is a legally binding agreement between the owner, developer, and tenant, to share and follow the green solutions defined in the design stage. If the building is sold out, a Green Building Guide can be made for all future tenants, on maintaining and improving the performance of the building. This is not legally binding.

There is possibilities of assessing bigger developments using BREEAM. This might contain several different buildings and types of developments, but if the total development site is to be assessed the outcome is based on the worst performing project.

The making of the BREEAM NOR certification placed more focus on the categories of Transportation and Materials, and less on Water and Pollution, to make it more suitable for Norwegian conditions. Further the different categories are emphasized differently, according to their importance. The credits in the different categories is given this value in percent:

- Energy 19.0 %
- Health & Wellbeing 15.0 %
- Materials 13.5 %
- Management 12.0 %
- Transport 10.0 %
- Innovation 10.0 %
- Land Use & Ecology 10.0 %
- Pollution 8.0 %
- Waste 7.5 %
- Water 5.0 %

The outcome of the assessment is then transformed into the final level of certification:

- UNCLASSIFIED <30 %
- PASS ≥30 %
- GOOD ≥45 %
- VERY GOOD ≥55 %
- EXCELLENT ≥70 %
- OUTSTANDING ≥85 %

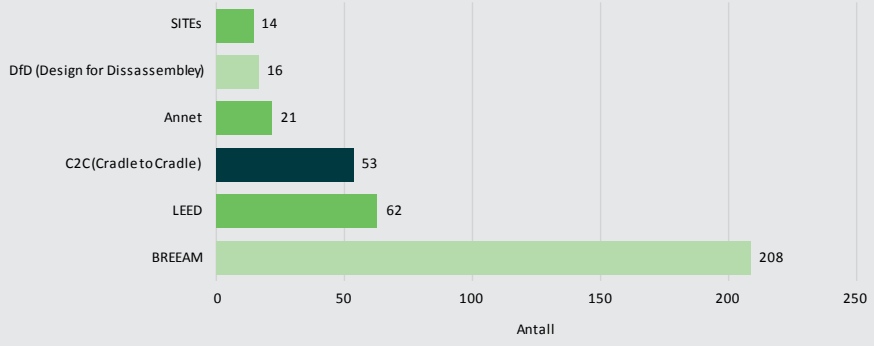
There are some prerequisites needed to be assessed, and some more to be able to achieve the higher levels. These are shown in the comparison on page XX.

The BREEAM credit for innovation is highly emphasized in the process, and an added 1 % score to the final BREEAM score is added for every innovation credit. This is to support the market of innovative technologies and practices.

Even though the BREEAM NOR method is created for Norwegian conditions, I have decided that the score card and categories have too much focus on building related topics. Within a larger development containing several disciplines and issues the BREEAM method might be well suited, but as an inspirational handbook in sustainable landscape design, I think it falls short.

(Norwegian Green Building Council, 2015)

"What certification methods have you heard of?"



COMPARISON OF LEED, BREEAM AND SITES

After reading through the different certification methods, I will in the following part compare the three to look at the similarities and differences between them. The categories that I have chosen to divide the credits into is created by combining some of the categories from the theories. This to make a comprehensive comparison and so that all the three different methods could easily implemented into the grid.

The topics chosen are:

- Process and Management
- Ecology and Vegetation
- Water
- Materials
- Transportation
- Energy and Climate
- Air and Pollution
- Health and Wellbeing
- Operations and Maintenance
- Innovation and Education
- Soil and Site

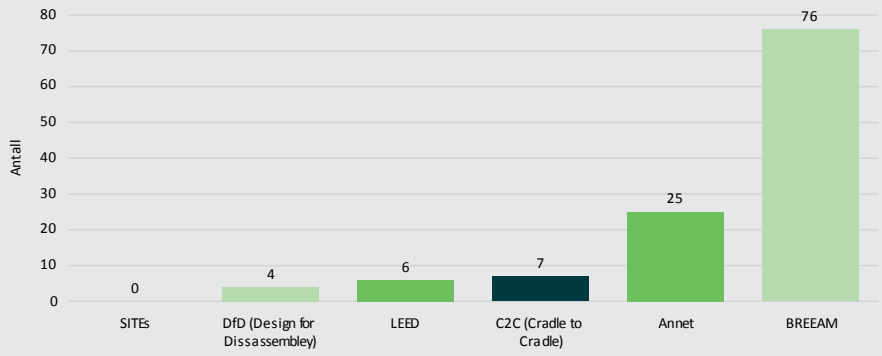
As sub-topics there are some themes to make it easier to understand the scope of the credits mentioned under each method. For Ecology and Vegetation this is Compost, Habitat, Plant choices, and Biomass.

The Cradle to Cradle theory is not part of this comparison. The reason for this is that the scope of this thesis is to use Cradle to Cradle in combination with a more detailed and defined method, and will therefore be used nevertheless. The scope is to figure out which one of the three other method, LEED, BREEAM, or SITES, is to be applied as well.

Following the survey to Norwegian landscape architects that I performed in September, there is a column to the left with the rating that the participators gave to the different topics of sustainability. This is part of this comparison to see the perceived value of each topic, within the methods and within the discipline of Norwegian landscape architecture. The importance that was given to each topic is part of the consideration for the use of the methods and the handbook presented later.

The credits in green are the ones related to landscape architecture. The credits in capital letters are the ones that are prerequisites in the method it relates to.

"What certification methods have you used?"



"If yes, how suited were they?"

	Well suited	Suitable	Unsuitable	Very unsuitable
BREEAM	11	47	15	2
LEED	1	3	2	0
SITES	0	0	0	0
Cradle to Cradle	2	4	1	0
Design for disassembly	2	2	0	0
Other	4	13	3	0

LEGEND:

Regular credit

PREREQUISITE CREDIT

Landscape related credit

LEED

Topic	Sub-topic	
Process and management	Management plans integrative process participation	• CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT • Enhanced Commissioning • Joint Use of Facilities • Construction and Demolition Waste Management Planning • Construction Indoor Air Quality Management Plan • Integrated project planning and design • Integrative process
Ecology and vegetation	Compost Habitat Plant choices Biomass	• Site Development—Protect or Restore Habitat • Open Space
Water	water treatment water management water use aquatic ecosystems	• OUTDOOR WATER USE REDUCTION • INDOOR WATER USE REDUCTION • BUILDING-LEVEL WATER METERING • Outdoor Water Use Reduction • Indoor Water Use Reduction • Cooling Tower Water Use • Water Metering • Rainwater Management

SITES	BREEAM	SURVEY
• CREATE AND COMMUNICATE A SOIL MANAGEMENT PLAN • USE AN INTEGRATIVE DESIGN PROCESS • Engage users and stakeholders	• CONSTRUCTION SITE WASTE MANAGEMENT • CONSTRUCTION SITE IMPACTS • Commissioning • Constructors' Environmental & Social Code of Conduct • Consultation • Shared Facilities • Life Cycle Cost Analysis	Reduction of construction costs | 42 Availability and participation | 123
• CONTROL AND MANAGE INVASIVE PLANTS • USE APPROPRIATE PLANTS • CONSERVE HABITATS FOR THREATENED AND ENDANGERED SPECIES • DESIGNATE AND COMMUNICATE VEGETATION AND SOIL PROTECTION ZONES (VSPZS) • Conserve healthy soils and appropriate vegetation • Conserve special status vegetation • Conserve and use native plants • Conserve and restore native plant communities • Optimize biomass • Reduce the risk of catastrophic wildfire • Support sustainability in plant production • Provide on-site food production • Recycle organic matter	• Ecological Value of Site and Protection of Ecological Features • Mitigating Ecological Impact • Long Term Impact on Biodiversity • Composting	Creating habitats / protection of habitats | 115 Habitat quality / species richness | 192 Carbon sequestration | 69 Food production | 175
• MANAGE PRECIPITATION ON SITE • REDUCE WATER USE FOR LANDSCAPE IRRIGATION • CONSERVE AQUATIC ECOSYSTEMS • Manage precipitation beyond baseline • Reduce outdoor water use • Design functional stormwater features as amenities • Restore aquatic ecosystems	• Water Consumption • Water Meter • Major Leak Detection • Sanitary Supply Shut Off • Irrigation Systems • Vehicle Wash • Sustainable on-site water treatment • Flood Risk • Minimising Watercourse Pollution	Protection of coastline, stormwater, flood protection | 127 Water conservation, groundwater management, water quality | 314

LEGEND:

Regular credit
PREREQUISITE CREDIT
Landscape related credit

Topic	Sub-topic	LEED
Materials	new materials reuse chemistry material knowledge design for disassembly	• PBT SOURCE REDUCTION—MERCURY • Building Life-Cycle Impact Reduction • Environmental Product Declarations • Sourcing of Raw Materials • Material Ingredients • PBT Source Reduction—Mercury (credit) • PBT Source Reduction--Lead, Cadmium, and Copper • Furniture and Medical Furnishings • Design for Flexibility
Soil and site	site assessment land protection soil restoration	• ENVIRONMENTAL SITE ASSESSMENT • Site Assessment • Site Master Plan • LEED for Neighborhood Development Location • Sensitive Land Protection • High Priority Site • Surrounding Density and Diverse Uses • Regional Priority

SITES	BREEAM	SURVEY
• Eliminate the use of wood from threatened tree species • Support sustainability in materials manufacturing • Maintain on-site structures and paving • Divert construction and demolition materials from disposal • Divert reusable vegetation, rocks, and soil from disposal • Use recycled content materials • Reuse salvaged materials and plants • Support transparency and safer chemistry • Design for adaptability and disassembly • Use regional materials • Support responsible extraction of raw materials	• MATERIALS SPECIFICATION • Responsible Sourcing of Materials • Floor Finishes • Re-Use of Facade • Re-Use of Structure • Recycled Aggregates • Designing for Robustness	Reuse / recycling of materials | 365 Reduction of waste | 331
• RESTORE SOILS DISTURBED DURING CONSTRUCTION • LIMIT DEVELOPMENT ON FARMLAND • Protect floodplain functions • Conduct a pre-design site assessment • Restore soils disturbed by previous development • Redevelop degraded sites • Locate projects within existing developed areas	• Reuse of Land • Site Investigation	Conservation of land and soil | 430 Property value | 53

LEGEND:

Regular credit
PREREQUISITE CREDIT
Landscape related credit

Topic	Sub-topic	LEED
Transportation	Modes of transport Public transport Green transport	• Access to Quality Transit • Bicycle Facilities • Reduced Parking Footprint • Green Vehicles
Energy and climate	Energy consumption Energy production Energy metering Heat island reductiion Light pollution	• MINIMUM ENERGY PERFORMANCE • BUILDING-LEVEL ENERGY METERING • FUNDAMENTAL REFRIGERANT MANAGEMENT • Optimize Energy Performance • Advanced Energy Metering • Demand Response • Renewable Energy Production • Enhanced Refrigerant Management • Green Power and Carbon Offsets • Heat Island Reduction • Light Pollution Reduction

SITES	BREEAM	SURVEY
• Encourage fuel efficient and multi-modal transportation • Connect to multi-modal transit networks	• Provision of Public Transport • Proximity to amenities • Alternative modes of transport • Pedestrian and Cyclist Safety • Travel Plan • Maximum Car Parking Capacity • Travel Information Point • Deliveries & Manoeuvring	Transportation and communication | 417
• Reduce urban heat island effects • Use vegetation to minimize building energy use • Reduce light pollution • Reduce outdoor energy consumption • Use renewable sources for landscape electricity needs	• ENERGY EFFICIENCY • SUB-METERING OF SUBSTANTIAL ENERGY USES • ENERGY SUPPLY WITH LOW GREENHOUSE GAS EMISSIONS • ENERGY PERFORMANCE OF BUILDING STRUCTURE • Sub-metering of High Energy Load and Tenancy Areas • External Lighting • Building fabric performance and avoidance of air infiltration for the delivery/dispatch of goods • Cold Storage • Lifts • Escalators and travelling walkways • Energy Efficient Fume Cupboards • Swimming pool ventilation and heat lossinfiltration for the delivery/dispatch of goods • Energy Efficient Laboratories • Energy Efficient IT Solutions • Energy performance of building structure • Internal and external lighting levels • Potential for Natural Ventilation • Reduction of Night Time Light Pollution	Reduction of heat island effect | 67 Energy consumption | 570

LEGEND:

Regular credit
PREREQUISITE CREDIT
Landscape related credit

Topic	Sub-topic	LEED
Air and pollution	emissions air quality pollutants pesticide contamination	• CONSTRUCTION ACTIVITY POLLUTION PREVENTION • MINIMUM INDOOR AIR QUALITY PERFORMANCE • Environmental Tobacco Smoke Control • Enhanced Indoor Air Quality Strategies • Low-Emitting Materials • Indoor Air Quality Assessment
Health and wellbeing	noise reduction aesthetics security inclusive environment health	• MINIMUM ACOUSTIC PERFORMANCE • Places of Respite • Direct Exterior Access • Thermal Comfort • Interior Lighting • Daylight • Quality Views • Acoustic Performance
Operations and maintenance	maintenance plan recycling performance	• STORAGE AND COLLECTION OF RECYCLABLES
Innovation and education	performance communication user guide accredited professional	• Tenant Design and Construction Guidelines • Innovation • LEED Accredited Professional

SITES	BREEAM	SURVEY
• CONTROL AND RETAIN CONSTRUCTION POLLUTANTS • Minimize exposure to environmental tobacco smoke • Protect air quality during construction • Minimize pesticide and fertilizer use • Protect air quality during landscape maintenance	• INDOOR AIR QUALITY • POLLUTANTS IN THE INDOOR ENVIRONMENT • Moisture protection • Contaminated Land • Microbial Contamination • Refrigerant GWP – Building Services • Preventing Refrigerant Leaks • Refrigerant GWP – Cold Storage • NOx emissions from heating source	Air quality | 308
• Protect and maintain cultural and historic places • Provide optimum site accessibility, safety, and wayfinding • Promote equitable site use • Support mental restoration • Support physical activity • Support social connection • Support local economy	• HIGH FREQUENCY LIGHTING • SECURITY • Daylighting • View Out • Glare Control • Lighting zones and controls • Thermal Comfort • Thermal Zoning • Acoustic Performance • Office Space • Noise Attenuation	Noise reduction | 49 Aesthetic quality and views | 86 Recreation, health and wellbeing, social value | 432 Safety | 41
• PLAN FOR SUSTAINABLE SITE MAINTENANCE • PROVIDE FOR STORAGE AND COLLECTION OF RECYCLABLES • Plan to monitor and report site performance	• RECYCLABLE WASTE STORAGE • Compactor / Baler • Ease of Maintenance	Reducing operating and maintenance cost | 151
• COMMUNICATE AND VERIFY SUSTAINABLE CONSTRUCTION PRACTICES • Innovation or exemplary performance • Promote sustainability awareness and education • Develop and communicate a case study	• BUILDING USER GUIDE • Consultation with Students and Staff • Innovation • Publication of Building-related information • Development as a Learning resource • BREEAM-NOR Accredited Professional	Educational purposes | 54

Conclusion of comparison

After comparing the three different certification methods, I've come to the conclusion that SITES is the most suited method to involve in the Cradle to Cradle inspired handbook. The reason for this is that SITES has many aspects that directly involves the landscape architect. LEED and BREEAM has some credits that is relevant for the landscape architect, but the majority of the credits concerns buildings and structures. My decision is to integrate elements from SITES alone, instead of combining some elements from all three.

The categories that is used for the comparison, gives some initial insight into why I have decided to use SITES and not LEED and BREEAM. Even though LEED and BREEAM has more credits on the Process and management category, the SITES credits covers what is needed for landscape architecture.

In the Ecology and vegetation category SITES is without doubt the more suitable method, considering the vast specter of topics included. On this matter LEED has two and BREEAM has four topics, which are rather general in scope.

The following category of Water is rather similar between the three. But where LEED and BREEAM has credits for building water use and such, SITES includes credits for aquatic ecosystems, which should be considered within landscape architecture.

Considering the category of Materials, SITES has more credits on on-site structures in general, and topics of vegetation use, while LEED and BREEAM has more specified credits for reuse of building parts.

Within the Soil and site category LEED has many credits that consider site suitability and master planning, while SITES has several credits for soil mending and redevelopments, and BREEAM has only Reuse of land and Site investigation.

The category of Transportation is where BREEAM comes out as the strongest. BREEAM considers different types of transportation and has several credits for different scales of transportation issues, for public transport, cars, bikes and pedestrians. LEED has some of the same, while SITES only assesses the issue fuel efficiency and multi-modal transit.

The category of Energy and climate is within SITES rather short, but to the point. SITES considers energy use, renewable energy production, heat island effect and light pollution. LEED and BREEAM uses the same, in addition to many other more specific credits for energy metering and building energy performance. This is not relevant for the handbook.

Considering the category Air and pollution SITES has several credits concerning outdoor air and pollution. BREEAM has close to only building related air quality credits. LEED defines credits that is meant for building practice, but some are applicable for landscape architecture as well.

The category of Health and wellbeing has some credits that are the same for all three theories. The issue of noise, scenery, security, and views is considered. But SITES assesses the topic of culture, activity, and inclusiveness more than the other two.

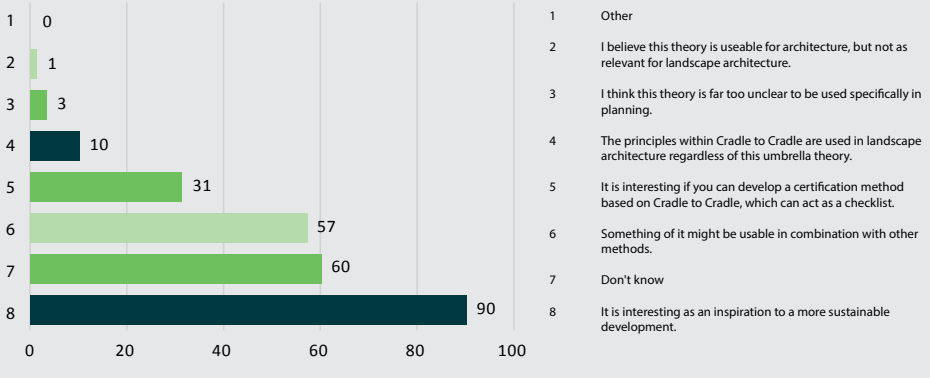
The last categories of Operations and maintenance, and Innovation and education are almost the same for all three, but SITES has more credits concerning the communication of experiences.

All this in addition to the value given to some of the topics from the survey, has lead me to conclude on the implementing of some of the SITES credits in the Cradle to Cradle inspired handbook.

I have done the best I could to combine the values from Cradle to Cradle and SITES, and to make it as relevant for Norwegian conditions as I could. Some issues have been taken out because they were considered irrelevant or without impact in Norwegian issues. The categories that I have chosen to focus on are Process, Materials, Energy, Biodiversity, Air, Water, Social, and Economics, within sustainability. These categories are then subdivided into topics containing some concrete tools.

FROM THE SURVEY

"Do you think there is use for the Cradle to Cradle theory in landscape architecture in Norway today?"



PART 3: HANDBOOK

HANDBOOK

FOR USE OF CRADLE TO CRADLE IN
SUSTAINABLE LANDSCAPE DESIGN

INTRODUCTION

The reason for making this handbook was to create a method to assess sustainable elements in contemporary landscape design, by using the Cradle to Cradle theory. The aim of the handbook is to show what aspects of Cradle to Cradle is useful when doing landscape projects, and defining some concrete tools for applying Cradle to Cradle in landscape architecture.

During my research I have discovered that there is a need for making Cradle to Cradle design more defined, tangible and measurable, in order to apply it as theory to landscape projects.

The handbook is based on the overall theory of Cradle to Cradle, but the defined tools are found in the following sources.

The method and structure is based on the Danish manual made for the Danish Building Industry (Jørgensen & Lyngsgaard) from 2013. This manual seeks to make Cradle to Cradle applicable for the Danish setting and the Scandinavian setting.

In order to create the manual based on landscape principals, the certification methods of SITES has been used as source for additional landscapes sustaianbility tools.

The city developemnt projects of Ronneby municipality in Sweden has also been useful examples to describe the process and applicability of Cradle to Cradle in landscape architecture.

As this handbook goes through the different aspects considered to be important for sustainable planning, each topic will be presented with a short introduction, examples and defined steps. The topics are symbiotics products of Cradle to Cradle and SITES.

The first category of this handbook is the process, which is important considering the focus of the process within Cradle to Cradle. The adaptability and relevance of the other categories might change from project to project, but the issue of process is something that every project should focus on.

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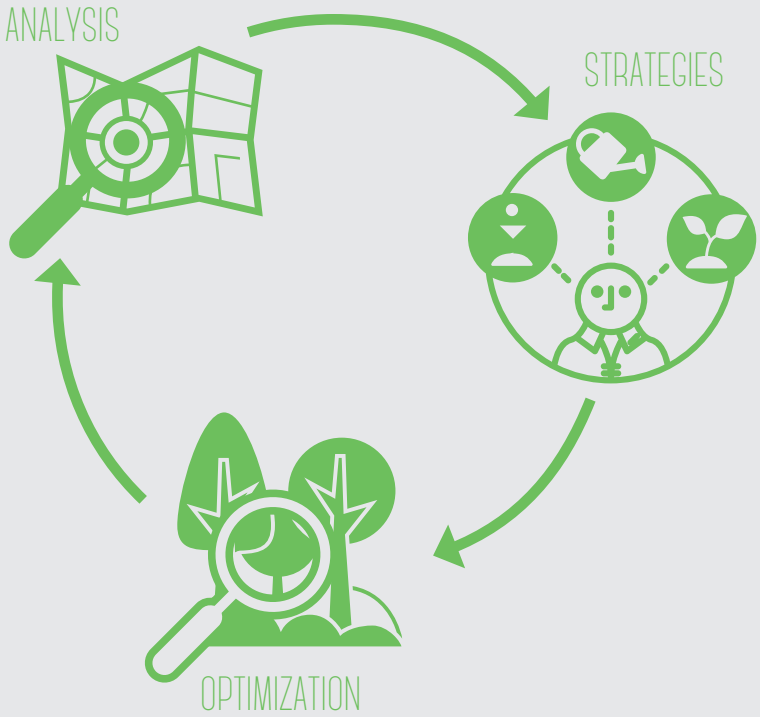
"The 20th century was about getting around.
The 21st century will be about staying in a place worth staying in."

