



GUIDE TO CRADLE TO CRADLE® (C2C) INSPIRED BUSINESS SITES

Version November 2014



ACKNOWLEDGEMENTS

Cradle to Cradle® and C2C are registered marks of McDonough Braungart Design Chemistry LLC. Scientists at EPEA Internationale Umweltforschung GmbH pioneered the methodologies which form the basis of the *Cradle to Cradle Design Protocol*® created by Michael Braungart and William McDonough.

Concepts and tools described in this publication borrow inspiration and passages from publications by authors from EPEA as well as from the Academic Chair, *Cradle to Cradle*® for Innovation and Quality, Rotterdam School of Management, Erasmus University, where Professor Michael Braungart holds the Chair.

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Final content of the Guide and Tools is the responsibility of C2C BIZZ and its partners.

Many individuals and organizations contributed to this publication. They include in alphabetical order: Steven Beckers (Lateral Thinking Factory), Laura Vidje and William Lavesson (City of Ronneby), Owen Zachariasse (Delta Development Group) and many others.

Apologies to contributors who might have been overlooked; please let us know so they can be added!

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INTERACTIVE USE

The electronic version of this document is designed for interactive use on your smart device. If you see the following symbols, you can access other parts of the document directly:



This document contains in Chapter 3 a modular design development process, which consists of six modules. They can be used during different phases of project development.



Several tools have been developed within the C2C BIZZ-Project. They are related to different design development modules. The complete tool description can be accessed by a link to Chapter 4 – just click on the symbol.



Pilot sites are used to show the application of the C2C tools. By clicking on this symbol you get access to the pilot site description in Chapter 5.



You can access the table of contents by clicking on this symbol.



You can access the start of a section by clicking on this symbol.



[Hyperlinks](#)

References to other materials contain hyperlinks for easy online access or for accessing the storage media (attached).

ALT + left / **CMD + left** For Adobe Acrobat: Use these short-cuts to display the previous (next) view.
ALT + right / **CMD + right**

DATA DIAL WHEEL

This document comes with a hexagonal data dial wheel, which is intended to easily describe the application of the C2C BIZZ-tools during a project development process. It also illustrates crosslinks between the different modules.



Full interactivity of this document is given by using Adobe Acrobat in a Windows- or Mac-environment. Interactivity on tablets is reduced and depends on the reader app you use.

C2C BIZZ - THE PROJECT AND ITS PARTNERS



C2C BIZZ was an INTERREG IVB project (North-West Europe) with the objective to enhance the implementation of *Cradle to Cradle*® on new and existing business sites.

It worked on three central topics, being the **main C2C principles**:

- ◆ Everything is designed as a resource for something else.
- ◆ Use current solar income; energy that can be renewed.
- ◆ Celebrate diversity, including innovation as well as cultural and bio-diversity.

The development of tools, instruments and guidelines to facilitate the application of C2C on business sites was a central focus of the work. The Project lasted from September 2009 to 2015.

Eleven partners from six countries of North-West Europe area (Belgium, France, Germany, Luxembourg, The Netherlands

and the United Kingdom) participated in this innovation project (see *Figure 1*). The diversity of the team was high, as the partners were either

- ◆ public bodies,
- ◆ research institutes or
- ◆ private companies.

Each partner contributed with its knowledge and experience to the project. The knowledge gained at different pilot sites was shared between the partners.

This C2C BIZZ Guide is the summary of this collaboration and knowledge transfer. It gives clear advice on the why and how business sites can be inspired by *Cradle to Cradle*®.

Within the context of this Project, a diversity of business site typologies were selected as pilot sites, in order to implement the different aspects of C2C. They differ in terms of their composition, own-

ership and type of development. (See Word-Document.)

There are sites mainly consisting of offices and logistic companies like Ecoparc Windhof in Luxembourg, heavy industrial areas like the London Sustainable Industries Park (LISP), as well as a mixed site like La Lainière in Lille Métropole's territory. The type of development also varies from public (La Lainière) to private (Ecoparc Windhof), from green-field (Bielefeld) to brownfield (Irisphere) (see Chapter 5 'Pilot sites').