– James Howard Kunsler

PROCESS



A Cradle to Cradle design process is based on three phases:

1. ANALYSIS
2. STRATEGIES
3. OPTIMIZATION

ANALYSIS
Through analysis the design team formulate a set of overall intentions, and objectives that aim for a 100 % positive goal. This is based on what the site is today and what the site will provide in the future.

STRATEGIES
The next step is to apply a set of strategies and tools in order to achieve the goal of the analysis. These are concrete ways to get the anticipated effect. The strategies can't by themselves secure the Cradle to Cradle quality in every extent, but they describe the way there, as Cradle to Cradle is future oriented on the notion of optimization.

OPTIMIIZATION
Evaluate the project and see if the measurable steps have been reached. The optimization is done my measuring the effect of the initial strategies and tools. This should continuously increase the value of the economic, social and environmental aspect of sustainability.

Overarching this is the doble effect of eco-effectiveness; enhancing compnents with positive impact, and eco-efficiency; minimizing the presence of negative components.

(Jørgensen & Lyngsgaard, 2013)

STEP 1. ANALYSIS

THE BEGINNING OF A PROJECT

Intentions
It is important to consider the process of a Cradle to Cradle project as the actual goal itself. The process starts with a set of intentions; what is the overall goal for the project, what are we going to achieve. Intentions can be one of the major topics of Cradle to Cradle: 'Respect diversity'. This intention (or others) will make the baseline of the project.

Objectives
From the intentions one can extract a set of objectives; ways of reaching the intentions. The objectives of the intention mentioned could be: 'develop the site to be more biodiverse than before'.

Measurable steps
The next step is then to decide on some measurable steps; ways of knowing if the objectives are reached or not. It is important that one decides on what to measure and when, so that the increase or decrease in output can be documented. Measurable steps for the objective could be, for 'an increase in biodiversity after X years'. Here one can do a counting of species, the amount of vegetation etc.

STEP 2. STRATEGIES

THE MAKING OF A PROJECT

Strategies and tools
The strategies and tools aim to achieve the objectives and goals. These are concrete ways to get the anticipated effect.

The main part of this handbook will describe such tools. Examples of tools could be, when considering increase of biodiversity: green roofs and walls, micro-habitats, increase in biomass etc.

STEP 3. OPTIMIZATION

THE EVALUATION AND A FOREVER ONGOING PROCESS OF IMPROVEMENT.

Example on increse in value
In the end the benefits of these objectives and strategies can be multiple. When considering biodiversity the increase in value can can be ‘pleasure of users, ecosystem services like cleaner water, cleaner air, pollination and food, climatic regulating etc.’

NEVER ENDING CYCLE

As all projects goes through the same stages, I have listed below the stages and what should be considered when planning following an Cradle to Cradle inspired method.

PROGRAMMING

- Intentions
- Opportunities and challenges
- Include all stakeholders
- Create a broader cooperation

SKETCHING

- Objectives
- Parameters and goals for the design
- Form, disposal, economy and time

PLANNING

- Measurable steps, qualitative or quantitative or a combination

TENDERING

- Request for tenders that define innovative models of supply and reuse
- Leasing and 'take back' agreements
Resource optimizing

CONSTRUCTION

- Improvement in the pace of the innovations
- Give space to implement the most innovative components

OPERATIONS

- Performed continuous measures
- Incitement structure that makes continuous enhancements attractive

REUSE

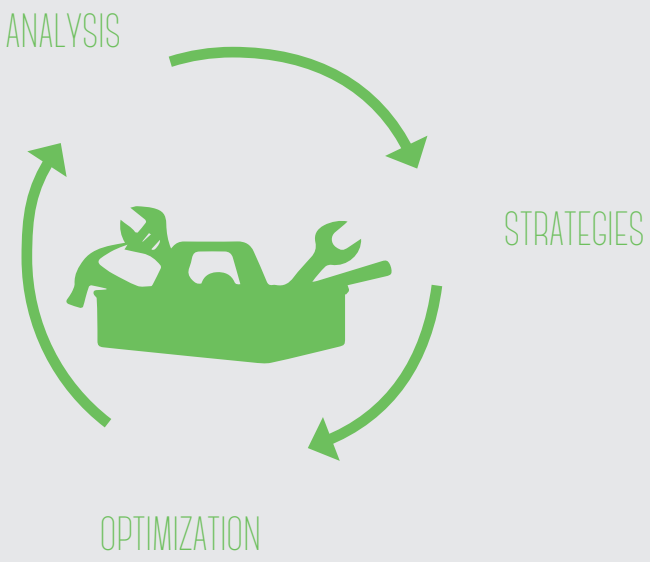
- Subcontractors could be responsible for improving and collection of their own materials

Figure 15: Process of planning

TOOLS

STRATEGIES FOR THE PROCESS OF THE PROJECT

PROCESS TOOLS



The following category list some tools used in the process of making the project. The tools are divided into three subcategories:

1. Communicate the plan
2. Obligations
3. Evaluation

The scope of this category is to present some strategies to make the process as integrated as possible and make is easier to implement and forfill the other strategies.

COMMUNICATE THE PLAN

PLAN FOR SUSTAINABLE SITE MAINTENANCE
Ensure long-term site sustainability by developing a site maintenance plan outlining the project's strategies and required implementation tasks. Here one should explain the short-term tasks and the long-term strategic plan, and make sure that the maintenance contractors commits to the plan.

The site maintenance plan should contain topics like:

- Stormwater features, water treatment, water quality, irrigation<<
- Soil amendments, fertilizers, erosion and compaction
- Plant health care, plant material, disease, pest and invasive species
- Materials replacement, functionality and extended use, historical elements, recyclable materials and food waste
- Aquatic ecosystems, conservation of habitats
- Type of maintenance equipment, site user experience, snow and ice, and the issue of ever updating the maintenance plan.

COMMUNICATE AND VERIFY SUSTAINABLE CONSTRUCTION PRACTICES
Ensure site performance by communicating and verifying the implementation of sustainable practices throughout the construction process. A design team member that will verify that the site is built per the construction specifications and drawings. Hold meeting with members of all disciplines. Review the specifications and steps needed and create a punch list. Determine short- and long-term sustainability principles and performances goals.

OBLIGATIONS

CONTROL AND RETAIN CONSTRUCTION POLLUTANTS
Protect receiving waters, air quality, and public safety by preventing and minimizing the discharge of construction site pollutants and materials. Create an erosion, sedimentation and pollutant control plan. Prevent loss of soil during construction by stormwater, prevent and reduce sediment discharge, prevent polluting the air, prevent runoff and infiltration of other pollutants. Use strategies of temporary and permanent seeding, mulching, dikes, sediment traps, filters, spill control equipment, and overfill alarms.

RESTORE SOILS DISTURBED DURING CONSTRUCTION
Support healthy plants, biological communities, water storage, and infiltration by restoring soils disturbed during construction. Achieve appropriate organic matter for plant growth, water storage and infiltration. Ensure that the compaction in the root zone is not damaging. Achieve infiltration rates that are comparable to the sites reference soil. Restore the appropriate soil chemical characteristics for plant growth. The pH, soluble salts, cation exchange capacity, carbon to nitrogen ratio and nutrient profiles, should be comparable to the original undisturbed soil. Strategies can be to stockpile and reuse existing topsoil, treat soil on site with organic matter, add mature and stabile compost. Construction-compacted subsoil should, through planning and involvement of a qualified horticultural or soil professional, be at a minimum. One should also make an effort to restore soils disturbed by previous development.

DIVERT CONSTRUCTION AND DEMOLITION MATERIALS FROM DISPOSAL
Support a net-zero waste site and minimize down-cycling of materials by diverting, reusing, or recycling construction and demolition materials to avoid disposal in landfills or combustion in incinerators. This is for non-hazardous materials. Create a construction waste management plan, including an inventory of existing materials. Some materials might be used as amendments for soil, but if they are non-organic. Soil test should be conducted.

DIVERT REUSABLE VEGETATION, ROCKS, AND SOIL FROM DISPOSAL
Support a net-zero waste site by diverting from disposal vegetation, mineral and rock waste, and soils generated during construction and land clearing activities. Contaminated soils and invasive species should not be included. Strategies for this can be to create an inventory of salvageable plants; use existing vegetation, mineral and rock materials; recycle excess vegetation as compost; balance cut and fill volumes.

COMMUNICATE THE PLAN

PLAN TO MONITOR AND REPORT SITE PERFORMANCE
Improve the body of knowledge on long-term site sustainability by monitoring and documenting sustainable design practices to evaluate their performance over time. Demonstrate ongoing performance monitoring and reporting, and develop a plan to increase the body of knowledge on long-term sustainability by widely communicating the results, like discipline-wide magazines etc. communicate early on in the design process that monitoring is a goal of the project and set aside funding to do so.

DEVELOP AND COMMUNICATE A CASE STUDY
Inspire and educate the public on the value of sustainable landscapes by describing and communicating a thoughtful and informative summary of the project. By illustrating the approaches, strategies, and benefits of implementing sustainability at the site scale. Before and after pictures, methodologies, benefits and limitations are important to put across.

In addition, what should be communicated is:
- Project details
- Project team
- Site context
- Challenges and solutions
- Sustainable features
- Environmental, social and economic performance benefits
- Cost comparison of sustainable vs conventional strategies
- Lessons learned
- Maintenance and monitoring

INNOVATION OR EXEMPLARY PERFORMANCE
Encourage and reward innovation and exemplary performance in site design, construction, and maintenance by providing examples and performances criteria outside the Cradle to Cradle theory, SITES or this handbook.

MATERIALS

The materials category is a list of tools related to new materials and products coming of-site, reuse of existing materials on-site, and ways of facilitating for reuse.
The three subcategories are:

1. New materials
2. Reuse of materials
3. Design for disassembly

The current way of recycling materials is one of downcycling, where quite different materials are melted or merged together into less durable materials of lower quality. This means that there is an ever growing need for raw materials of higher quality, and that the value of materials is getting lower. In Cradle to Cradle design there is a material intention, which states that the built environment should be a material bank for the future generations. This entails that what we build is of temporary use, and that the materials are potential nutrients for the next generation of products. One must defined the materials, both biological and technological, from extraction, use and potential reuse; where does it come from, where is it going? It is important that the materials keep their value through their cycle. This is achievable if the contents are made clear and that the product is designed for disassembly.

Cradle to Cradle inspired project might be beneficial for several stakeholders. It might increase value for the developer, by making adaptive and changeable buildings; for the manufactures, by providing high quality resources and reducing responsibility and risk; for the recycle industry, by making it easier to recycle products that are designed for disassembly; for future generations, by securing that the resources are maintained and used more efficiently.

The notion of 'upcycling' rather than 'downcycling' when considering recycling is a major feature within Cradle to Cradle. Upcycling means that a higher quality of the materials is reached. To achieve this, the products must be defined, more focus on design for disassembly is important, everyday nutrient flows needs to be mapped, and a strategy that looks beyond the site need to be implemented. All of this will give higher material value, but also increased consciousness about resource use and stimulates to innovation (Jørgensen & Lyngsgaard, 2013)

NEW MATERIALS

ELIMINATE THE USE OF WOOD FROM THREATENED TREE SPECIES
This requires that all wood used in the project, either for construction or temporary use, is from sustainable, local forestry that can document the whole manufacturing process. This includes the use of wood coated with substances that are not biodegradable, which excludes it from being brought back to the biological cycle.

INCREASED KNOWLEDGE OF MATERIALS
There is a need of an overall list of the quantity and quality of materials used. Value of materials follows from the knowledge of the content. A database for material information, within BIM planning, could be used as a material passport, which gives information of content, intentional period of use, disassembly, reuse and recycling. An Environmental Product Declaration (EPD) can be used for this. The EPD is not a certification, but an ISO standard to catalog the environmental consequence of a product. This is based on a Life Cycle Assessment (LCA) which gives an overall picture of the bounded energy, transportation distance and resource use of a product.

USE REGIONAL MATERIALS
To reduce transportation, support local businesses, increase demand for locally produced materials. Like soil, compost, mulch, boulders, rocks, aggregate and

plants. These must be identified during pre-design and defined in the process and construction.

SUPPORT RESPONSIBLE EXTRACTION OF RAW MATERIALS
Protect ecosystems, respect cultural and community values through responsible extraction of raw materials. This applies to all new materials. Support those suppliers that meet these standards. Must be verified by a third party and can involve responsible mining, legal harvesting, certified food products, human rights laws, ecologically responsible land use, reducing environmental harms, economic and social supports. These standards should be written into the project specifications.

SUPPORT TRANSPARENCY AND SAFER CHEMISTRY
Decrease the harmful impacts of materials, and support materials with chemical inventories, life-cycle information and hazard assessment. This to support the development and disclosure of chemical inventories. Use materials without finishes, utilize product certification systems.

SUPPORT SUSTAINABILITY IN MATERIALS MANUFACTURING
Specify materials that come from manufacturers that increase energy efficiency, resource and waste reduction. Advocate the use of Life-Cycle Assessments (LCA) with the suppliers and focus on using suppliers that actively implement practices of reducing emissions of air pollutants, water pollutants, and wastes; reduce the emissions of greenhouse gasses; reducing energy consumption; use renewable energy sources and reduce use of potable water.

SUPPORT SUSTAINABILITY IN PLANT PRODUCTION
Purchase plants, sod and seeds from providers that increase energy efficiency, reduce resource consumption and waste. Use suppliers that have publically sustainable statements, should include reducing use of potable water, reduce runoff from irrigation, sustainable growing media, recycle organic matter, reduce waste, use integrated pest management (IPM), prevent use of invasive species, reduce energy consumption, use renewable energy and provide fair working conditions.

RECYCLED MATERIALS

REUSE MATERIALS

MAINTAIN ON-SITE STRUCTURES AND PAVING
Reduce waste by maintaining existing structures and paving in their existing form. Not if they may be hazardous for plant, animal or human life.

REUSE SALVAGED MATERIALS AND PLANTS
To conserve resources and avoid landfilling. The salvaged plants should be disease-free. Rescue plant prior to construction, for later reinstalling.

USE RECYCLED CONTENT MATERIALS
To reduce the consumption of virgin materials and avoid landfilling, by purchasing products with recycled content. Might be plastic lumber made with recycled content, crushed concrete, recycled asphalt, recycled steel and other materials as aggregate in concrete.

DESIGN FOR ADAPTABILITY AND DISASSEMBLY

DESIGN FOR DISASSEMBLY

DESIGN FOR ADAPTABILITY AND DISASSEMBLY
To minimize material use and waste flow. This goes for both materials and components. Create a maintenance plan that describes how to replace deteriorated or damaged components. Identify materials and product suppliers that can help to achieve this. To make a catalog of the different materials and their intentional lifespan makes it easier to design from the start when and how the period of use is ending. To distinguish between the biological and the technological nutrients is important, and therefore as important to optimize the assembly methods. It is easier to use mechanical methods than gluing. Like reversible connections, friction-fit connections, and to avoid coatings that can't be recycled.

PROVIDE FOR STORAGE AND COLLECTION OF RECYCLABLES
Facilitate for recycling in the outdoor areas. Coordinate the size and function according to the anticipated amount of recyclables.

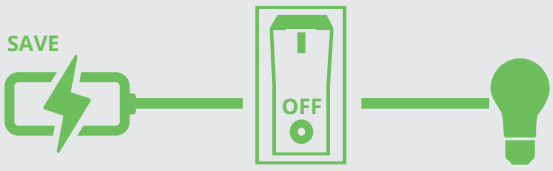
ENERGY

The energy category is not as important for landscape projects ad buildings, but there is still something that relates. Not only seeking to reduce the energy consumption; the intention is to produce more energy than is needed. This gives economic and environmental benefits.
The subcategories are:

1. Reduce consumption
2. Produce renewable energy
3. Energy functions

The subcategory Energy functions consist of strategies related to energy in an indirect way.

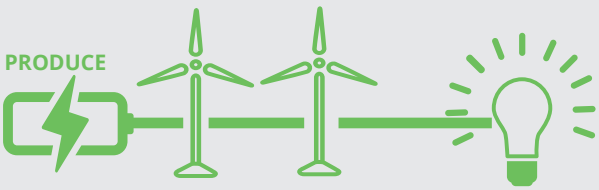
REDUCE CONSUMPTION



REDUCE CONSUMPTION

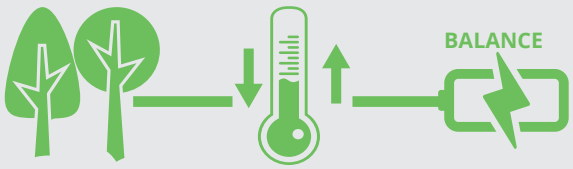
USE RENEWABLE SOURCES FOR LANDSCAPE ELECTRICITY NEEDS
Reduce greenhouse gas emissions and minimize air pollution, habitat destruction, and pollution from fossil fuel-based energy production by supporting renewable energy production. Engage in contacts for delivering green power, calculated by quantity, not cost. First determine the energy needs on the site, then assess for renewable energy sources, like solar collectors, photovoltaic panels, wind, geothermal and low-impact hydropower. By supplying biogas production with excess biomass from sites, the project could turn waste into energy.

PRODUCE RENEWABLE ENERGY



PRODUCE RENEWABLE ENERGY

REDUCE OUTDOOR ENERGY CONSUMPTION
Reduce greenhouse gas emissions by minimizing energy consumption. Select the right outdoor lighting equipment, fountain operation systems, path heating and snow melting systems to achieve an annual energy reduction. Look at solar powered alternatives. Use intelligent installations like, to use energy only when needed, like movement- or light sensors.



ENERGY FUNCTIONS

USE VEGETATION TO MINIMIZE BUILDING ENERGY USE
Place vegetation in strategic locations around buildings to reduce energy consumption, for cooling and heating, and for shading. Use vegetation to provide a windbreak form the prevailing winter wind. Use species that maximize benefits appropriate to the climate. Deciduous trees allow access to the sun in winter and shade in summer. Vegetated roofs and walls will help insulate the building and provide ecosystem services like water retention, habitat, and act as a mentally restorative view.

REDUCE URBAN HEAT ISLAND EFFECTS
Minimize effects on microclimate, humans and wildlife habitat by using vegetation and reflective materials to reduce heat island effect. Use plant material to shade paving areas, provide shade with structures that generate renewable energy, use an open-grid pavement system. Install high-reflective roofs or green roofs in areas where heat island effect is known to present a problem. Reduce impervious surfaces, and consider placing parking under cover.

REDUCE LIGHT POLLUTION
Minimize negative effects on nighttime environments and human health and functioning, reduce sky-glow, and increase nighttime visibility by reducing light trespass to the sky from the site. Uplight and light trespass should be at a minimum on the site. Adopt site lighting criteria to maintain safe light levels while avoiding off-site lighting and night sky pollution.

BIODIVERSITY

The category of biodiversity is the largest in this handbook.
The subcateogories in the biodiversity cateogy is:

1. Soil and landscape intervention
2. Species and habitat
3. Vegetation
4. Limit pesticides and chemicals

The situation of the biodiversity is that it often must give way for human made projects, but human production cannot be viewed as separate from the natural system.
Ecosystem services is something that is considered more and more. These ecosystem services can be clean air, fresh water, pollination and food, shading and isolation.
The natural environment is based on two major elements: biodiversity and biomass. The biodiversity is the diversity in everything living and the biomass is the total amount of living organisms. A high biomass is necessary for a high biodiversity. (Jørgensen & Lyngsgaard, 2013)

Within Cradle to Cradle there is two focus point to biodiversity: to secure and recover biomass and to support biodiversity. The biomass is a measurable indicator. In the planning process of a project one should seek to integrate strategies to restore the biomass during construction, to support an increase in plants, insects and animals. But also to preserve as much untouched nature as possible (Jørgensen & Lyngsgaard, 2013)

To support biodiversity is important in both landscape projects, as well as in the built environment. The roof and the walls of a building can support natural habitats for flora and fauna, but also supply nutrients, create biotopes and biological corridors.

With biodiversity one can make a five point strategy:
- TO GIVE WAY: integrate built environment and nature in each other
- CREATE CONNECTIONS: make spatial connections, as spreading corridors for animals and plants
- ESTABLISH CONTINUITY: find potential habitats for a broader fauna, by analyzing the existing fauna
- GIVE PROTECTION: make niches, reservoirs, and protrusions, that give access for some but not all species
- SECURE ACCESS: give access for people to experience and appreciate the nature

Biodiversity can also be utilized as active and recreational elements. These recreational opportunities can be combined with the service of rainwater treatment, as reestablishing wetlands. Information and measurable indicators is important to take into account early on in the project. With the help of professionals the wellbeing of nature may be useful information. Measurable elements like vegetation counting, set by geographical limitationspecies mapped and time of year, is a measurable indicator.

SOIL AND LANDSCAPE INTERVENTION

CREATE AND COMMUNICATE A SOIL MANAGEMENT PLAN

To support healthy plants, biological communities and water storage and infiltration by planning for soil restoration, and to limit soil disturbance during construction. Identify previous developed and disturbed soils, and how to restore and re-vegetate. Imported top soil may not be imported from greenfield sites or prime farmland. Create a soil management plan (SMP) included an erosion and sediment control plan. Define a vegetation and soil protection zone (VSPZ). Define fencing and other physical barriers during construction. Methods of restoring topsoil might be stockpiling and reusing existing soil, amending site soil with organic matter in place or importing topsoil. The best practice is to use soils for functions comparable to their original function.

CONSERVE HEALTHY SOILS AND APPROPRIATE VEGETATION

Maintain ecosystem services and landscape performance by limiting soil and plant disturbance. Locate construction on areas of previously disturbed soil if possible, make clear construction boundaries. Protect root zone of trees found on site.

LIMIT DEVELOPMENT ON FARMLAND
Conserve the most productive farmland for future generations, like prime farmland, unique farmland, and farmland of local importance. Applies to sites of healthy soil and previously undisturbed land. Locate the project on an infill site, or sites of desired development. Can be mitigated by purchasing off-site farmland to reassure the food production.

PROTECT FLOODPLAIN FUNCTIONS
Limit all new development within the 100-year floodplain of all types of water ways and watercourses. Might take use of former developed brownfield areas, but must maintain or increase existing floodplain storage. Re-establish areas of vegetated floodplain in brownfield, and avoid causing erosion.

SPECIES AND HABITAT

CONTROL AND MANAGE INVASIVE PLANTS
To limit damage on local ecosystem by implementing an active management plan to control invasive plants on site, and to ensure that no other invasive spices are brought on site. Important to document known invasive species early on and to remove them before or during the construction period. Plan for integrated pest management (IPM) or plant health care (PHC), identifying and monitoring of additional invasive species, and to make plans for initial-, follow-up- and long-term treatments. Learn the most effective management techniques for the invasive species found on site, and limit the disruption to protected areas. Prevention is the first line of defense, so early detection is key. Control and management may slow down and reduce their impact. Invasive species may undermine the ability of high-value ecosystems to restore, and since invasive species don't see project boundaries, coordination and collaboration is critical to success.

SPECIES AND HABITAT

USE APPROPRIATE PLANTS
Improve landscape performance and reduce resource use by installing plant that are appropriate to site conditions, climate and design intent. Use plants that are nursery-grown and that meet regional standards. Plant diversity provides resistance to insect and disease pests. Select species that contribute to the biodiversity in the community and the region as a whole.

CONSERVE AND USE NATIVE PLANTS
Foster habitat for native wildlife by using plants that are native to the site's ecoregion. Conserve the existing native plants or install new native plants. Define a goal for the amount of vegetated area that is supposed to be inhabited by native plants, after a certain span of time. Consult qualified professionals, like arborist, biologist, or environmental scientist, to define the appropriate plant species for the site.

CONSERVE SPECIAL STATUS VEGETATION

CONSERVE HABITATS FOR THREATENED AND ENDANGERED SPECIES
Protect ecosystem function by avoiding development of areas that contain habitat for plant and animal species identified as threatened or endangered. Identify if the site is on the range of potential habitat for species threatened, on the 'Red list'. Avoid impacts on endangered species during site maintenance. Minimize the disruption to existing habitats, and design to allow species connectivity, habitat corridors, to adjacent sites.

CONSERVE SPECIAL STATUS VEGETATION
Protect ecosystem services by conserving all vegetation on site with designated special status, like heritage, legacy or specimen trees; rare and endangered species, rare vegetation in a unique habitat; unusual genetic variations. Determine appropriate special protection measures. Pay extra attention to the root system and the soil chemistry.

CONSERVE AND RESTORE NATIVE PLANT COMMUNITIES
Contribute to the regional diversity and habitat of native wildlife conserving plant communities and installing vegetation that contributes to plant communities native to the ecoregion. Design the site to minimize damage to existing healthy native plant communities.

OPTIMIZE BIOMASS

VEGETATION

OPTIMIZE BIOMASS
Support ecosystem services by providing regionally appropriate vegetative biomass. Use such tools as determining the terrestrial biome and use a site biomass density index (BDI, bluegreen factor). Use the BDI to calculate the grade prior to design and the planned grade. On greenfield sites (undeveloped land) the BDI will be used to limit the disruption of the biomass. For brownfield (developed land) the BDI will be used to plan a biomass grade after a set of years. Green walls and green roofs can increase the BDI. So can structures such as trellises or espalier and pergolas as well.

RECYCLE ORGANIC MATTER

RECYCLE ORGANIC MATTER
To support nutrient cycling, improve soil health and reduce transportation cost and materials going to landfills by recycling vegetation trimmings or food waste to generate compost. Conduct a waste stream study and make a site maintenance plan. Excess vegetation and grass, in addition to food waste, should be treated on site, or one can utilize neighboring facilities.

LIMIT PESTICIDES AND CHEMICALS

MINIMIZE PESTICIDE USE

Reduce the negative impact on environment and humans by observe and plan to minimize, and in the long run, eliminate synthetic pesticide. Create buffer zones, for water bodies, drains, human use areas. Create safety requirements, keep detailed records of the application, and communicate these policies. Establish thresholds that define pest population levels, require prior notification. Ban the use of pesticides for cosmetic purposes and the used of pre-emergent herbicides. Decide what pesticides that can be used when physical, mechanical and biotic control methods have been ineffective. Chose appropriate species and a variety of species so that the robustness of the project becomes the highest. Learn to identify the pest life stages, and use practices that rely on observation and planning.

MINIMIZE FERTILIZER USE

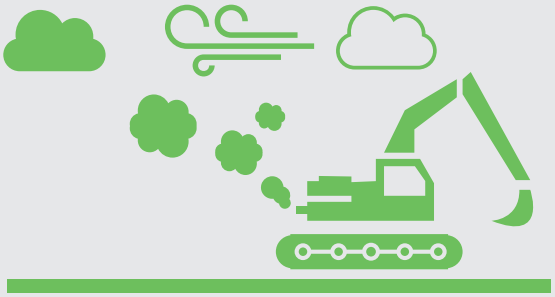
Outline the need for the use of fertilizers. Require soil or plant tissue testing. Define thresholds. Define the amount of water applied after fertilizing. Use services that have current certifications in fertilizer best management practice. Ban the application of fertilizers during rainy seasons and after the establishment period. Develop a list of organic and slow-release fertilizer products.

AIR

The category of air has only two tools, both considering air quality; during construction and during site maintenance.

The use of green plants will in any way produce oxygen and reduce the flow of airborne particles. This is not listed as a tool in this section.

PROTECT AIR QUALITY



AIR QUALITY

PROTECT AIR QUALITY DURING CONSTRUCTION
Protect air quality and reduce pollution by using construction equipment that reduces emissions of localized air pollutants and greenhouse gasses. Establish policy to reduce fossil fuel emissions, both in construction and as a preventive maintenance plan. Select contractors that are committed to reduce emissions, by reducing idling. Use GPS to track machine run and idle time.

PROTECT AIR QUALITY DURING LANDSCAPE MAINTENANCE
Protect air quality and reduce pollution by minimizing the use of powered landscape maintenance equipment that exposes site users to localized air pollutants and generates greenhouse gasses. Should only occur when the site is closed, or the number of users is at the lowest. Best of to use manual or electric-powered maintenance equipment. Design the site so that the need for maintenance is minimized. Right type of plants to function, like establishing meadows instead of lawns.

WATER

Water is an important aspect of every landscape project. Water is a valuable and vulnerable resource. That is why one must utilize rainwater and wastewater, like grey and black water. The issue of overloading the sewage system is a reason to consider scale, function and location of a decentralized system, which might be favorable. This category is divided into four subcategories:

1. Precipitation
2. Reduce water consumption
3. Water as a social resource
4. Aquatic ecosystem

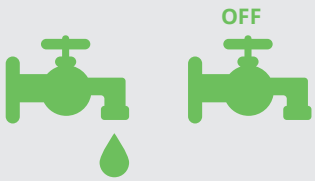
PRECIPITATION

MANAGE PRECIPITATION ON SITE

Maintain site water balance, protect water quality, and reduce negative impacts to aquatic ecosystems, channel morphology and dry weather base flow by replicating natural hydrologic conditions and retaining precipitation on site. Secure run-off reduction through on-site infiltration, evapotranspiration and reuse. The discharge should not increase the natural rate of erosion in receiving water channels. Reduce runoff volumes, peak flows and pollutant discharge. Design to minimize impervious surfaces, hard surfaces should drain into on-site landscape areas, use plants and healthy soils as filters. Select vegetation that can tolerate periodic inundation and soil saturation, and are resistant to pollutant commonly known in precipitation runoff. Improve water retention capacity by increasing the organic matter content in the soil. Use rainwater-harvesting systems. Avoid material used in buildings and landscape construction that can be a source of pollutions in stormwater. Reduce nutrient runoff. Provide multiple pollutant removal processes, and phytoremediation.

RAINWATER TREATMENT

Rainwater treatment utilizes rainwater in an internal water system. It will reduce fees on water consumption, and in addition provide experience and recreational value, as well as branding of the project. The LID (low impact development) aims to use the stormwater rather than letting it create problems. The LID is imitating the natural cycle with a decentralized waterway system that protect the central system from acute overload. The LID analyses different elements like terrain, soil, water flow map, to find the correct tools, like green roofs, rainwater- and infiltration islands, raingardens that lead the water from the buildings to let it percolate into the ground and permeable surfaces of reinforced grass or permeable paving.



REDUCE WATER CONSUMPTION

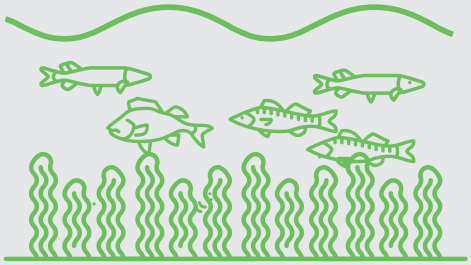
REDUCE WATER CONSUMPTION
Reduced water consumption can be achieved by communicating and stimulating behavioral change. It can also be achieved by optimizing the water system through better sanitary systems that employ a circular system.

TREATMENT OF WASTEWATER
The treatment of wastewater uses the nutrients that the water contains to healthy systems. What kind of separation depends on the scale, function and location. It can produce energy, and nutrients to food production. One can implement biological water cleaning, by utilizing nature's own biology to decompose organic material. Like the living machine; where several basins is filled with wastewater, that used the metabolism of natural organisms, both microorganisms, plants, animals, soil and geology plays a part. This is self-healing and long-lived process. Reed beds are another concept of cleaning water, using vegetated gravel filters. Here microorganism in the filter use the degradable nutrient in the water and cleans it.

REDUCE OUTDOOR WATER USE AND LANDSCAPE IRRIGATION
Conserve water resource and minimize energy use by reducing the use of potable water, natural surface water and groundwater withdrawals and encouraging alternative irrigation methods and water conservation strategies for landscape irrigation after the establishment period. Design the landscape to not require a permanent irrigation system. Maximize the use of captured stormwater; make all features to be self-sustaining with natural precipitation only. Consider planting season, regional appropriate species; create separate hydro zones so that plants can be discontinued when the plants become established. Use high-efficient equipment, reuse graywater, and capture rainwater.

WATER AS SOCIAL RESOURCE

DESIGN FUNCTIONAL STORMWATER FEATURES AS AMENITIES
Provide a connection to the local climate and hydrology by integrating aesthetically pleasing stormwater features that are visually and physically accessible and manage on-site stormwater. This ensures that precipitation is treated as an amenity, in a natural ecosystem. Emphasize site design to mimic natural infiltration-based, groundwater-driven hydrology of historic landscapes.



AQUATIC ECOSYSTEMS

CONSERVE AQUATIC ECOSYSTEMS

This is applicable for all aquatic ecosystems. Human-made water bodies on previously developed sites must be assessed to detect if aquatic ecosystems are present. Designate a protection zone for wetland and deep-water habitat buffer. The extent of the aquatic ecosystem habitat buffer must be defined. Identify the ecosystem that are in poor condition, and demonstrate how the functions will be protected, restored and maintained, to keep the long-term health. Minimize the disruption to existing wetland, and create an on-site buffer to off-site ecosystems. (

RESTORE AQUATIC ECOSYSTEMS

Support healthy functioning aquatic ecosystems for fish, wildlife and people by restoring the ecological function, integrity and resiliency of those ecosystems that have been degraded, damaged or destroyed. This could be caused by artificial modification, sea level rise, alteration of natural hydrology, loss of native flora and fauna, invasive species and alteration of biological processes, soils, geomorphology, and water quality. Restore the geographic extent of the aquatic ecosystem, and include a description of the reference site and its condition. Include ongoing management activities to protect the integrity of the aquatic ecosystems. Restoration prescription and strategies will vary, so it is important to develop a set of restoration and management practices. Reconstruct and reintroduce an array of biotic, geochemical, hydrological morphological and vegetative processes on the road to recovery. This should be in accordance with the current science and practice.

SOCIAL ASPECTS

In this category there are four subcategoriues:

1. Community
2. Participation
3. Inclusive environment
4. Social functions

A society can be seen as humans' dependence of each other. This dependence can be described as a responsibility, over both time and place. Over time we must leave healthy, biological and technological systems for future generations. Currently we are limiting future generations' possibility of living productive and healthy lives. That is a basic injustice.

Societies are changing, and new needs emerge. Buildings and landscapes need to be able to take this change; to be flexible and adaptive, because there is ever changing social structures and technological developments. The responsibility within the aspect of place can be seen as the building industry as part in defining the social conditions, both for those who use the building and for those around it.

The ambitions are on creating a holistic practice, which stimulates to positive relations, between humans and between human and system.

On three different scales, social sustainability needs to be considered: the production, the project, and the community.

- The production – How is it produced? How are the working conditions, and pollution?
- The project – is the project supporting positive social conditions?
- The community – is it stimulating to positive social relations to the surrounding areas?

COMMUNITY

PROTECT AND MAINTAIN CULTURAL AND HISTORIC PLACES
Enhance a site's identity and meaning by protecting and maintaining significant historic buildings, structures and objects, as well as cultural landscapes. Identify and protect sites that are included in a local, regional, national or tribal register, by communicate with the local community.

SUPPORT SOCIAL CONNECTION
Strengthen community and encourage social connections by providing outdoor gathering spaces to support people gathering, eating, working, and playing together. This includes seating, elements that address microclimate, amenities, services and activity spaces. Needs a variety of smaller social spaces, movable seating etc.

PARTICIPATION, BOTTOM UP, ENGAGE PEOPLE

PARTICIPATION

PROMOTE EQUITABLE SITE USE
Provide economic and social benefits to the local community by providing publicly available on-site events, facilities, amenities or programming. Engage users and stakeholders. Provide free public site access. Engage the local community to identify needs and develop options to generate the economic and social benefits of the site. Permanent elements and temporary installations may promote benefits for different user groups.

ENGAGE USERS AND STAKEHOLDERS
Identify specific, measurable, attainable, realistic, and timely project goals by engaging site users and stakeholders during the design process to supplement professional expertise with local knowledge. Identify the various needs of various site user groups. Solicit input and feedback in imaginative and flexible ways, use a variety of approaches to gather more participation, engage a wide variety of community members by providing the services that is needed, and take extra effort to include less influential groups or individuals.

PROMOTE SUSTAINABILITY AWARENESS AND EDUCATION
Promote understanding of sustainability in ways that positively influence user behavior by interpreting on-site features and processes, like site design, construction, operations, and maintenance.

INCLUSIVE ENVIRONMENT

PROVIDE OPTIMUM SITE ACCESSIBILITY, SAFETY, AND WAYFINDING
Increase site users' ability to understand and access outdoor spaces by incorporating elements of accessibility, safety, and wayfinding into the site design. Accessibility for people with disabilities, actual and perceived safety, natural surveillance with adequate lighting, clear visibility and good sight lines, a variety of options for access, that wayfinding is easy and intuitive, are some of the elements needed. Other components that might be included are clear entrances and gateways, viewpoints and sight lines, landmarks, decision points, hierarchy of pedestrian and vehicular circulation, distinct areas and regions, orientation devices and systems and maps. The objective is to improve legibility without compromising sensitive site features. Adapt universal design practices.

SUPPORT MENTAL RESTORATION
Improve human health and well-being by providing visual and physical connections to restorative outdoor spaces. Provide accessible and equate outdoor spaces that include a variety of seating, visual and physical access to vegetation, elements that reduce noise and elements that address microclimatic issues, like rain and wind. Involve potential users, design for a variety of sizes of spaces, plan for maintenance work that will not interfere with users, create a sense of enclosure, and design for a multi-sensory aesthetic experience.

SUPPORT PHYSICAL ACTIVITY
Improve human health by providing on-site opportunities that encourage outdoor physical activity. Develop a functional plan that encourages outdoor physical activities for the larges user groups, and provide services that support this activity. This could be on-site trail or bicycle path, playgrounds, fitness courses, physical activity programs, and scheduled events. The walkability, accessibility and variety are the major concerns.

MINIMIZE EXPOSURE TO ENVIRONMENTAL TOBACCO SMOKE
Improve human health by minimizing site users' exposure to environmental tobacco smoke. Develop and implement a smoke-free policy. Designate outdoor smoking areas, and account for the microclimatic effects.

SOCIAL INFRASTRUCTURE

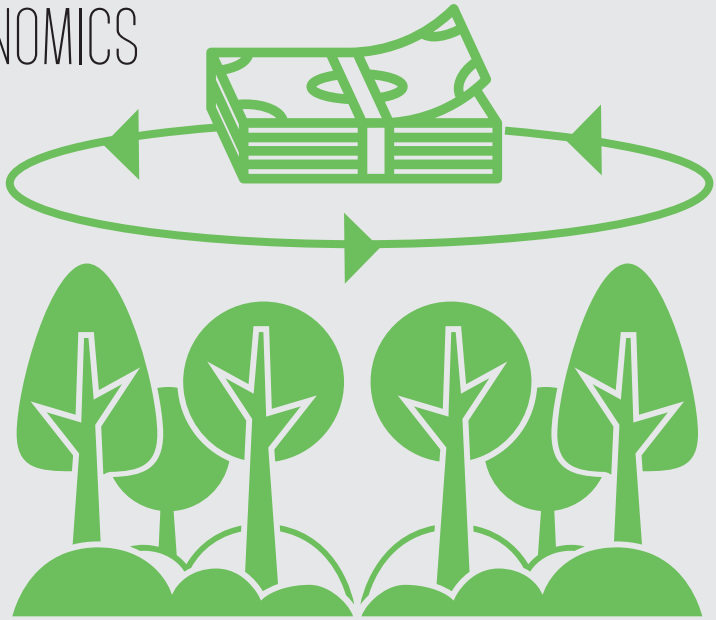
PROVIDE ON-SITE FOOD PRODUCTION

Improve human health and well-being, community involvement, and education about food production and nutrition by designing and managing food production on site. If site conditions are appropriate, as much as possible of the vegetation should be edible. Research on the potential in-ground and airborne contaminants and their potential harm on food should be performed. The gardening should be organic, to reduce human consumption of harmful chemicals, a variety of gardening methods should be used, as well as harvested rainwater and composted excess materials. Animal husbandry should also be considered to perform innovation.

ENCOURAGE FUEL EFFICIENT AND MULTI-MODAL TRANSPORTATION

Reduce emissions and promote a healthy lifestyle by encouraging and supporting efficient and adaptive modes of transportation. This by reducing number of parking spaces; preferred parking for vehicles that have reduced emissions and for car pools, electric re-charge stations, bicycle parking, and services at bus shelters. There should also be infrastructure and incentives to promote car sharing, bicycle sharing, and shuttle services to mass transit.

ECONOMICS



Economic profit is often the driving parameter in a building project, and therefore an important focus for the actors of the building. Economic profit isn't the only thing to consider when considering the quality of a building, but should be seen in relation to a broader array of values, where all values take part in securing an economical functional project. The 'Cradle to Grave' notion is a bad business model. The Cradle to Cradle inspired economic model supports a 100 % circular use of resources, that seeks to get rid of all waste through a smart design of materials, products, systems and business models, so that the raw materials never lose their value. There are rising prices on fossil fuels and raw materials, at a high rate because they are getting less available. Within the economic topic here there are four focus points: Material leasing, total economy, energy services, and material communities.

Material leasing is based on the notion that there are products we are using in the daily life, which we don't need to own; but rather the service they provide. If we are leasing a product, they can continuously be optimized and changed, i.e. light instead of a lamp. This is a strong incitement to develop quality products that minimize the need for repairs and change, since this is now the producer's responsibility, not the consumer.

The notion of total economy considers the designing, construction and operation in an economic relation, where the use and operational phase is considered from the introductory phases of intentions and objectives. If one gathers the costs of materials and operations, it might cost more at construction but will provide advantages during the operation of the project. By including factors like this higher quality products will be profitable, environmental friendly and social stimulating.

Another topic is public-private partnership, where private businesses are planning, constructing, operates, maintains, and sometimes finance a public project. The gains are increasing performance of public investments, divide the responsibility, shorter construction period, lower construction- and operation costs, higher quality.

Energy optimizing is an economical incitement for renewable energy sources, that are ever optimized. There might be a rather high first time investment, but the operational costs are low, and the optimization leads to shorter recoupment. The gains are security for the contractor, increased economic incitement, security that the project is completed in a politically changing world, working in the same direction, and economical savings for the users.

A material community is a community of businesses that that makes agreements on common deliverance of high quality materials. They formulate values, and set ambitious goals for material quality. A common material bank, where healthy materials that can be withdrawn after the service time, and be reused. Good for small and medium businesses, that can't on their own, perform a vast purchasing organization. The gains are economical savings on materials, savings on depositing fees, deliverance security, reduce CO2 emissions, and to keep the value of materials. (Jørgensen & Lyngsgaard, 2013)

SUPPORT LOCAL ECONOMY

SUPPORT THE LOCAL ECONOMY
Provide economic and social benefits to the local community during site construction by providing employment opportunities and purchasing local materials and services. Hire a local workforce and support local businesses, both on materials and services.

SUMMARY

This handbook has taken you through some of the issues that should be considered in landscape architecture today. The goal of a more sustainable practice, within this and other disciplines, as the starting point, and these tools and topics as a inspirational manual. The formulation of intentions and objectives is a suitable tool to explicitly state what the goal with the project is. It is not sufficient to design a project that just looks pleasant, functions as surrounding of a building development or cover-up of vast landscape intervention projects.

The initial stage of every project or development must state what more the outcome of the project will be; if it is water treatment facilities, increased biomass, aesthetic and functional community places, or implementing renewable energy production.

If you as a practitioner of landscape architecture looks through this handbook when starting on a new project, I think you easily will get some ideas of some topics you would like to address, or some solutions to implement. It is important for the overall outcome that this is done early on.

In every type of project there are elements of all the categories in this handbook; the process, materials, energy, biodiversity, air, water, social, and economic considerations.

But it is important to use this handbook for what it is; an inspiration to more sustainable landscape projects.

PART 4: CASE STUDY

NYE KLØFTAHALLEN KINDERGARDEN

INTRODUCTION

In this part I will highlight the differences between conventional landscape planning and the Cradle to Cradle inspired handbook presented prior, with the planning of a kindergarden as the setting. As the landscape and outdoor issues is the scope for this, I will only where it is necessary consider the building, and functions related to it. I will use the background information presented within the project documentation for the initial project. Such as issues of soil structure, geology, permeability, fire safety, acoustics, electricity and plumbing work.