The general business site considered in this guide is therefore a mixed use site, that is, containing services, logistics and industrial companies. Housing and natural areas in proximity to the site should also be considered in the development, whether they are or not located within the borders of the development area, as they are an essential aspect to consider for C2C site development. The goal is to develop a business site that is connected with its surrounding environment and positively contributing to the natural, human and economic systems it integrates.

C2C BIZZ movie

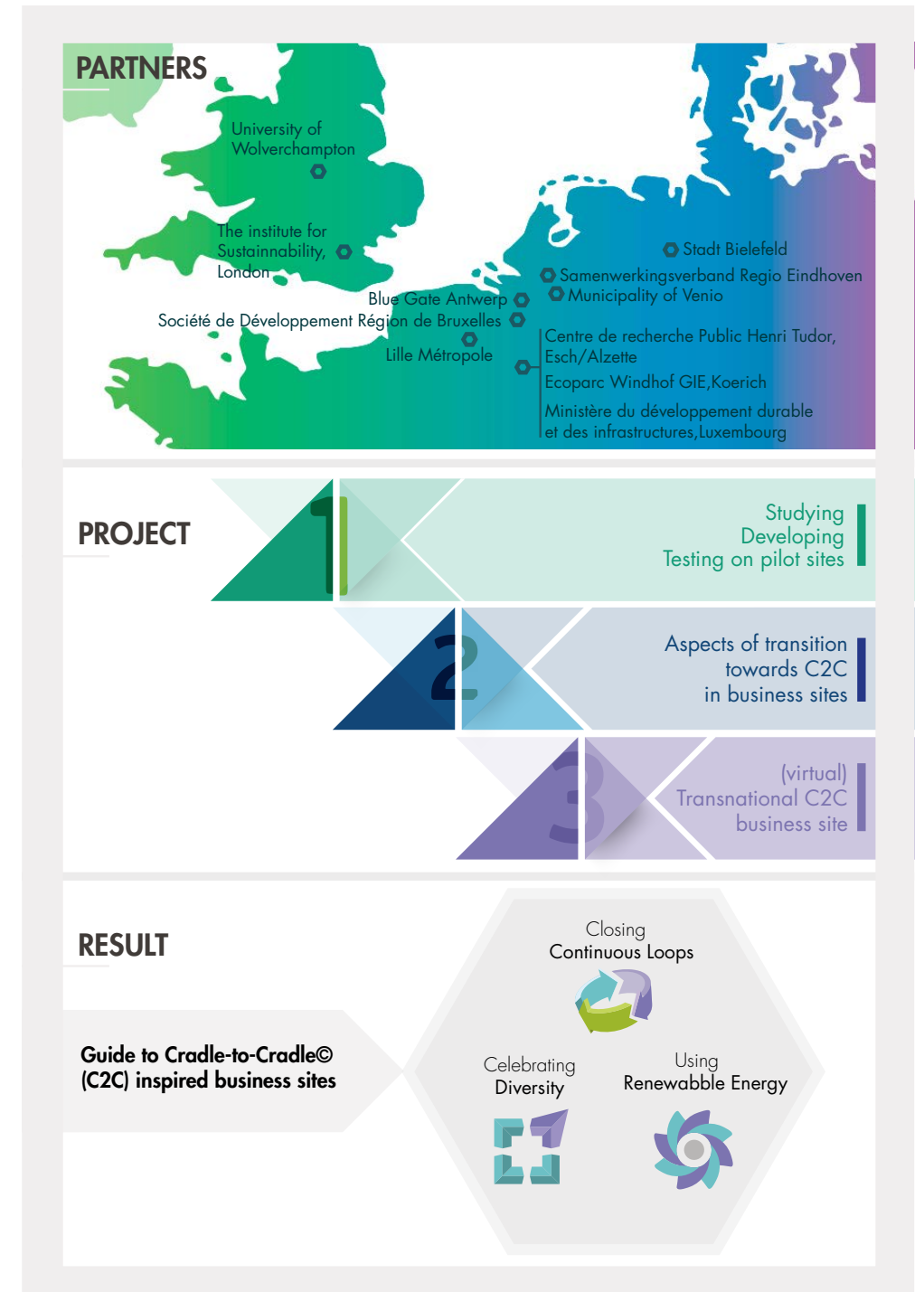


Figure 1: Scheme of the C2C BIZZ-Project.