SURROUNDING THE SITE

The original plan for the Nye Kløftahallen kindergarden was made in 2013, with Ullensaker municipality as the contracting entity and Pir II as architect and Asplan Viak as landscape architect. The kindergarden is supposed to consist of eight sections, with six of the eight sections as the first construction phase. The site is regulated for kindergarden purposes, and is rather flat. To the east there is the sports hall Kløftahallen and behind that the ravine valley Bakkedalen. There are private small houses to the south, the Gamleveien to the west and some houses and a grove of trees to the north. On the other side of the road to the west there is a grove of approximately

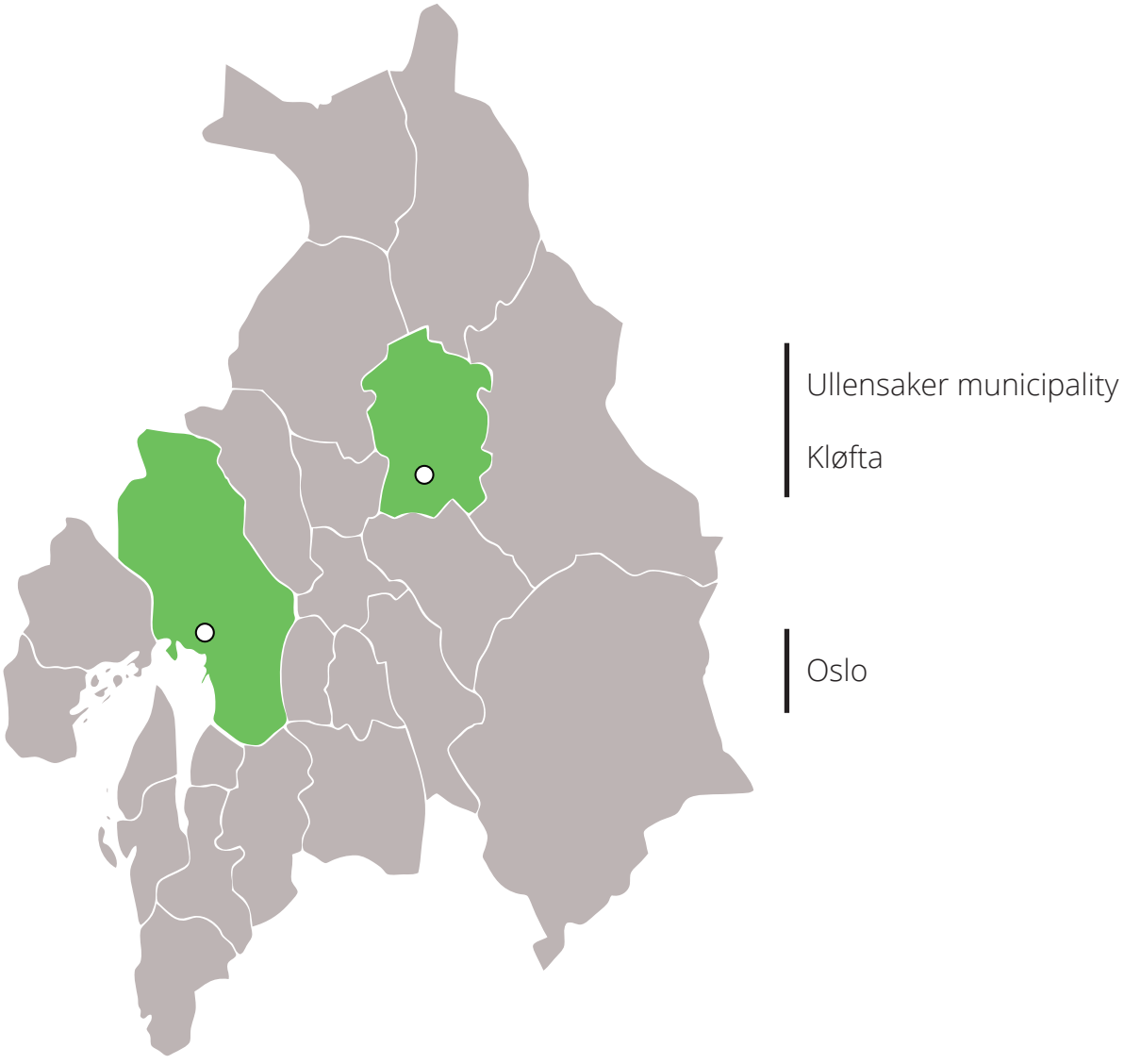


Figure 16: Map of Ullensaker municipality

32.000m2, which is the site of an old military base from the Second World War. These buildings are protected, and no longer used for military purposes. The vegetated area within this site is rather big, some 13.000m2.

THE SITE
On the site today we find grass fields for ballgames, and a smaller fenced area used by the current kindergarden located inside the sports hall. The transportation situation of today is some carparking and bus connection. The original plan is to facilitate for 50 parking spaces for both the kindergarden and the sports hall, and 38 bike racks.

Considering the shape of the site, facilitating for disabled people is not a big issue.

The site consists of mostly dense clay soil masses, so there might be difficult to achieve permeability thorough the soil. To facilitated water treatment there is planned a closed retention basin implemented under the site.

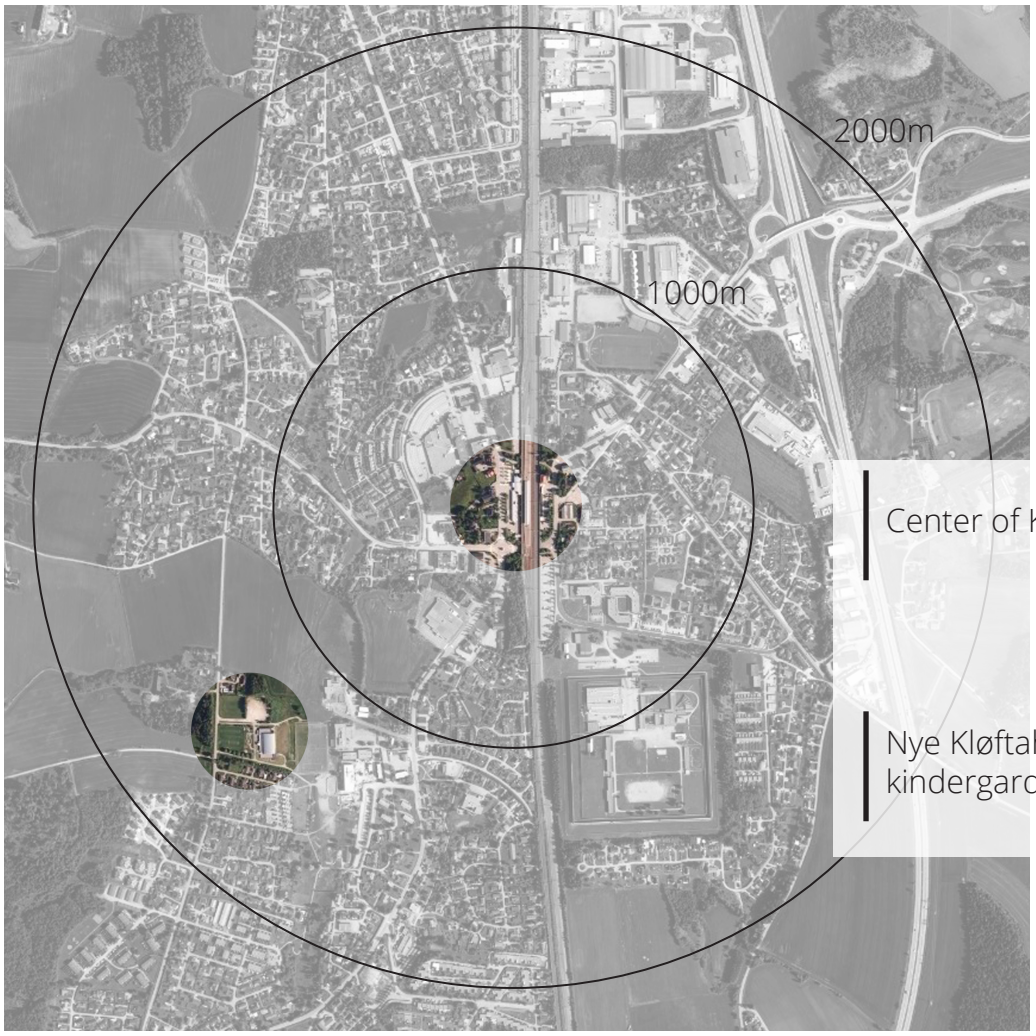


Figure 17: Map of Kløfta

Figure 18: Map of Kløftahallen

PROCESS
The process for the project was taken through a programming phase with user participation workshop, sketching, regulation phase, an interdisciplinary pre-planning phase and input from the municipality. As of today, the project is waiting for political decision.

MATERIALS
The issue of balancing the cut and fills of the grounds is considered, but only roughly. Several embankments are planned on site, both as noise barriers to the north and as play elements within the playground. There are large quantities of rubber surfaces used, both as shockproof surface for safety and as common play ground cover.

In addition to this there are vast areas of asphalt in the original plan. This is used between access point of gate and entrance, to facilitate driving on site like maintenance trucks and firetrucks, and as regular play ground surfaces. These surfaces are surrounded by curbstone in granite. There are vast use of cobblestone and mosaic stone, all granite, within the playgrounds as decorative and other marking purposes.

Both the façade of the building and other wooden decks are described as acetylated wood from the manufacturer Accoya. This product has achieved a Cradle to Cradle product certificate in gold, so it is 100% safe and biodegradable (Accoya, 2015). Other wood elements are in the same category.

Some of the grass areas are supposed to be reinforced with rubber mats, delivered from Elverdal.

Figure 19: Original plan of the new Kløftahallen kindergarden

Sandbox

Energy crop of Salix

Gravel

Rubber surface

New vegetation

Grass surface

Entrance gate

1. *The current site*
2. *Walkway between the site and the elementary school*
3. *Surrounding farmland*
4. *Wooded area in the north east corner of the site*
5. *View of the sports hall from the east*
6. *View from the site to the north*
7. *The sports hall*

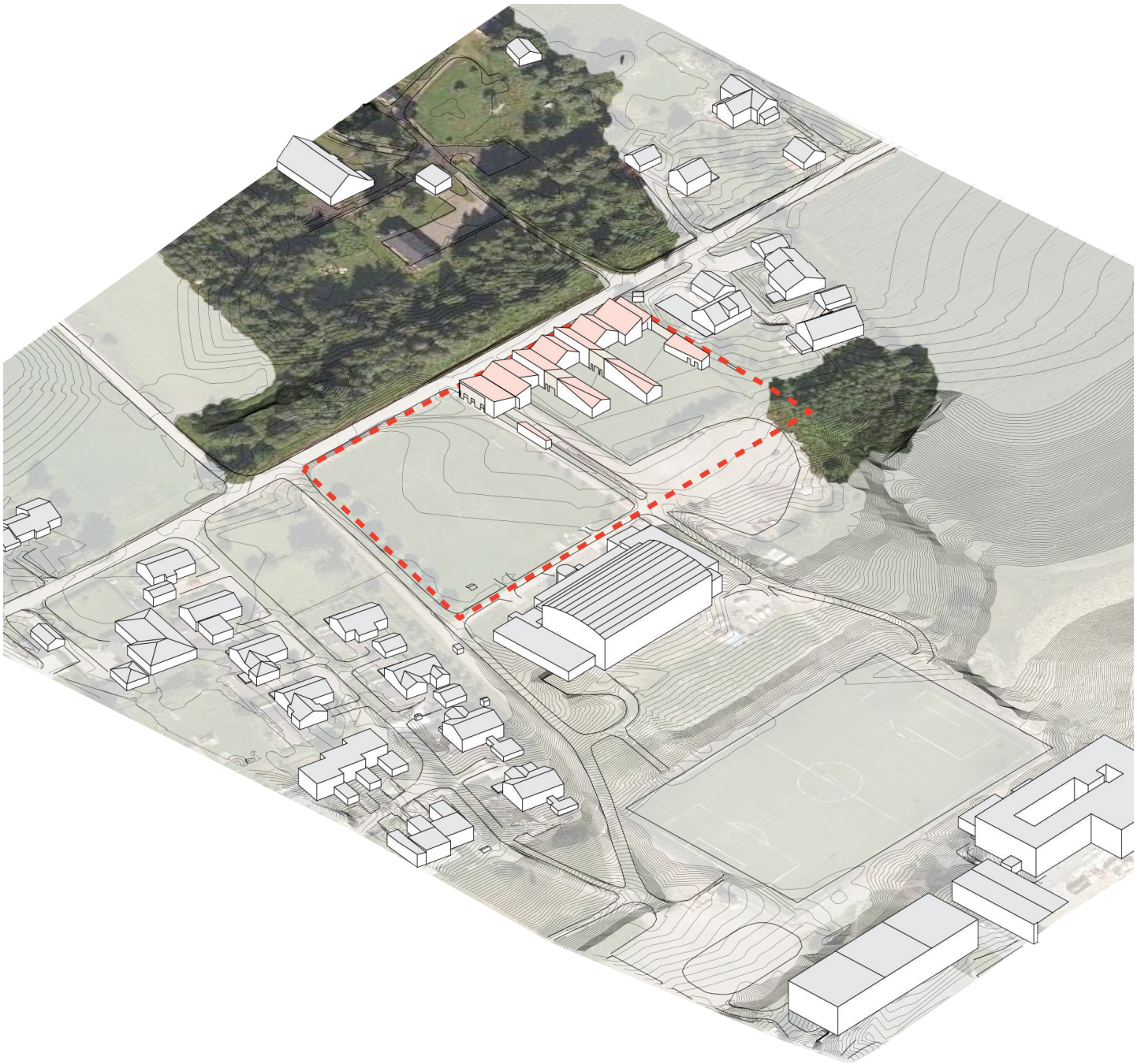


Figure 20: The site

The playground equipment that is described is from several different suppliers, Norwegian, Danish and German. Some of the equipment is new versions of what today already exist on the site, and something is completely new.

ENERGY
There are plans for snow melting systems and areas for storage of snow during the winter and spring months. The snow melting system is heating cables under the asphalt from the gates to the main entrances, but not elsewhere on the site.

The outdoor lighting is planned to consist of six lighting poles, 6.5 meters high, with four spots on each in addition to CCTV surveillance, and wiring to this.

BIODIVERSITY
The landscape part of the plans contains topics of vegetation, stating that the kindergarden will use current and new vegetation, which is supposed to be diverse, with an educational aspect, and with an array of edible species.

The plan for the vegetation has an overall objective of introducing colors, forms, and flowering, non-toxic and non-allergenic. The planned conservation of existing trees concerns ten trees. The original description of the project tells us that the protection zone of the trunks is two meters, and that the rote zone is to be cut and not torn. In addition, there is a specific fine for hurting some of these trees, of 50.000kr each.

The crop of basket willow (Salix viminalis) is defined as an 'energy crop'. This implies that the plants are put close together and cut heavily each year.

AIR
There is no description on the air situation in the project.

WATER
The issue of drainage and water treatment is relevant for this site. The ground consists mostly of packed clay, and the drainage is rather slow. Water from the roof and other surfaces is on the new landscape plan diverted to the closed underground attenuation basin before lead into the municipal water system.

SOCIAL
There is a thematic division of the playgrounds, in age classes and themes as forest, farm, and play garden, containing equipment that understates these themes.

The site of the kindergarden is planned with fences and gates in galvanized steel encircling the grounds. The fencing is not following the border of the site, and the area of the noise barrier is left out.

In the following pages of this part I will asses the original plan from the landscape architect, and make some conclusions on what is within the scope of the handbook and what might be added or taken out. The first pages are some general text on this assessment, followed by a matrix where I go through all the aspects from the handbook and comment on existing features and additional ones. In the matrix I will not consider the first category of Process, since I would then have to plan and perform the strategies in that category. That is not within the reach of this theses. It is also important to state that this part is not a full design project. It is merely a presentation of existing plans.

The main difference between the conventional and the alternative plan is the notion of open, future oriented plan, on the contrary of the rather closed and predefined plan. Inspired by the kindergarden plans from Ronneby, the Backsippans förskola and the theoretical case of Hulta förskola, the idea of the evolving outdoor environment is an important aspect of Cradle to Cradle. The evolving outdoor is both social and environmental sustainable.

The opportunity for the children to form and create their own play environment should be considered more strongly. To achieve the evolving outdoor environment one can create a mosaic of smaller areas. This creates an area where the children are on level with the surroundings and where they can fully involve them self in the surroundings. Early on in the process one should perform an on-site mapping on a small scale, to discover the smallest nooks and crannies of the site. This would secure places that would be ignored otherwise. This helps to distinguish what features might be interesting for play, mastering and children incentive. One can say that we should use the ten centimeters contour lines rather than the meter contour lines. It would seem that even thought there were some participation and workshops early on in the design process, more extensive focus on this during the whole design process could provide better solutions for the children.

PARTICIPATION

The scale is important to consider when planning for children. The playground equipment and the mass plantings should be on the level of the children. It is often the case that vegetation

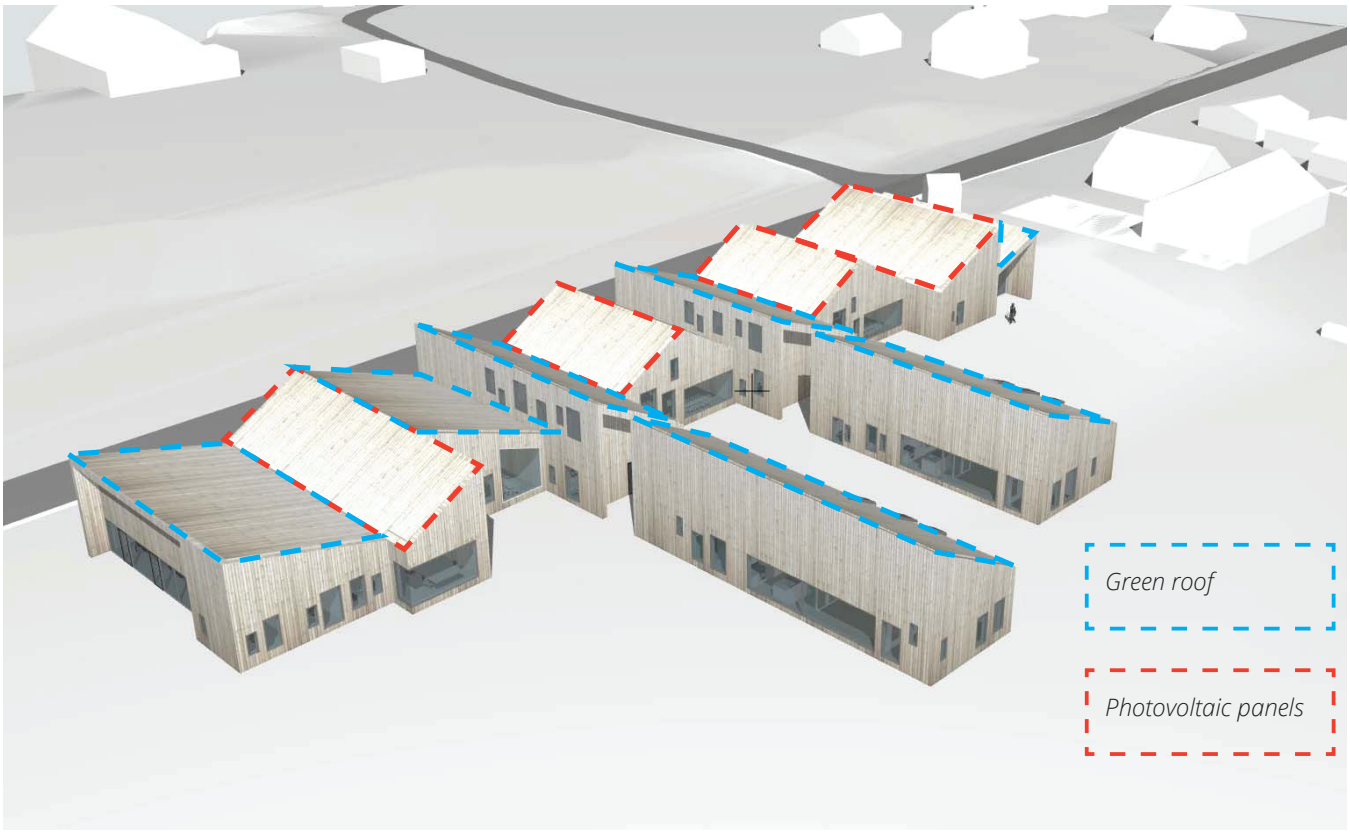


Figure 21: The original architects drawing, with applied alternative functions

is planned to be transparent so that the employees and the parents without effort can keep an eye on the children and control their activities. This is in conflict with the need of the children to have small intimate spaces that they control.

There should be a cascade of opportunities for play, both spatial and functional. If trees and other vegetation always are kept with a high trunk with few branches near the ground, few areas with extensive shrubs and bushes, these 'secondary' innovated places to play and stay are never made.

Children should be involved in the path making. Where does the kids walk, which nodes is important to connect and what stretches is not necessary to connect? Then spread the gravel on the ground where you find appropriate, with help of the children. Let them 'construct' their own ways. These paths might not be uniform in measures, it might change in width and might not appear 'logical' to everyone. The major walkways, like the one from the gate to the main entrance should be made properly, considering the soil conditions. Here the top layer of clay must be dug out, to get some more stability.

VEGETATION
The use of the existing vegetation could be prioritized in a larger extent. There are some trees on the site that is preserved, but I think that several more trees could be spared. There are a whole stretch of birch trees that is cut in the original plan. They could be implemented in the plan, because they are located on the site where there is outdoor play area. Those trees that comes in conflict with the building, in this case there is three trees that is removed to give way to the building. Another tree is taken out to give way to the loading area on the west side of the site, next to the main road. This loading area could be moved a bit further north, to spare the tree.

To spare existing vegetation is in many ways better than introducing new. The factors of height, canopy size and cover are important for the spatial function of the vegetation; how they create rooms. The positive side by introducing new vegetation is that one can use vast array of different species, cultivars and seed sources to make the site more resistant to pest and diseases.

One could be more focused on more dynamic planting. Meaning that in can fill the matrix with vegetation and then let some spots 'fall out'. This will show where the most used areas are, what stretches are used, and what plants that will be removed over time. It will also give more robust vegetation, when there is room for individual trees to die without losing the design or function.

The topic of water treatment should be implemented in the project, not just for the sake of efficient waste water transportation, but also for the recreational and educational

Wooded area to the north east of the site

Existing row of trees, removed in the original plan

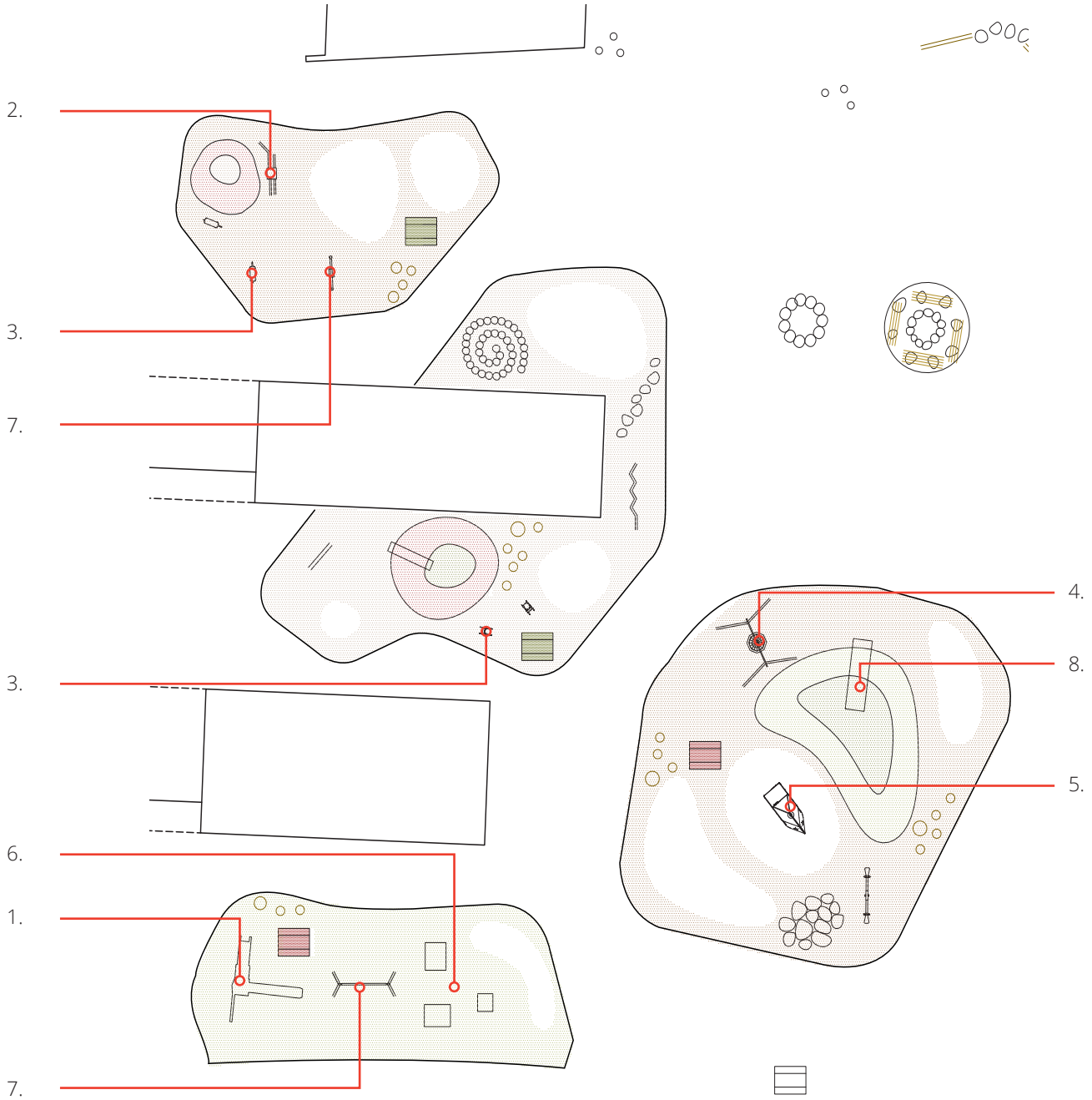


Figure 23: Surface covers and play ground equipment

purposes. Considering the soil situation the rainwater will precipitate slowly through the ground, so the opportunity of creating a dam of some sort would be possible.

The idea of the closed cycles within Cradle to Cradle is a premise of not removing material from the site. Tree cuttings, leaves and cut grass should be held and used on site. This could be used as compost and growth medium, or just piling up to be used as living environment for different flora and fauna.

There are some edible pants used in the original plan, like apple trees, two plum trees, three red currant bushes, two red currant bushes, four black current, and two gooseberry. There should be reserved some area to more extensive crop production, like vegetables, and more fruits and berries.

The vegetated area across the main road to the west should be implemented in the plans and used by the children and staff. The alternative plan on is an example on some changes that would be done if the handbook was used in the planning process. It is not a detailed plan and not all aspects from the comparison is included.









Figure 24:
Existing equipment


1.


2.


3.


4.


5.


6.

7.


8.


9.

Figure 25:
Planned equipment

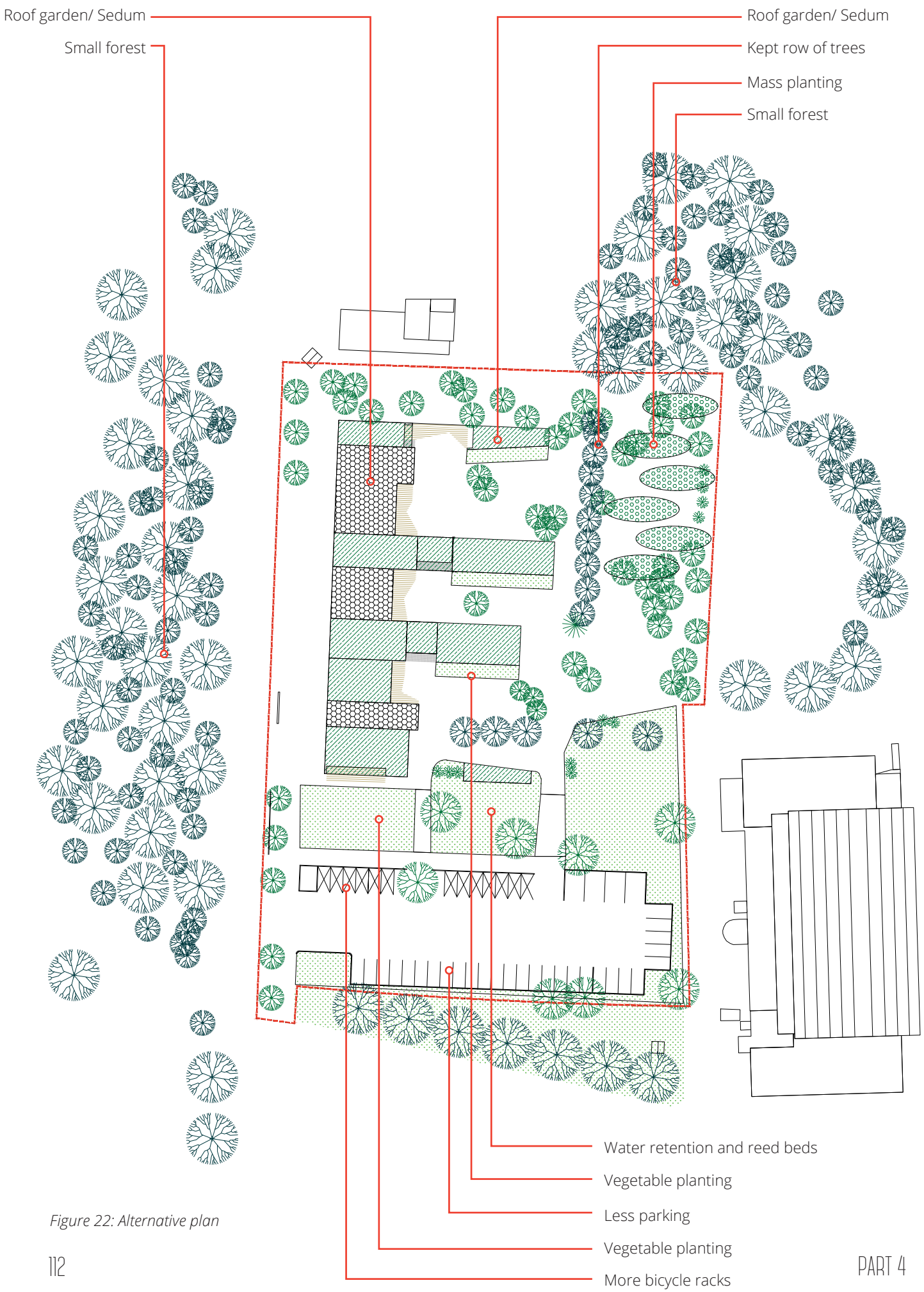


Figure 22: Alternative plan

The play ground equipment in the original plan and the existing equipment on site is almost the same, so in the alternative plan the existing equipment is salvaged and implemented in the plan, but the exact placement is note set.


1.


2.


3.

1. *Wooded area to the west of the site*
2. *Different density of trees in the forest*
3. *The wooded area seen from the sports hall*
4. *The wooded area seen from the south*
5. *A dirt road leading past the wooded area*


4.


5.

MATERIALS

NEW MATERIALS	ELIMINATE THE USE OF WOOD FROM THREATENED TREE SPECIES	• The supplier described in the plan has a policy of sustainable forestry, and is certified by Forest Stewardship Council (FSC) and Program for the Endorsement of Forest Certification (PEFC), in addition of holding a Cradle to Cradle certificate in gold.
	INCREASE KNOWLEDGE OF MATERIALS	
	USE REGIONAL MATERIALS	• The described supplier of gravel: is Fjelltun Sandtak, located 230 km from the site.
	SUPPORT RESPONSIBLE EXTRACTION OF RAW MATERIALS	• All products must be produced under ethically satisfactory conditions
	SUPPORT TRANSPARENCY AND SAFER CHEMISTRY	• Described that no hazardous substances are to be used
	SUPPORT SUSTAINABILITY IN MATERIALS MANUFACTURING	• The use of stone, steel and wood should be environmentally labeled if possible, that no materials from vulnerable extraction is to be used, and that wood should be from sustainable forestry.
	SUPPORT SUSTAINABILITY IN PLANT PRODUCTION	
REUSE MATERIALS	MAINTAIN ON-SITE STRUCTURES AND PAVING	
	REUSE SALVAGED MATERIALS AND PLANTS	• There are several trees in the original plan that is taken out. The birch trees are taken out considering the allergenic effect.

ADDITIONS FROM THE HANDBOOK	NOT APPLICABLE WITH CRADLE TO CRADLE
• Strategies used should include: Material passport Life cycle assessment (LCA) Environmental product declaration (EPD).	
• Gravel: there is one manufacturer 10 km away, within the same municipality. • Plants: a plant nursery (Sven Myrvold AS Planteskole og Hagesenter) 10 km away. • A place providing soil and compost (Herremyr gård) 17 km away. • Granite: Jogra in Skjeberg, 115 km away	• Should not be using imported stone, from for example China or India.
• Should only hire suppliers that have open and available information of where their resources originate from and how they are extracted.	
• Relates to knowledge of materials. (see above) • Suppliers should make an inventory list of all chemicals and materials used in their product.	• The use of rubber cover is something that should be reconsidered when planning inspired by Cradle to Cradle, considering the chemicals and contents.
• Suppliers that have policies regarding waste reduction, air and water treatment, reducing greenhouse gas emissions, energy consumption and water consumption, and focus on renewable energy sources, should be prioritized.	• The making, transportation, and laying of asphalt is rather energy consuming, as well as the static and predefined play area it makes.
• Use locally grown E-plant • Producers that advocate energy, water and waste reducing, that have a publically sustainability statement, and use an integrated pest management plan.	
• Figuring the possibility of leaving some of the grass surfaces un touched, instead of laying new grass. • Other structures that should be maintained is the current playground equipment and tool sheds.	• As the plan appears today nothing is reused.
• Some of the trees should be taken up, and reinstalled in the new kindergarden, at least the willow and whitebeam.	• Nothing of the plant material is leaving the site.

REUSE MATERIALS (CONT.)	USE RECYCLED CONTENT MATERIALS	• The issue of balancing the cut and fills of the grounds is considered, but only roughly. This might be reconsidered to be a prerequisite; that no material leaves the site.
DESIGN FOR DISASSEMBLY	DESIGN FOR ADAPTABILITY AND DISASSEMBLY	
	PROVIDE FOR STORAGE AND COLLECTION OF RECYCLABLES	• This issue is addressed in the original plan and meets the demand on site.
ENERGY		
REDUCE CONSUMPTION	USE RENEWABLE SOURCES FOR LANDSCAPE ELECTRICITY NEEDS	• Some of the lightning and heating features are within the scope of Cradle to Cradle, like Inclusiveness and Social connection.
PRODUCE RENEWABLE ENERGY	REDUCE OUTDOOR ENERGY CONSUMPTION	
ENERGY FUNCTIONS	REDUCE URBAN HEAT ISLAND EFFECTS	
	REDUCE LIGHT POLLUTION	

ADDITIONS FROM THE HANDBOOK	NOT APPLICABLE WITH CRADLE TO CRADLE
• The design team should describe materials from manufacturers that has a high level of recycled and reused materials. This is applicable for the asphalt, the gravel and the rubber surfaces. The gravel situated on-site today should be reused. Further the soil from the grass areas should be relocated and used on site. • Structures on site are the playground equipment, fences, wood decks, benches and tables. These elements should from the manufacturers and suppliers' side be designed for disassembly and a policy of adaptation of new solutions should be implemented. The lighting solutions should also be adaptable for changes and modifications. • The issue of composting degradable materials should also be considered here.	
• The energy for the outdoor lighting and the areas of snow melting systems should come from renewable sources, preferably on site. • Solar panels should be installed on the roofs of the building and the south facing facades, to supply the light and heating. • Geothermal heating could also be used for the snow melting systems. • The energy consumption for the lighting should be reduced by reducing the number of spots and the effect of them, and by installing motion sensors for the lights. • The snow melting system should be used at a minimum; as only the area from the gate to the main entrance. • There should be more green surfaces and the roof of the buildings should either be vegetation or photovoltaic panels. • As this is a good intention, the site of the kindergarden in its surroundings is not the most critical spot for the heat island effect.	• The extent of the lighting, heating and surveillance systems are too much.
• The issue of light pollution to the atmosphere should be addressed on every site possible. I consider the extensive lighting for the original plan to be too excessive. The light posts should be shorter, with fewer spots, and should be installed with a movement sensor during closing hour, to reduce the of-site glare.	• The lighting of the site will create too much light pollution.

BIODIVERSITY

SOIL AND LANDSCAPE INTERVENTION	CREATE AND COMMUNICATE A SOIL MANAGEMENT PLAN	
	CONSERVE HEALTHY SOILS AND APPROPRIATE VEGETATION	
	LIMIT DEVELOPMENT ON FARMLAND	• This does not apply. There are farm land surrounding the site, but nothing of this is affected by this development.
	PROTECT FLOODPLAIN FUNCTIONS	• There are no floodplains on site.
SPECIES AND HABITAT	CONTROL AND MANAGE INVASIVE PLANTS	
	USE APPROPRIATE PLANTS	• All the species on the list from the original plan meets these criteria. • The presence of allergenic plants is an issue of opposing interests of social and environmental aspects. The birch trees are taken out in the original plan
	CONSERVE AND USE NATIVE PLANTS	
	CONSERVE HABITATS FOR THREATENED AND ENDANGERED SPECIES	• There are no red list species is close proximity of the site.
	CONSERVE SPECIAL STATUS VEGETATION	• Should involve arborist, but as far as I can tell there is no special status vegetation on or close to the site.

ADDITIONS FROM THE HANDBOOK	NOT APPLICABLE WITH CRADLE TO CRADLE
• Parts of the site that is east of the planned building should be untouched. • Both the grass cover and the soil should be maintained as it is today. • Fencing of the areas needs to be planned and complied with. • Rote zone around trees should be left uncompressed for a minimum of two meters from the trunk.	
• Topsoil from the area for the building should be removed and reused on site.	
• The presence of invasive species in the area need to be mapped and controlled so that the maintenance department and the employees in the kindergarden know what to be alert on. • In addition to control the species brought on site.	
• Use plants that are of close locality and climatic appropriate, E-plant certified and supports biodiversity. • Need to have an educational intention and be robust.	
• The design team should hire an arborist or biologist to assess properly the native species. . The trees surrounding the site are for the most part Salix, birch, pine and spruce, which is some of the species chosen in the original plan.	

	CONSERVE AND RESTORE NATIVE PLANT COMMUNITIES	• See Conserve special status vegetation (p.118).
VEGETATION	OPTIMIZE BIOMASS	• The crop of basket willow (Salix viminalis) is defined as an 'energy crop'. This implies that the plants are put close together and cut heavily each year. This is within the scope of Cradle to Cradle design of dynamic and successive planting.
	RECYCLE ORGANIC MATTER	
LIMIT PESTICIDES AND CHEMICALS	MINIMIZE PESTICIDE USE	
	MINIMIZE FERTILIZER USE	
AIR		
AIR QUALITY	PROTECT AIR QUALITY DURING CONSTRUCTION	
	PROTECT AIR QUALITY DURING LANDSCAPE MAINTENANCE	

ADDITIONS FROM THE HANDBOOK	NOT APPLICABLE WITH CRADLE TO CRADLE
• Measure the BDI (biomass density index) before the development and the planned outcome. • The BDI should be higher after the development. • Use the Norwegian manual to calculate 'bluegreen factor' (BGF). (Stange, Clavier et al, 2014)	
• All excess vegetation trimmings, like branches, grass, leafs and other tree parts should be used in composting on site. This in addition to food wastes from the kindergarden, and preferably from neighboring facilities. • This compost should be used as nutrients for the existing vegetation.	
• Considering the function of a kindergarden, there should be no pesticide in use. • The plant species chosen should be of locality and function so that no pesticide is needed. • A variety of species will create a more robust natural environment. • There should be focus on supervision and mechanical control methods, so that the future need of pesticides doesn't emerge.	
• Once the plants are established, the application of slow-releasing organic fertilizer can be used. • The soil used for new vegetation should be nutrient rich so that the use of compost in the future will be sufficient.	
• Hire contractors that have a policy of reducing air pollution during construction. • Encourage used of electrical equipment, and be conscious on idling time of machinery and fuel driven power generators.	
• The equipment needed should be electrical, or even by hand power. • Some of the maintenance could be performed by the staff and some of the children together, like cutting hedges and branches, gathering leaf and cut grass. • If there is a need to perform heavier maintenance surrounding the kindergarden, this should be outside opening hours.	

WATER

PRECIPITATION	MANAGE PRECIPITATION ON SITE	• The underground water retention basin could be installed as a backup solution.
REDUCE WATER CONSUMPTION	REDUCE OUTDOOR WATER USE AND LANDSCAPE IRRIGATION	
WATER AS SOCIAL RESOURCE	DESIGN FUNCTIONAL STORMWATER FEATURES AS AMENITIES	
AQUATIC ECOSYSTEMS	CONSERVE AQUATIC ECOSYSTEMS	• Does not apply.
	RESTORE AQUATIC ECOSYSTEMS	• Does not apply.

SOCIAL

COMMUNITY	PROTECT AND MAINTAIN CULTURAL AND HISTORIC PLACES	
	SUPPORT SOCIAL CONNECTION	

ADDITIONS FROM THE HANDBOOK	NOT APPLICABLE WITH CRADLE TO CRADLE
• The rainwater gathered on site should be treated on site. • A raingarden with reef beds should be installed, to retain rainwater and to be used as an educational source. • Some areas within the playground should be used for this measure, but should not be designed so that it makes a hazard for children. • Outside the playground area, adjacent to the kindergarden and the parking areas could have more extensive reef beds and retention basins.	
• There should be no need for extra watering for the landscape and new trees and plants, in the long run. • During the establishing phase watering should be done by using gathered rainwater or treated graywater.	
• The plants and vegetation used and the design should be aesthetically pleasing and functional as play area, in addition to serve as a water treatment facility. • Use plants that gives a wide range of features, from color, flowering and seasonal changes.	
• This neighboring site is today sold out and plans are made to develop it into housing, while some of the buildings are protected. This neighboring site should be utilized as educational resource both for its natural environment, with forest and farm land, and as historic site.	
• There should be facilitated for stay and recreation outside the kindergarden next to the sports hall. Providing seating, roofing, bicycle parking and other amenities related to bikes, like pumps, and tools. • There should be a natural place to stay during a walk for the whole community, not just those using the kindergarden or the sports hall.	

PARTICIPATION	PROMOTE EQUITABLE SITE USE	
	ENGAGE USERS AND STAKEHOLDERS	• There has been some workshops in the initial stages of the planning process.
	PROMOTE SUSTAINABILITY AWARENESS AND EDUCATION	
INCLUSIVE ENVIRONMENT	PROVIDE OPTIMUM SITE ACCESSIBILITY, SAFETY, AND WAYFINDING	• The presence of allergenic plants is an issue of opposing interests of social and environmental aspects. • The original plan take measures to remove allergenic trees.
	SUPPORT MENTAL RESTORATION	
	SUPPORT PHYSICAL ACTIVITY	• All the elements of the original plan support physical activity for children. Both path for cycling, running, balancing, and other gross motor skills, to more fine motor skills like sandboxes, berry bushes and areas to do handwork close to the building.
	MINIMIZE EXPOSURE TO ENVIRONMENTAL TOBACCO SMOKE	

- What kind of activities outside of the kindergarden is possible and wished for? This could be different places to use as excursions goals.
- The children themselves and their parents.
- There should be held more extensive workshops prior to the design stage, to engage the local community to identify wishes for the development of the outdoor grounds.
- During the early phases of use, parents and employees of the kindergarden should be allowed to use workshops to change elements of the playgrounds.
- The strategies implemented into the project should be communicated to the users of the kindergarden and the nearby sports hall by signs, maps and through local media.
- Not the most critical site to support accessibility and safety.
- The playground should be visible from several sides, from the houses to the south and north and the sports hall to the east.
- The use of vegetation should not be so dense that it creates too many spots without visible lines to adjacent sites.
- It is important to create areas for different function and expression. Areas with different types of vegetation and cover, and the use of water as a recreational element is a valuable tool.
- The size of the different rooms as well as roofing of some sort is important to feel the grade of enclosure and safety.
- The whole site should have a non-smoke policy, communicated through signage.

SOCIAL INFRASTRUCTURE	PROVIDE ON-SITE FOOD PRODUCTION	• There are some berry bushes in the original plan.
	ENCOURAGE FUEL EFFICIENT AND MULTI-MODAL TRANSPORTATION	• There are some bicycle parkings on site.
ECONOMIC		
LOCAL ECONOMY	SUPPORT LOCAL ECONOMY	

ADDITIONS FROM THE HANDBOOK	NOT APPLICABLE WITH CRADLE TO CRADLE
• A part of the outside ground should be assigned for food production. This crops don't have to make a substantial contribution to the food consumed in the kindergarden, but the main focus should be on the educational function of the production. • The staff should, with help of some of the children at the time, maintain and cultivate the small garden, using compost and rainwater from the site. • The food garden should be fenced in so that the children need to be in company with an adult to enter.	
• There should be a reduction in the number of car parking. • some charging stations for electric cars should be installed. • More bike spots should be added, in addition to point Support social connection (p.122). • The bus stop that today is some hundred meters south of the site should be moved closer to the site.	• Too many parking spaces.
• During the construction phase the majority of the materials and services used should be local.	

PART 5: CONCLUSION

CONCLUSION

During the work of this thesis I have gotten some idea of what sustainable landscape design might be and how to achieve it. By going into the different certification methods of sustainable building practices, I have seen how sustainability is measured, in Norway through BREEAM, and equivalent methods from the US, in LEED and SITES. Assessing sustainability is difficult, and the issue of deciding what to assess and what not, is an everlasting debate. I see the value and applicability of making and implementing certification methods, but I also see the limitations and rigidness in this approach.

I think it is difficult to use certifications as a project specific approach, and the conclusion on this thesis is that it is more useful and wanted, to present an inspirational handbook.

From the research question *"Can we achieve more sustainable landscape projects by implementing the Cradle to Cradle theory? "* I have come to the conclusion that 'yes', we can, but I don't think that every single project will become sustainable by solely using this handbook. It is a single step.

On the other hand, this handbook is not 100 % Cradle to Cradle, it is a Cradle to Cradle inspired manual. But by using this handbook one will get some insight in what Cradle to Cradle is about, and to implement some of the tools from that.

Some of the topics mentioned within different certification methods, in Cradle to Cradle, and in the sustainability debate in general, can't be measured with a check list from on day to the next. The topics of biodiversity, ecosystem services, water quality, temporary planning, and participation is dynamic elements, where the time aspect is important. I think it is valuable to move some of the time, resources and focus from the design and construction of a project, and spend more on the operation, use and maintenance of it. If we can focus more on optimization over time, and less on the as-built drawing, the future might become more sustainable.

Considering the objectives, I set my self for this master thesis I think I have come to some kind of conclusion on them. *"What does 'sustainability' entail in terms of landscape architecture?"* is

difficult to answer, since it follows from the difficulty of defining what 'sustainability' is. As the survey showed there are many notions and attitudes towards this term within the landscape architecture profession in Norway. I think that the major role of the landscape architect in the debate or sustainability, is the role of facilitator; that from the early phases set the stage of sustainable intentions.

The objective *"How can the Cradle to Cradle theory be used by landscape architects in Norway?"* is best answered as a cooperational method. I think the use is for landscape architects and other members of a design team to use together. All members of the team must be in with the idea and the intentions for the project to achieve the goals.

The third objective: *"Does landscape architecture need a sustainability certification?"* I think is best answered as no; it is not needed. There are other disciplines where certifying the projects are important to reach a sustainability goal. Landscape architecture is in itself rather environmentally friendly, despite the opportunity landscape architects have to facilitate unsustainable development. This conclusion also follows by the survey result.

REFLECTION

"Water, soil, and the earth's green mantle of plants make up the world that supports the animal life of the earth. Although modern man seldom remembers the fact, he could not exist without the plants that harness the sun's energy and manufacture the basic foodstuffs he depends upon for life. Our attitude towards plants is a singularly narrow one."

These are the words of Rachel Carson in her classic book 'Silent Spring' from 1962. There is a general agreement that this book was the first to point at the environmental issues that the human species was inflicting on the earth. Some fifty years later, we have come some way further since then. The use of DDT is no longer happening, and we agree on that there is some benefit from biodiversity. Yet we have a long way to go before we as a species and nature will live together in harmony.

Through this thesis I have given my contribution to the debate and perhaps created something useful for landscape architects who wishes to pursue the Cradle to Cradle idea.

After working with this thesis for six months, and thinking about it for close to two years, I have changed my mind a number of times. What started as an idea of creating a certification method for Cradle to Cradle in landscape architecture, became something less defined. The process went through aiming for a Cradle to Cradle certification, to trying to find the best landscape architecture certification, to trying to make Cradle to Cradle into something more defined. My product of the Cradle to Cradle inspired handbook for sustainable landscape architecture might be somewhat long and diffuse title, but might be just what is needed. Based on the feedback I got in the survey to Norwegian landscape architects, I got the impression that an easy-to-read, inspirational handbook was what was needed; rather than a rigid certification method. Further I got the impression that the certification approach to sustainability, was something that the majority saw as useful, but something one would rather not be involved with.

The approach of making a theoretical handbook, based mostly on written material, has been challenging. The project chosen as case study to test the handbook, was equally challenging, considering the phase of the project with it's lack of detailing. I think it would be easier to assess a built project; to spot differences and "wrongs". On the other hand, the phase of the project used, might be the correct one to implement some of the suggestion in this thesis.

I hope that this thesis and the handbook presented in it will come in useful for landscape architects today and in the future, to remember some topics that should never be neglected.

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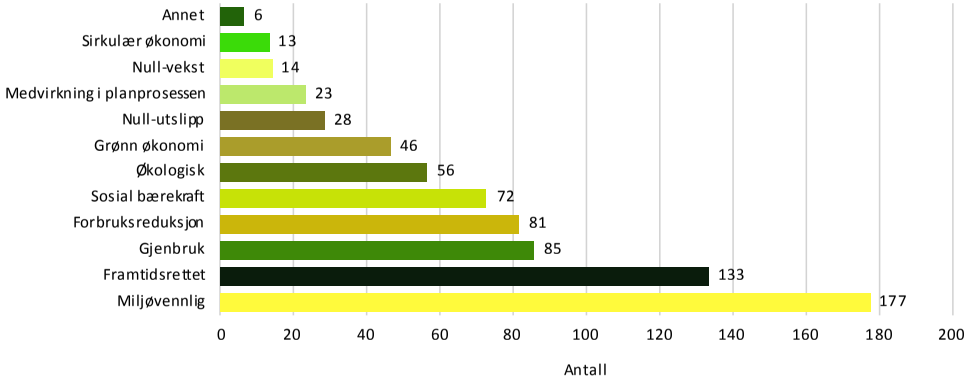
Spørreundersøkelse om bærekraft i landskapsarkitektur

1. Hvilke begreper synes du er viktigst innenfor "bærekraftig"? (maks tre kryss)

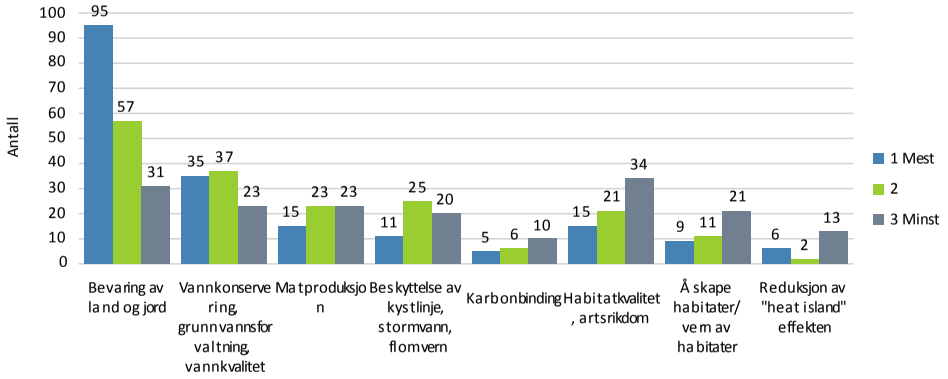
Første del: Bærekraft.
I den første delen lurer jeg på din egen oppfatning ved begreper som bærekraft, miljøvennlig, økologisk o.l.



Navn	Antall
Annet	6
Sirkulær økonomi	13
Null-vekst	14
Medvirkning i planprosessen	23
Null-utslipp	28
Grønn økonomi	46
Økologisk	56
Sosial bærekraft	72
Forbruksreduksjon	81
Gjenbruk	85
Framtidsrettet	133
Miljøvennlig	177
N	252

Spørreundersøkelse om bærekraft i landskapsarkitektur 03.10.2015 16:05

2. Hvor viktig anser du disse elementene for å være innen "bærekraftig" planlegging? (Kryss tre, rangert fra 1 til 3)

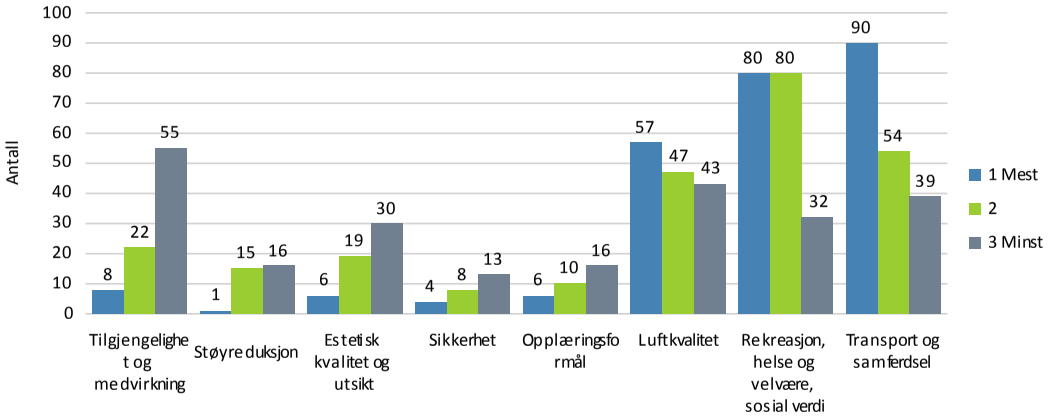


Spørsmål	N	Gjennomsnitt	Standardavvik	Median
Bevaring av land og jord	183	1,65	0,75	1,00
Vannkonservering, grunnvannsforvaltning, vannkvalitet	95	1,87	0,77	2,00
Matproduksjon	61	2,13	0,78	2,00
Beskyttelse av kystlinje, stormvann, flomvern	56	2,16	0,73	2,00
Karbonbinding	21	2,24	0,81	2,00
Habitatkvalitet, artsrikdom	70	2,27	0,79	2,00
Å skape habitater/ vern av habitater	41	2,29	0,80	3,00
Reduksjon av "heat island" effekten	21	2,33	0,89	3,00

	1 Mest	2	3 Minst	N
Bevaring av land og jord	95	57	31	183
Vannkonservering, grunnvannsforvaltning, vannkvalitet	35	37	23	95
Matproduksjon	15	23	23	61
Beskyttelse av kystlinje, stormvann, flomvern	11	25	20	56
Karbonbinding	5	6	10	21
Habitatkvalitet, artsrikdom	15	21	34	70
Å skape habitater/ vern av habitater	9	11	21	41
Reduksjon av "heat island" effekten	6	2	13	21

Navn	Antall
1 Mest	6
2	11
3 Minst	9
N	26

11. Hvor viktig anser du disse elementene for å være innen "bærekraftig" planlegging? (Kryss tre, rangert fra 1 til 3)

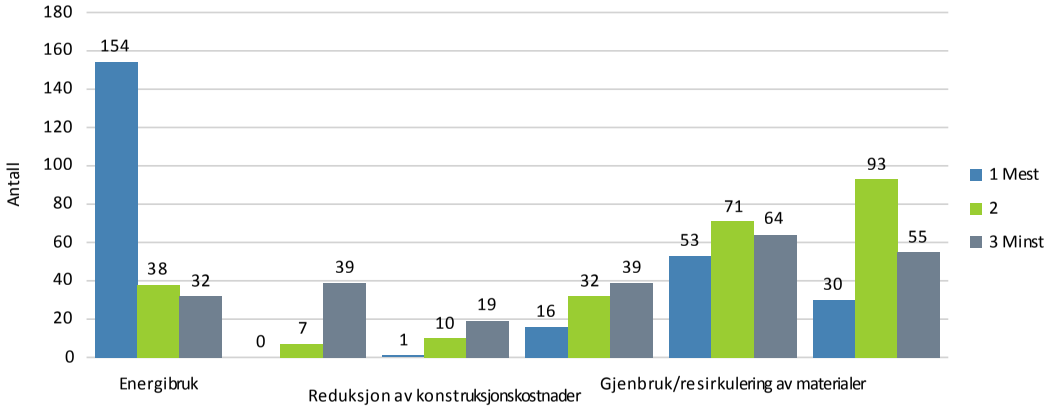


	1 Mest	2	3 Minst	N
Tilgjengelighet og medvirkning	8	22	55	85
Støyreduksjon	1	15	16	32
Estetisk kvalitet og utsikt	6	19	30	55
Sikkerhet	4	8	13	25
Opplæringsformål	6	10	16	32
Luftkvalitet	57	47	43	147
Rekreasjon, helse og velvære, sosial verdi	80	80	32	192
Transport og samferdsel	90	54	39	183

Spørreundersøkelse om bærekraft i landskapsarkitektur 03.10.2015 16:05

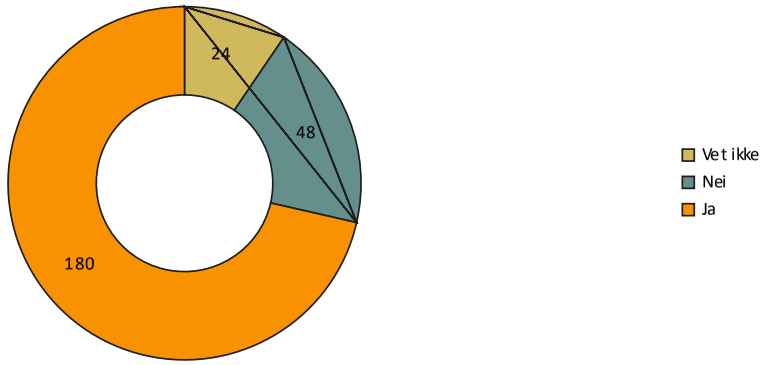
Navn	Antall
1 Mest	8
2	22
3 Minst	55
N	85

20. Hvor viktig anser du disse elementene for å være innen "bærekraftig" planlegging? (Kryss tre, rangert fra 1 til 3)



	1 Mest	2	3 Minst	N
Energibruk	154	38	32	224
Eiendomsverdi	0	7	39	46
Reduksjon av konstruksjonskostnader	1	10	19	30
Reduksjon av drift/vedlikeholdskostnader	16	32	39	87
Gjenbruk/resirkulering av materialer	53	71	64	188
Reduksjon av avfall	30	93	55	178

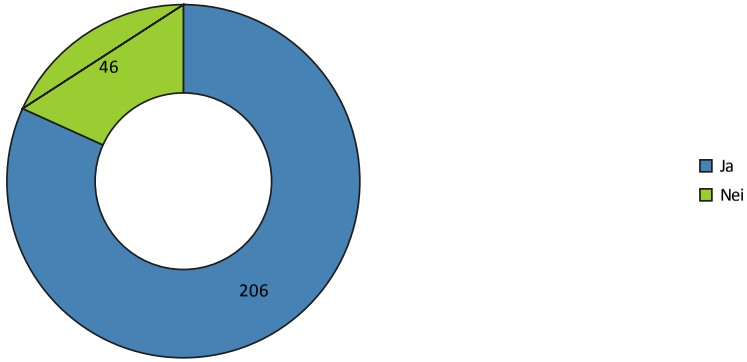
27. Har du i din profesjon jobbet med et eller flere prosjekter hvor "Bærekraftig" har vært med i beskrivelsen?



Navn	Antall
Vet ikke	24
Nei	48
Ja	180
N	252

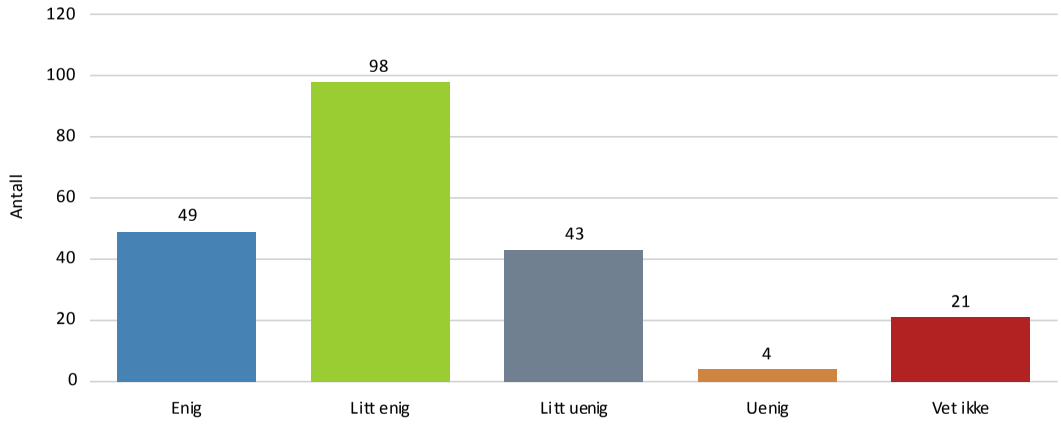
Spørreundersøkelse om bærekraft i landskapsarkitektur 03.10.2015 16:05

29. Har du noen gang diskutert med kolleger om hva Bærekraft betyr?



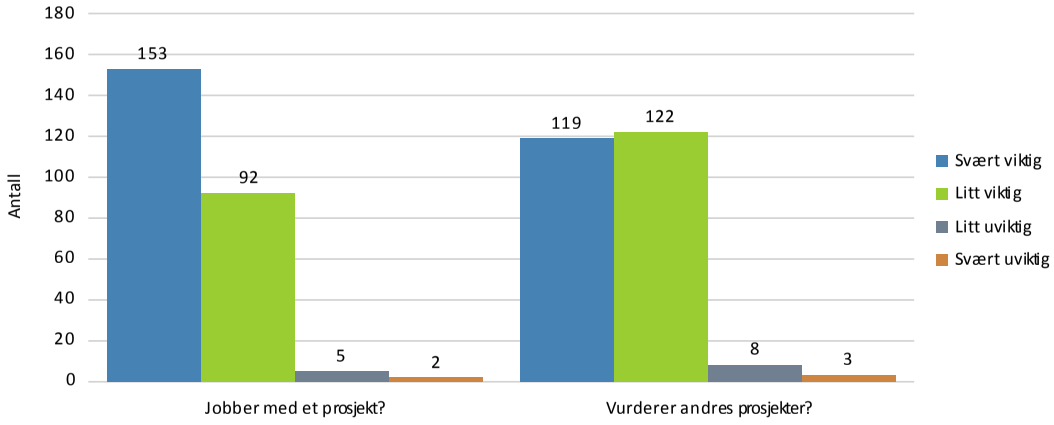
Navn	Antall
Ja	206
Nei	46
N	252

30. Hvis ja; hvor enig eller uenig vil du si dere er/var?



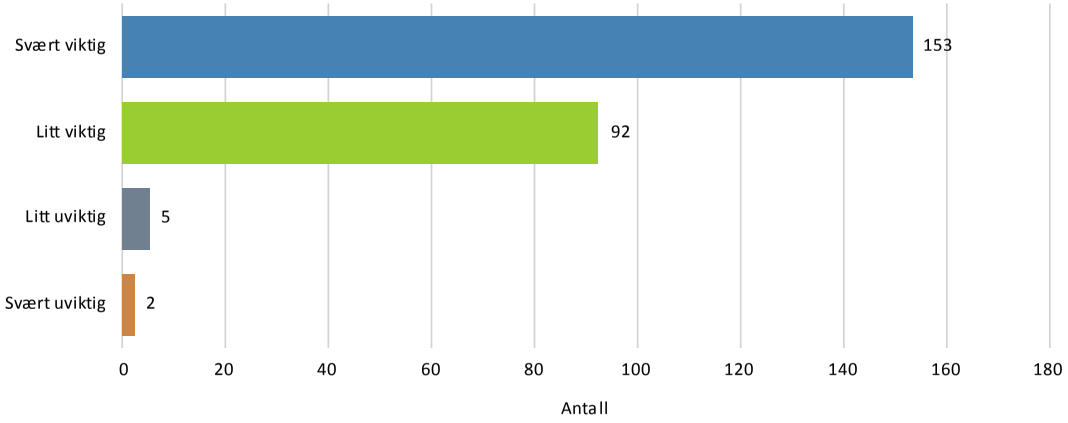
Navn	Antall
Enig	49
Litt enig	98
Litt uenig	43
Uenig	4
Vet ikke	21
N	215

31. Hvor viktig er bærekraftelementet for deg når du:



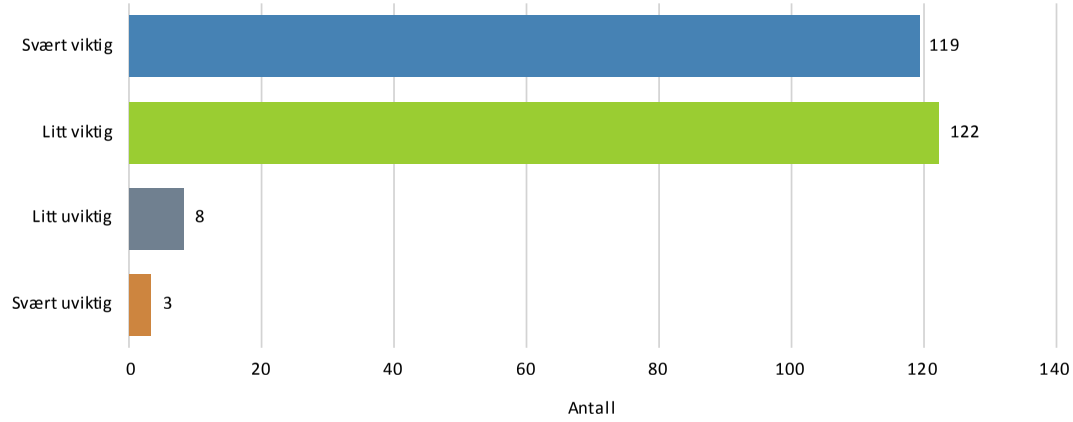
	Svært viktig	Litt viktig	Litt uviktig	Svært uviktig	N
Jobber med et prosjekt?	153	92	5	2	252
Vurderer andres prosjekter?	119	122	8	3	252

32. Jobber med et prosjekt?



Navn	Antall
Svært viktig	153
Litt viktig	92
Litt uviktig	5
Svært uviktig	2
N	252

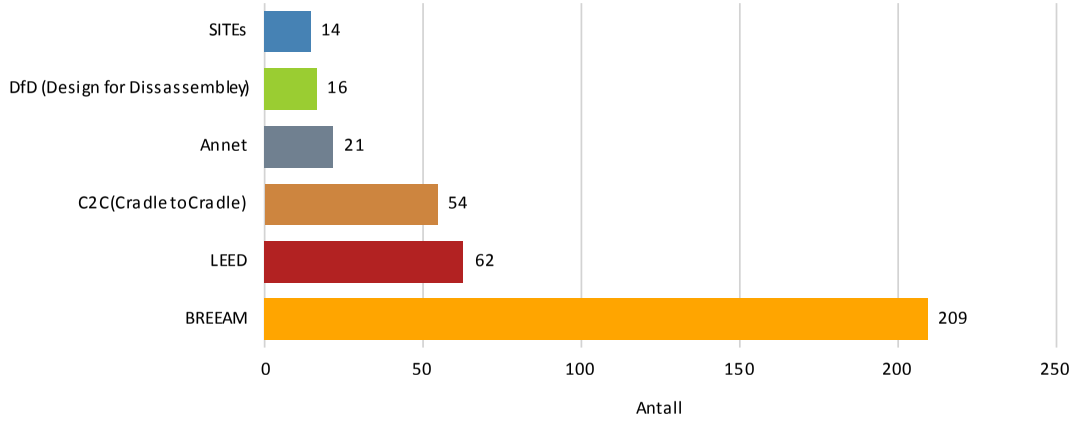
33. Vurderer andres prosjekter?



Navn	Antall
Svært viktig	119
Litt viktig	122
Litt uviktig	8
Svært uviktig	3
N	252

34. Har du hørt om noen av følgende teorier? (Kryss flere)

Del to: Sertifiseringer
I denne delen vil jeg stille noen spørsmål om din kjennskap og bruk av diverse sertifiseringsmetoder og teorier innenfor bærekraft.



Spørreundersøkelse om bærekraft i landskapsarkitektur 03.10.2015 16:05

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36. Har du hørt om Cradle to Cradle?

Del tre:Cradle to Cradle

Cradle to Cradle- design er en bærekraftteori, utviklet av William McDonough og Michael Braungart. Den går ut på at i stedet for at hovedfokuset innen bærekraft skal være på å redusere det som er skadelig for omgivelsene, bør vi fokusere på å øke det som kan ha positiv innvirkning på omgivelsene.

Waste equals food:

Alt tilhører en av to sykluser; den biologiske syklus eller den teknologiske syklus. Alt som kan brytes ned i naturen og som kan brukes som næringsstoff der er i den biologiske syklus, og alt som ikke kan brytes ned, men må behandles av oss mennesker er i den teknologiske syklusen. Dersom elementer fra disse to syklusene blandes, uten mulighet for å skille dem igjen, får man en farlig hybrid som i dag kastes/deponeres eller brennes.

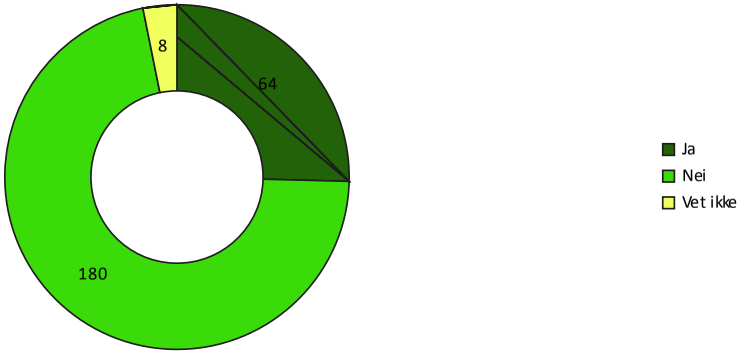
Celebrate diversity

Cradle to cradle søker også å tilrettelegge for mangfold, både når det kommer til arter, sosialt, politisk, innenmedvirkning,og innen systemer.

Renewable energy

Energikilder som skal brukes skal være fornybar, som vind, vann, sol, bioenergi etc.

(Link til Cradle to Cradle på Wikipedia.no https://en.wikipedia.org/wiki/Cradle-to-cradle_design)



Navn	Antall
Ja	64
Nei	180
Vet ikke	8
N	252

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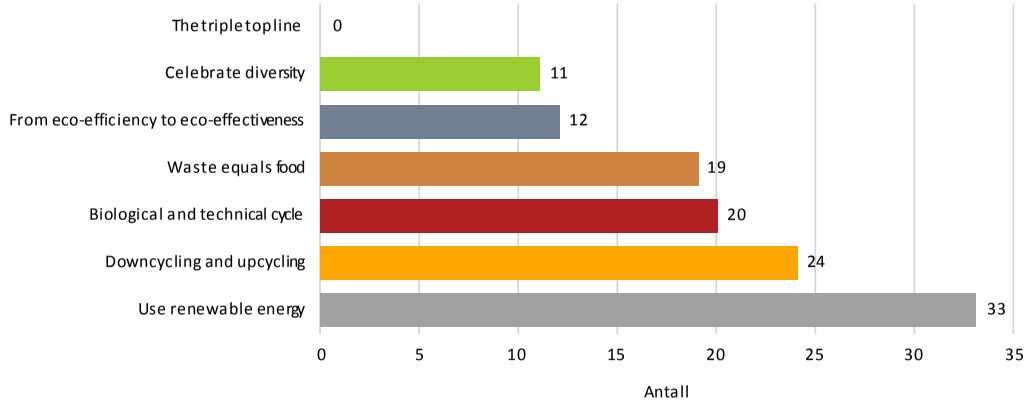
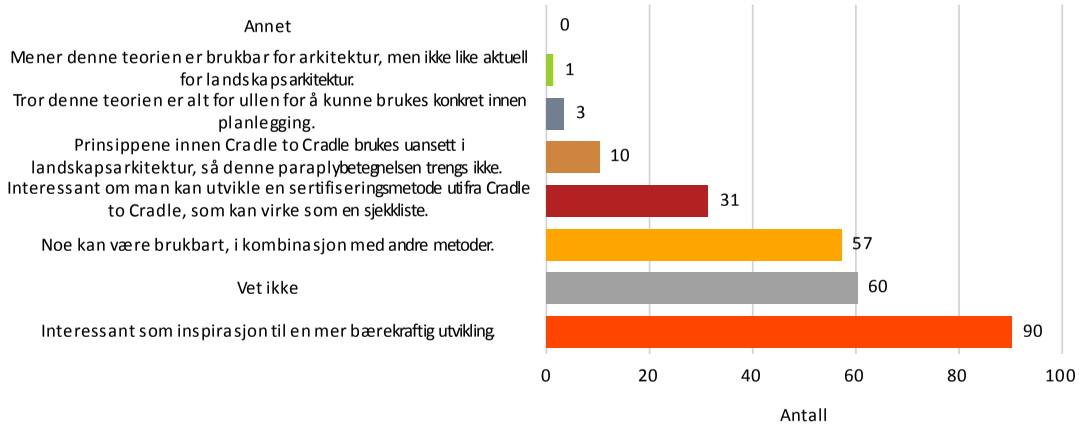
37. Hvilke av temaene under har du hørt om, i forbindelse med Cradle to Cradle? (Kryss flere)



Spørsmål	N	Gjennomsnitt	Standardavvik	Median
Hvilke av temaene under har du hørt om, i forbindelse med Cradle to Cradle? (Kryss flere)	48	3,97	2,10	3,00

Navn	Antall
The triple top line	0
Celebrate diversity	11
From eco-efficiency to eco-effectiveness	12
Waste equals food	19
Biological and technical cycle	20
Downcycling and upcycling	24
Use renewable energy	33
N	48

38. Tror du det er bruk for Cradle to Cradle-teorien i landskapsplanlegging i Norge i dag?



Navn	Antall
Annet	0
Mener denne teorien er brukbar for arkitektur, men ikke like aktuell for landskapsarkitektur.	1
Tror denne teorien er alt for ullen for å kunne brukes konkret innen planlegging.	3
Prinsippene innen Cradle to Cradle brukes uansett i landskapsarkitektur, så denne paraplybetegnelsen trengs ikke.	10
Interessant om man kan utvikle en sertifiseringsmetode utifra Cradle to Cradle, som kan virke som en sjekkliste.	31
Noe kan være brukbart, i kombinasjon med andre metoder.	57
Vet ikke	60
Interessant som inspirasjon til en mer bærekraftig utvikling.	90
N	252

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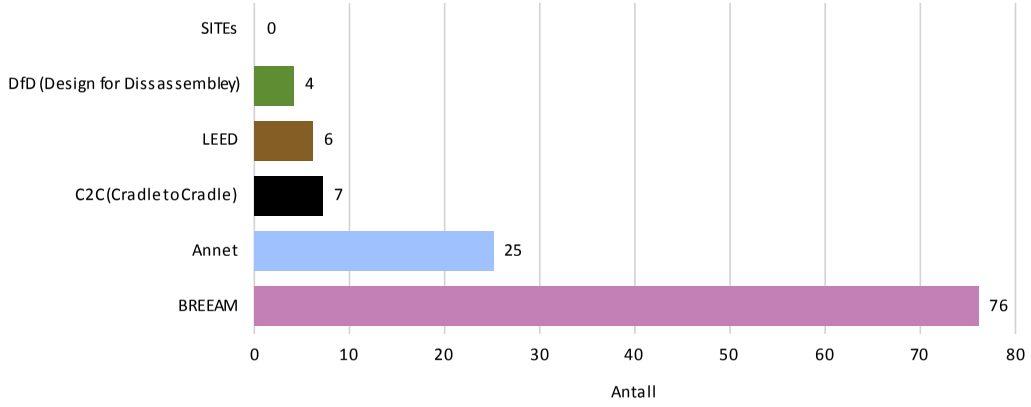
Navn	Antall
SITEs	14
DfD (Design for Dissassembley)	16
Annet	21
C2C (Cradle to Cradle)	54
LEED	62
BREEAM	209
N	226

35. Har du benyttet noen av følgende teorier når du har planlagt/prosjektert et anlegg? (Kryss flere)



Navn	Antall
SITEs	0
DfD (Design for Dissassembley)	4
LEED	6
C2C (Cradle to Cradle)	7
Annet	25
BREEAM	76
N	98

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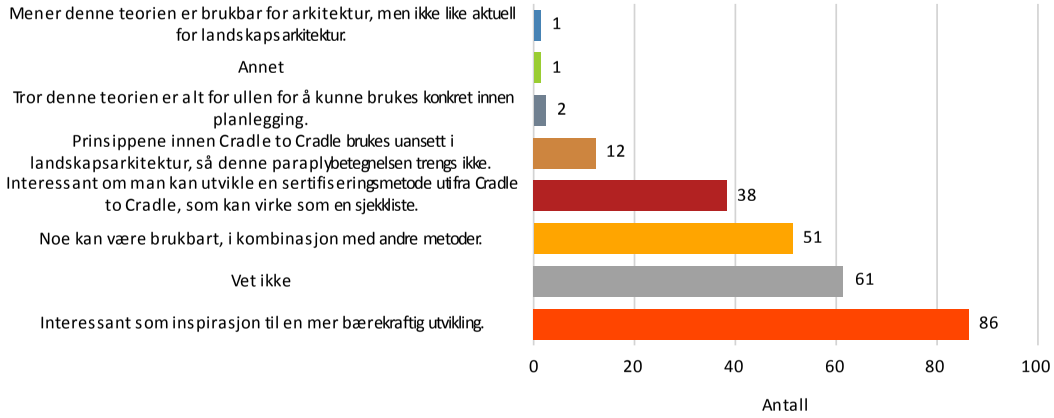
39. Tror du Cradle to Cradle er noe også norske kommuner kan bruke som planpremiss i sine kommuneplaner/ grøntplaner?

I Ronneby kommune i Skåne, Sverige, er Cradle to Cradle brukt i utformingen av Grøntplanen i kommunen. Gjennom dette søker de å fokusere på landskapsidentitet, rekreasjon, helse, naturverdier, gode livsmiljø, økosystemtjenester, biologisk mangfold og medvirkning.
(Link til Ronneby kommunes grøntstrukturplan)
http://www.ronneby.se/Documents/Milj%C3%B6-%20och%20byggnadsf%C3%B6rvaltningen/Gr%C3%B6nstrukturplan/2_del%201_14-51.pdf

(Link til presentasjonsvideo fra Ronneby kommune)
https://www.youtube.com/watch?v=ojCShxhfyh8



Navn	Antall
Mener denne teorien er brukbar for arkitektur, men ikke like aktuell for landskapsarkitektur.	1
Annet	1
Tror denne teorien er alt for ullen for å kunne brukes konkret innen planlegging.	2
Prinsippene innen Cradle to Cradle brukes uansett i landskapsarkitektur, så denne paraplybetegnelsen trengs ikke.	12
Interessant om man kan utvikle en sertifiseringsmetode utifra Cradle to Cradle, som kan virke som en sjekkliste.	38
Noe kan være brukbart, i kombinasjon med andre metoder.	51
Vet ikke	61
Interessant som inspirasjon til en mer bærekraftig utvikling.	86
N	252

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40. Har du noen andre betraktninger du ønsker å nevne? Rundt designprinsipper, prosesser, framtidsutsikter, erfaringer e.l.

Teorier er viktige, men implementering er enda viktigere. Frivillig deltakelse fungerer bare i det offentlige, private aktører må tvinges gjennom forskrift.

Min erfaring er at begrepet "bærekraft" er et litt vidt og ullent begrep, som man bare "slenger på" for at det skal høres bra ut.
Tror det ville vært fint med en sjekkliste som var helt konkret, og hvor alle typer prosjekt kunne måles opp mot de samme kriteriene.
Som denne undersøkelsen viser, er bærekraft så mangt, og for mange er det litt uklart hva det egentlig dreier seg om, og ikke minst hvordan man skal sette det ut i live i planer og prosjekter.

Opplever ofte at oppdragsgiver kun klarer å ta innover seg en del av miljøperspektivet. Man setter seg ikke nok inn i hva som monner av miljøtiltak. Eks. krav om A+ bygg, men alle brukerne av bygget kjører privatbil. Breeam krav til bygg, men ingen krav om å håndtere overvannet lokalt.

Byggherrer virker mer og mer interessert i bærekraft, da de ser at slike prosjekter får positiv omtale. De satser ikke på bærekraft av idealistiske grunner, men av tanke på profitt. JEg tror det er viktig å "brande" prosjekter, all den tid det ikke fins regelverk som tvinger dette frem. (tenk Stordalen; han bruker bærekraft som reklame for seg og firmaet)

landskapsarilteker og arkiteker er generelt opptatt av å bygge og planlegge bærekraftig. Men på byggherre siden tror mange at det finnes et fasit, feks BREAM, C2C osv. men det finnes mange teorier man kan bruke, man må se an de lokale forholdene og bruken. jeg tror det derfor er viktigere at kommunene, staten byggherrene ikke henger seg opp i en sjekkliste/ teori som skal gjelde for alt. noe som er bra for et sted er ikke så bra for et annet. det er bra med mål, men veien til målet bør være mer fleksibelt.

Det er viktig å se på bærekraft som en overordnet ide med tre hovedsøyler (som ble befestet i RIO konferansen 1992).
Bærekraft gjør oss mer bevisste og klar over det paradigme som akademia har nå og det vi går mot. Paradigmeskifte fra det maskinelle verdensbilde til det organiske verdensbilde. Nå snakker vi om bærekraft under det maskinelle verdensbilde noe som gjør det hele litt snodig! For eksempel vekst i det maskinelle- og vekst i det organiske. Når vi har kretsløpsbevissthet(kretsløp er et bærende prinsipp i naturen/på denne planaten) som et overordnet element vil alt vi planlegger og skaper taes hånd om fordi vi må bevise at naturen klarer å omdanne og akkumulere det vi lager. Dvs omvendt av det vi har i dag. Hvor en økobonde må bevise at han driver organisk jordbruk! Da vil også søppel forsvinne og vi sitter igjen med avfall som kan omdannes og naturen kan akkumulere det.Det er levende og ikke døtt! I det organiske verdensbilde vil den minste enhet være livsenergi og ikke en død partikkel som i det mekaniske verdensbilde. Når jeg var student fra 1999-2004 gikk jeg inn i studiet med denne kunnskapen og det var skuffende liten bevissthet blant landskapsarkitektene da. Vi har enda mye arbeid å gjøre for å få til et bærekraftig samfunn som har velferd og ikke konsum som mål. Lykke til!

Det etter hvert gamle begrepet samordnet areal og transport er fortsatt relevant.
Satsning på "grønn" mobilitet.
Holde fram gode, miljøvennlige løsninger som fungerer som eksempler.

Jeg jobber som premissgiver hos byggherre i et stort eiendomsselskap. Vi driver blant annet med knutepunktsutvikling. Jeg savner at man innenfor lsndskapsarkitekturen tør å tenke større, tør å utfordre arkitektene mer enn det vi gjør i dag. Mulig også tørre å ta initiativ til mer samarbeid også når det gjelder spørsmål rundt bærekraft. Bærekraft er ikke er spørsmål om enkelte faglige problemstillinger, men om sammensatte tverrfaglige utfordringer.

Tror det viktigste er å tenke helhetlig rundt bærekraft i planleggingen tidlig. Sertifiseringssystemer som BREEAM bidrar til et skifte i næringen og fungerer som en gulrot, det samme gjør Futurebuilt-prosjekter. Tenker at de viktigste er å få inn bærekraft begrepet så tidlig som mulig i et prosjekt for å gi maksimale gevinster. Kanskje bør også næringen bli flinkere til å skrinlegge prosjekter man ikke miljømessig kan stå inne for.

De viktigste kriteriene blir vurdert på et overordnet nivå. Likevel synes jeg det er problematisk når det kommer til detaljplanlegging og når det skal velges elementer i et anlegg og spesielt type hardt dekke. Her er det få valg; granitt transporteres fra andre siden av jordkloden og medfører fare for barnearbeid. Norsk stein er for dyr og det er lite å velge i. Asfalt og betongdekker er lite bærekraftig.

Krysset av for "økologisk" i første spørsmål, dette innebefatter etter min oppfatning en helhetlig økologisk tankegang der man forstår samspillet og prosessene i naturen. (ikke økologisk som det snevre uttrykket økologisk mat)

Savner mer fokus på de estetiske konsekvensene av mer bærekraftige anlegg. Kanskje vil mer kunnskap endre syn på hva vi synes er en pen park?
Eks: Hageavfall er jo en ressurs i ethvert anlegg, men dette tar gartneren med seg og leverer til kompostering et annet sted, fordi vi ikke synes det ser pent ut. Ved å lage egen jord/ kompost til anlegg vil man kanskje også redusere driftskostnader på sikt.

Cradle to cradle virker interessant og selv om temaet virker stort og "allment", tror jeg flere deler innen teorien kan være bra å se på for oss landskapsarkitekter.

Tett by i europeisk tradisjon (kvartaler og funksjonsblanding) gir mindre energiforbruk til oppvarming og transport, sammenliknet med småhusområder og amerikanske bystrukturer (tett kjerne men utstrakt sonedeling). Arbeid med grønnstruktur kan derfor fort oppleves tveegget. Mer park og lavere utnytting av områdene kan gi mer utflytende byer og større nedbygging alt i alt. De viktigste virkemidlene for bærekraft finnes derfor neppe i prosjektstyring men i arealplanlegging.

Viktig å planlegge for bedre "resilience" i både overordnet kommuneplanlegging, lokale planer og detaljprosjekter - lære av feil og justere seg inn for å finne/lage bedre motstandsdyktige og framtidsrettede løsninger.

Å lage noe som er vakkert er å lage noe varig- som er å lage noe bærekraftig.:
Det er større sjanse for at det vakre du en lager blir likt, vernet om/vedlikeholdt og ivaretatt.

Dette kan lett bli for teoretisk, og ikke så enkelt å formidle på forståelig vis for mange. Da mister tenkemåten mye av sin verdi. Gjør det enkelt.

Minimumsfaktoren er mangel på kompetanse om bærekraft i planlegging og utbygging i kommunene, spesielt i de små kommunene. Planleggere og utbyggere trenger at kommunen som oppdragsgiver har forventninger til bærekraft, stiller krav og tilbyr oppfølging.

Fornybar energi

Premissene legges for en stor del av oppdragsgivere i form av offentlige etater (kommunepolitikere), eller private aktører. Politikere er viktige premissgivere men ofte uten kunnskaper og styrt av kortsiktige og trange partiprogrammer. Private aktører er styrt av profitt. Vi har liten mulighet til å påvirke dette annet enn helt marginalt. Jeg mener fokuset må rettes mot styrende myndigheter som kan gi rammebetingelser og stille krav. Dessuten: jeg har vært med på å rive kostbare men ubrukelige skoleanlegg som var mindre enn 10 år gamle, fordi de ikke hadde et innhold rettet mot barn. Funksjon er også en del av et bærekraftig prinsipp.

"Resilient" er et begrep som også brukes i dag i forhold til bærekraftig planlegging. Dette blir ofte sett på som mere dynamisk og tilpasset skiftende forhold. "Resilient landscape" kan vel kanskje oversettes som motstandsdyktig landskap?

Arbeider i kommunal sektor med arealplanlegging. De senere år er det meste av planene innkomne private utbyggingsplaner, hvor hovedpremisser er lagt allerede. Kan derfor være vanskelig som fagperson å få endret på dette, bl.a. fordi man er avhengig av de politiske behandlingene. Disse styrer beslutningene og kan ha andre premisser enn (bare) bærekraft.

Planlegging og formgivning i et bærekraftsperspektiv bør kunne føres i dialog med eiere og brukere og da i norsk språkform. Dine spørsmål praler og mangler norsk språk og referanser og "very universisty" i sine forutsetninger og innganger. Hva er det du vil forske i, i innhold, systemer eller referanser?
Vennlig hilsen Sjur Frimann Hjeltnes

Min erfaring er at bærkraft kommer med som uttalt målsetting i et prosjekt dersom oppdragsgiver
a) ser en økonomisk gevinst
b) får et pålegg om det eller
c) har 'råd' til å smykke seg med en sertifisering

Kunnskap om materialer; CO2 avtrykk og livvssyklus for materialer er viktig for å kunne gjøre godt begynnete valg. her har arkitektene kommet MYE lenger. Vi landskapsarkitekter bør også ha et forsterket fokus på dette !

Bærekraft begrepet blir i dag brukt om svært mange forskjellige tema, og hver faggruppe har sin tilnærming til begrepet. Dette kan gjøre det problematisk i forhold til å jobbe mot felles mål.
Har tro på at gode prinsipper og prosesser må innarbeides i forskjellige instanser, slik at det tas med både i store og små prosjekter.

Bare at dette er et nyttig stykke arbeid du gjør. At dere som neste generasjon tar ansvar.

viktig å legge prinsipper for gode prosjekter så tidlig som mulig, allerede i reguleringsplan/kommuneplan.
Det må ikke komme til slutt i en prosess, men må være med fra start.

Sjeldent at man for oppdrag som er bærekraftige - og når man har et oppdrag så gjør man det frivillige gjennom foreninger. Når man har oppdrag så behøver man faglitteratur - har hatt nytte av boken Villroser skrevet av en landskapsarkitekt. Hun har jobbet videre med permakulturprinsipper og de synes jeg er viktige.

Savner mer tilgjengelig informasjon om materialer og deres egenskaper over tid, om hva det har kostet av ressurser og forurensing å fremskaffe dem. En kan lett få inntrykk av at det benyttes mye mer betong i dag enn for 20 år siden, kanskje bare egne inntrykk, men betong medfører store utslipp av CO2...

"Bærekraft" - begrepet er på mange måter blitt et ullent moteord... Jeg bruker det aldri.

Synes grønn faktor tenking, i sammenheng med overflatevannhåndtering og koblet opp mot økologi/urban dyrking og sosiale møteplasser kan være interessant å forsøke å koble sammen. Ofte vanskelig å få med seg bærekraftbegrepet fra overordnet nivå ned til "bygd" landskap, og videre å få til en sammenheng mellom private rom, felles rom og offentlige rom i denne helhetstenkningen.

Tverrfaglige prosesser

Bærekraftig utvikling er viktig i planprosesser men blir ofte ikke fulgt opp av politikere på lokalt nivå. Regionale planer har viktige bærekraftige prinsipper som utgangspunkt, men kommunene klarer ikke å følge opp på bakgrunn av egeninteresse og lav kunnskap blant beslutningstakere.

Ronneby ligger i Blekinge, ikke i Skåne

Sertifiseringssystemer er ingen garanti for gode prosjekter og kan til dels ta fokus vekk fra selve målet om å skape noe som er bra.

Ansvarlighet i forhold til fremtidige generasjoner som sjekkpunkt, er en generell holdning som bør ligge innbakt i de ulike prinsippene for planlegging.

Det er generelt alt for lite oppmerksomhet på drift og vedlikehold av alt det menneskeskapte byggeriet.

All trafikkvekst skal tas med gående, syklende og kollektivreiser.
Blågrønn faktor i planleggingen.
Hensyn til klimaendringene i planleggingen. Ekstremvær.
Universell utforming.

Ja, om vi setter hensyn til miljø over verdier vi dessverre har i vårt ekstremt kapitalistisk styrte samfunn (Norge er ikke best i klassen) vil våre barn få glede av det i fremtiden.

En tid før jeg gjennomførte LA-studiet var jeg veldig opptatt av prinsipper for permakultur.
Den grunnleggende holdning som dette skape, tok jeg med meg inn studiet og i de prosjektene jeg har vært involvert i har jeg forsøkt å holde tak i dette.
Jord, luft, vann og substans i god forfatning gir grunnlag for god vekst og økologisk stabilitet. Men så skal det jo sies at det er mange, holdninger og ytre faktorer som strider mot disse prinsipper som det har vært vanskelig å få til å samvirke med dette. Her kan vel Cradle-prinsippet bidra om det får innpass i planlegging. Breeam bidrar også. Det er mange landskapsprosjekter som etter min vurdering nå understøtter bærekraft i framtida.

Spennende temaer! Jeg skrev master om gjenbruk av materialer i landskapsarkitekturen i 2014. Der nevnte jeg litt om "design for gjenbruk", men dette har du sikkert lest om allerede siden du nevner design for disassembly. Lykke til!

God arealplanlegging en viktig faktor for en bærekraftig utvikling.

Prosesser og økonomi. Bærekraft bør i større grad være lovpålagt i prosjekter, på en slik måte at økonomi ikke blir et argument for å la være. Opplever litt i dag at det blir argumentert med at det blir for dyrt.

nei

blågrønn arealfaktor har jeg hørt om og lært litt om
Breeam virker veldig tekninsk og det virker som at fokuset er overdrevent mye på karbon, det blir litt for matematisk og utlilgjengelig, uinspirerende. har hørt at det slår rart ut også for landskapsarkitektur.
i den kommunen jeg jobber (Bergen) er det veldig mye fokus på klima, men jeg vet at artsmangfoldet i Norge heller er truet av aralendringer (86%?) enn klimaendringer (3% og mest i arkiske strøk..) fokus er dermed feil mener jeg. Det bør være mer fokus på vern av områder og naturtyper og kyst og vassdrag. (klassisk naturvern)

For tiden er det mange forskjellige metoder og sertifiseringer, begreper og hensyn. Mye å forholde seg til og mye forskjellig å ta hensyn til. Forhåpentligvis blir dette strømlinjeformet etter hvert som en integrert del av planleggingen på lik linje med andre krav.

Det er behov for klare krav fra myndigheter for at temaet bærekraft skal tas mer seriøst inn inn i utvikling av planer og prosjekter. Det er behov for en konsensus, og videre krav i form av for eksempel beregninger/ sjekklister ihht målsettinger for et prosjekt.

Et spørsmål var om ordet "bærekraft" var brukt i beskrivelsen av prosjekter. Selv om ikke ordet bærekraft er brukt, kan innholdet vise at man ønsker bærekraftig utvikling. Et ord som bærekraft kan være lite presist fordi vi tillegger det ulike betydninger, og jeg bruker derfor begrepet sjelden. Det betyr ikke at prosjektene jeg er involvert i ikke er opptatt av en bærekraftig utvikling. Jeg konkretiserer i stedet hva som er målet med prosjektet, ordet bærekraft blir for lite presist. All planlegging i Norge i dag bør være bærekraftig.

En god landskapsarkitekt vil alltid ha bærekraft som en underliggende verdi - ellers er de fleste av våre prosjekter dømt til å tape. Vi må lage anlegg som samarbeider med naturen - det er jo ny natur vi lager. Har vi ikke dette med i planleggingen vil anleggene forfalle etter kort tid. Og erfaringene fra alle kvalifiseringsteoriene er at dette gir en falsk trygghet og tar fokus vekk fra det vi egentlig skal jobbe med. Alt skal måles utfra tall og teorier - det er virkeligheten og erfaringene som teller. Og unødvendig mye tid av den kreative og konstruktive planprosessen går bort i skjema og dokumentasjon som kanskje første gang de brukes er til nytte - men etterhvert bare krysses av for å få unna og godkjent. Jeg synes ikke spørsmålene dine var enkle å svare på - altfor mange like valg og for lite gjennomarbeidet. Og så velge 1-3 der aller er like viktige. Men for å være konstruktiv - så er det er bra tema og det trengs å diskuteres. Men kanskje på et litt mer praktisk nivå - for å forstå nyansene i det du spør om må man være like mye inne i teorien som du er - og det er vi ikke i vår praktiske hverdag.

For å få gjennomslag for teorier/ tenkning vil det ofte i "den virkelige verden" være gunstig med sjekklister. Det er mange (og kanskje særlig) ingeniører som trenger noe mer håndfast og beskrivelse av "what's in it for me" for å benytte ny tenkning. Jf. Breeam der man får poeng om man har vært "flink nok", noe som er mer håndfast for praktikere. Arealplanleggere/ landskapsarkitekter planlegger mer med teorier i bakhånd og har uansett mye metodikk/ kunnskapsgrunnlag og tankesett som ikke er målbare, og er trolig fra studiene av mer opplært til å benytte mindre "konkrete" tankesett enn f.eks. ingeniører.

Innen infrastrukturprosjekter går alt for mye ressurser med til å håndtere feil (ca 20% av midlene -mange mrd. kr). Det er dokumentert at endring i planleggings/prosjekteringsmetodikk kan bidra til å redusere denne bortkastede ressursbruken betraktelig. Modellbasert metodikk (innen byggebransjen kalt BIM) bør vurderes når det er snakk om bærekraftig design.

Modellbasert planlegging og prosjektering gir dessuten bedre mulighet for å kommunisere bærekraftbudskapet enn rapporter, tegninger og andre tradisjonelle virkemidler.
- Etabler 3D modell over eksisterende situasjon der all relevant informasjon registreres/kan vises.
- Bruk modellene til å gjøre analyser/fatte vedtak.
- Prosjekter byggeplaner i modeller for å luke ut feil før byggingen starter
osv

Vurderingen av større gjenbruk ved planlegging av nye anlegg. Dekker, møblering etc. fra eksisterende anlegg.

nei

Mitt bidrag til en mer bærekraftig utvikling, er daglig arbeid med tilrettelegging for alternative transportformer som gåing og sykling.

Breeam bør deles inn i Breeam Nor og Breeam Communities. Den siste er svært godt egnet innen landskapsplanlegging/arkitektur. Den første kan i stor grad unngå å ha stort fokus på landskapet, avhengig av hvilke poeng prosjektet velger ut for å oppnå poeng.

Fokus på bærekraftige løsninger og miljø gjennomsyrer landskapsarkitektur og arbeidsprosessen for både prosjektering og planlegging. Fokuset (virkemidlene) innen prosjektering og planlegging er noe ulike. Jeg har jobbet med både prosjektering, planlegging og utredning, både privat (konsulentbransje) og i stat og opplever at det er et stort fokus på det i bransjen. Det tilrettelegges for og oppmuntres til økt kompetanse innen bærekraftige løsninger (kurs/seminarer). Politikerne og de nasjonale føringene som styrer vårt arbeid gir gode rammer for det. Vårt fag er sentralt i søken etter og tilrettelegge for bærekraftige løsninger og nettopp derfor tror jeg at landskapsarkitekten har en viktig og karrieremessig trygg rolle i nå og fremtiden.

Jeg har jobbet mest med planlegging, og nå større infrastrukturprosjekter i stat. Størst fokus her er 0-vekst, og planlegging som prioriterer/tilrettelegger for "bærekraftige" transportformer, gang-, sykkel og kollektiv, og gjør de mer konkurransedyktige med bilbruk (dvs også gjøre dette mindre "effektivt"/ikke øke kapasiteten her). Samordnet areal- og transportplanlegging - konsentrert utbygging (med høy opplevelseskvalitet, det må være attraktivt), både bolig og næring ved kollektivknutepunkter. Fokus er også på reduksjon av støy-/luftforurensning. Redusere inngrep i ikke-prissatte KUtema for miljø (landskapsbilde, naturmiljø, kulturminner/-miljø, naturressurser, nærmiljø og rekreasjon). Biologisk mangfold, landskapsøkologi (korridorer mm) er sentralt. Etablering av sosiale møteplasser. Stort fokus på håndtering av overvann i både planlegging og prosjektering. Mens jeg legger mest vekt på strukturer og overordnede prinsipper, er prosjekterende larker mer bevisst materialvalg med lavere C02fotavtrykk, vegetasjonsbruk (ikke svartelistede arter, demping av luftforurensning langs større veganlegg, arter som tiltrekker humler/bier). Små grep som forsøk med biehotel i vegskråninger ble nevnt av en jeg nylig møtte fra Statens vegvesen. En ikke-uttømmende liste.

Bærekraft blir dessverre nedprioritert da det av byggherrer oppfattes som for kostnadsdrivende, og for de er det sluttsummen som styrer alt og betyr alt. Det virker som kun visjonære byggherrer eller enkeltpersoner som har noen idealer har interesse av å implementere disse tingene inn i sine prosjekt. Tror løsningen må være at det fra statlig hold kommer konkrete krav som må innfris for å få planer godkjent og for å få byggetillatelser.

Oppdragsgivere/byggherrer er nøkkelpersoner for bruk av bærekraftige prinsipper, prosesser, planleggingsmetoder og valg. Det er vanskelig for landskapsarkitekter å ha avgjørende innvirkning i prosjekter hvis det ikke er tanker om bærekraft "fra toppen av". Hvis noe har økte kostnader som konsekvens, er det vanskelig å få gjennomslag. Bærekraft må inn som premiss i prosjekter, gjerne i kommunens planverk eller lignende og i mest mulig konkret form.

I transportplanleggingen må sosial bærekraft og hensyn til stedsegne verdier tillegges større vekt enn vi ser i mange byområder i dag. Det er dessverre vanskelig med de gjeldende utredningsmetodene. De grunnleggende metodene som ligger i statens KVU-system for de store samferdselsprosjektene har ikke mulighet til å vektlegge bærekraft, enten sosialt eller ut i fra økologiske og naturlige ressurser, foran hensynet til bilens fremkommelighet. Mao, konseptene som får flest mulig biler gjennom et punkt vil bli stemplet som det samfunnsøkonomisk mest lønnsomme uansett de ikke-prissatte konsekvenser for et sted eller byområde. Metoden bør nyanseres eller i større grad sees opp mot andre metoder for bærekraftig by- og stedsutvikling.

Håndtering av overvann er gjerne alt for lite vektlagt og blir gjerne underdimensjonert. Medvirkning blir dessverre lite vektlagt om prosjektene blir for store. Alt for lange planprosesser fører noen ganger til at utdaterte prosjekter blir bygd, siden det allerede er lagt inn mye ressurser i arbeidet. Konsekvensutredninger holder ikke prosjekter innenfor budsjett.

Landskapsarkitekter bør bli enda bedre til å formidle at store deler av vår jobb kan knyttes til bærekraft-begrepet.

Det bør ses på om man kan lage en mer spesifikk sertifisering innen bærekraft for landskapsarkitektur. Det kan være sjekkliste og som kan si noe om hvilket "nivå" av bærekraft et prosjekt kan klassifiseres i for å skape gode forbildeprosjekter og for å få oppdragsgiver, utførende og prosjektgrupper til å legge lista høyere for mer langsiktige mål.

Skal bærekraft kunne anvendes og ettersees, må det være kvantifiserbart og målbart. Man må utvikle metoder for å sette fingen på hvor bærekraftig prosjekter er. Du har ikke nevnt massebalanse som tema i din undersøkelse. Det mener jeg er et av viktige prinsipper man kan måle som bør regnes som del av bærekraftighet.

I planleggingsprosessene er en svært låst til kommune/utbyggers krav til prosjektet, det er ikke like lett å få gjennomslag for bærekraft - tankegangen når bare økonomi på kort sikt er det som teller. Trenger visjonære kommuner / utbyggere.

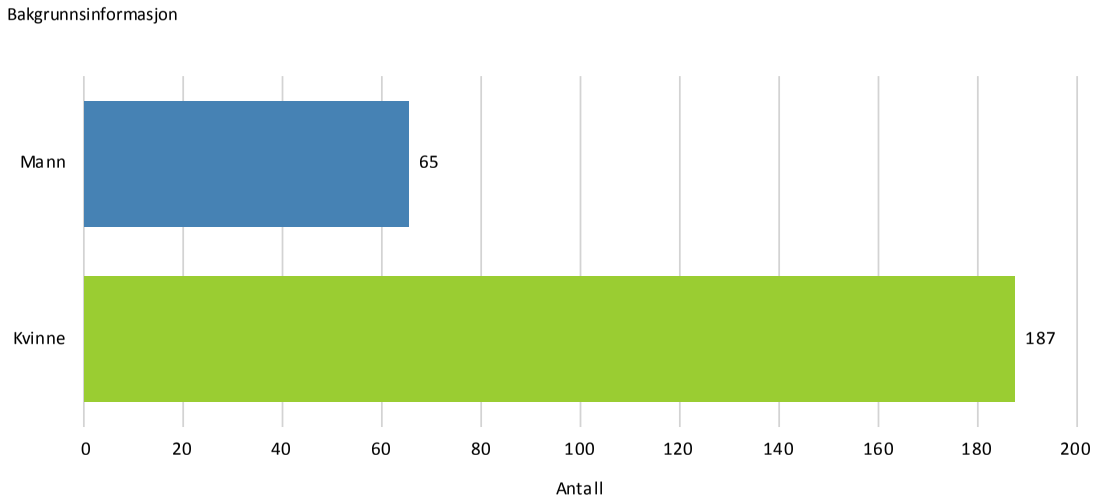
I detaljprosjektering mht. plantevalg tenker jeg at vi trenger en fornyet interesse for å bruke stedegne/ norskproduserte planter som ledd i en bærekraftig tankegang.

Bærekraft er er bredt begrep som kan være vanskelig å bruke i kommunikasjon med folk flest, viktig å kunne bryte ned og eksemplifise. Dvs at prinsipper og sjekklister er nyttig, og innhold vil variere avhengig av type planlegging (tema,nivå) det dreier seg om.

Viktig å være åpen og nyskjerrig på nye løsninger, prinsipper osv. tilsynelatende små tiltak kan vokse seg store og vikrige.

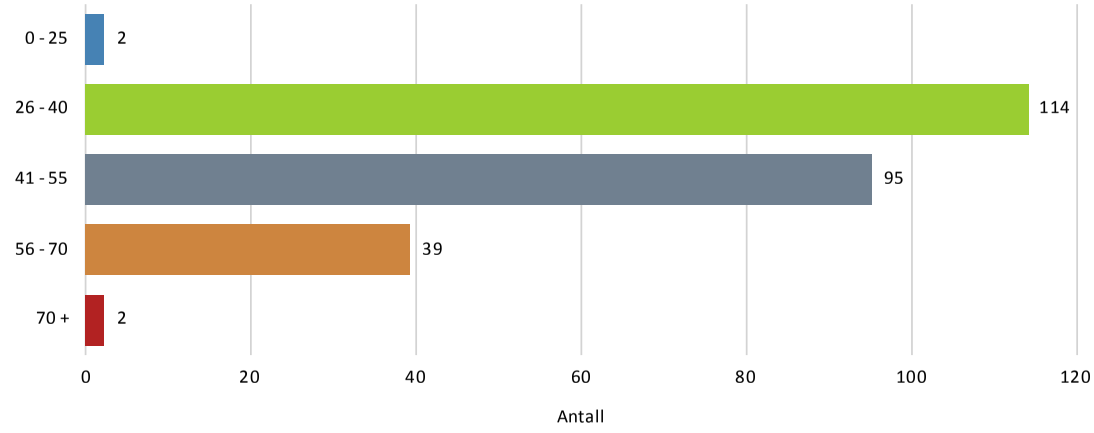
Spørreundersøkelse om bærekraft i landskapsarkitektur 03.10.2015 16:05

41. Kjønn



Navn	Antall
Mann	65
Kvinne	187
N	252

42. Alder



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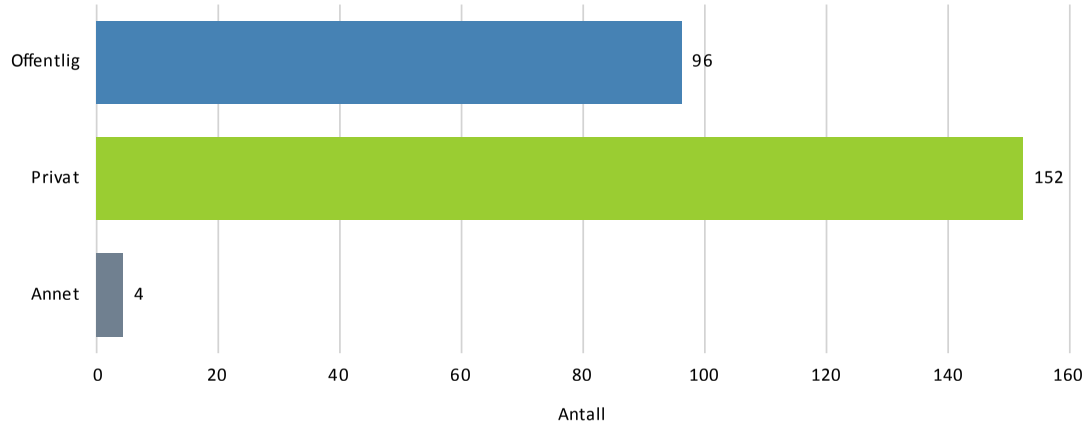
Navn	Antall
0 - 25	2
26 - 40	114
41 - 55	95
56 - 70	39
70 +	2
N	252

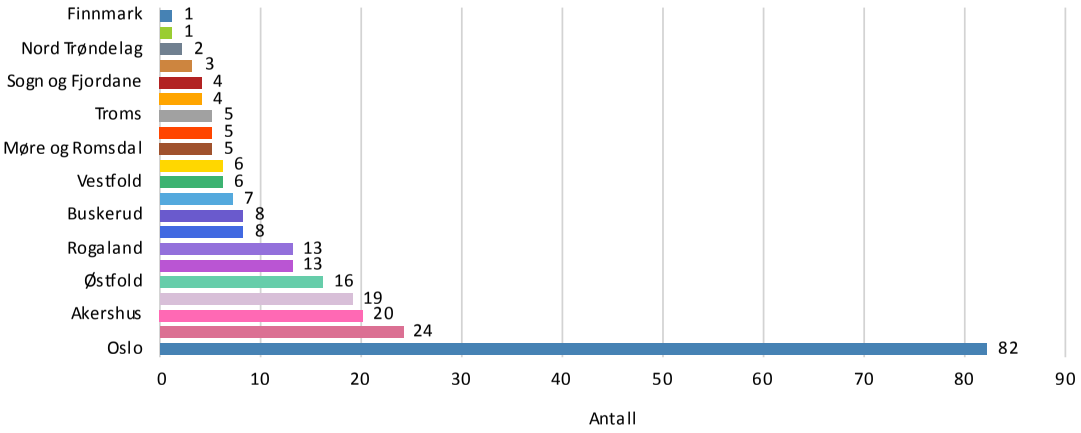
43. Sektor



Navn	Antall
Offentlig	96
Privat	152
Annet	4
N	252

Spørreundersøkelse om bærekraft i landskapsarkitektur 03.10.2015 16:05

44. Fylke



Navn	Antall
Finnmark	1
Annet	1
Nord Trøndelag	2
Aust Agder	3
Sogn og Fjordane	4
Nordland	4
Troms	5
Oppland	5
Møre og Romsdal	5
Ønsker ikke oppgi fylke	6
Vestfold	6
Vest Agder	7
Buskerud	8
Hedmark	8
Rogaland	13
Telemark	13
Østfold	16
Sør Trøndelag	19
Akershus	20
Hordaland	24
Oslo	82
N	252

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