Within the context of this Project, a diversity of business site typologies were selected as pilot sites, in order to implement the different aspects of C2C. They differ in terms of their composition, ownership and type of development.

PREFACE

A NEW WAY OF CREATING BUSINESS SITES

Quality is a competitive advantage.

C2CBizz pioneers are creating a competitive advantage for their business sites by using *Cradle to Cradle*® to generate high-quality positive impacts.

Creating positive impacts is the basis for *Cradle to Cradle*®. It inspires business innovations while supporting our society to be vibrant, innovative and enjoyable. It is a beneficial departure from the traditional approach of only minimizing negative environmental impacts.

The digital interactive '**Guide towards C2C inspired business sites**' defines those benefits in economic, ecological and social terms by using these C2C principles as a framework;

Everything is a resource for something else

Use energy which is renewed by the sun

Celebrate conceptual, social and biological diversity

The *C2C Technical Cycle* and *Biological Cycle* described in this Guide are the basis for organizing

those high quality impacts in the circular economy. According to leading business organisations like the World Economic Forum, those C2C cycles are powering the circular economy so it becomes a truly transformational paradigm.

As the term 'circular economy' gains momentum, pioneers at C2CBizz are proving how circularity makes the best business sense when *Cradle to Cradle*® is used to guide it. C2C puts the circular economy on the right path when it is used to generate positive impacts like improved productivity as well as high quality upcycling at business sites.

The tools, guidelines, showcases and pilot sites used to generate those positive impacts were developed to support municipal authorities, owners of land and buildings as well as developers, investors and occupants to apply C2C on business sites.

WHY 'C2C INSPIRED' BUSINESS PARKS?

At its ultimate destination a *Cradle to Cradle*® *Business Park* is an economic and social ecosystem with innovations generating positive impacts for stakeholders across the value

chain. However the ***journey from 'C2C-Inspired' to 'C2C Business Park' is just as important as the destination.***

The journey is the C2C Roadmap supported by this Guide. The destination is the measurable Goals created by stakeholders. Together the Roadmap and Goals make it realistic to reach from 'C2C-Inspired' to truly C2C.

Publications like this one are a next generation of C2C tools for giving the circular economy functionality. To give some **examples** I would like to celebrate here just a few of the many successes working in the marketplace and described further in the Guide;

- Ecoparc Windhof where innovative approaches to materials and renewable energy are a lighthouse for the country of Luxembourg.
- The City of Bielefeld which is on the way to becoming a *Cradle to Cradle*® inspired city as well as leading Nordrhein Westfalen into being a C2C-inspired Region.
- The region of Lille Metropole which successfully defined how to integrate biodiversity as a value proposition.
- The C2C Expolab in the City of Venlo which has one of the

most successful showrooms of C2C-certified products and in collaboration with EPEA guided development of the Venlo city hall.

- The city of Antwerp which is redeveloping its core around BlueGate by applying C2C industrial principles.

Every one of those partners did training with EPEA over the years so I am delighted to see their results and to see that all ***tools and guidelines are using the C2C framework***; generating positive C2C impacts, translating them into guidelines, developing tools to measure the impact.

The innovations are stepping stones along a scientific pathway from molecule to chemical to materials, products, buildings, areas, regions, countries and ultimately globalized systems! The partners in C2C BIZZ, universities, governmental bodies, business parks, integrated their qualities. Together they ***succeed with a holistic approach.***

Initially when C2C BIZZ asked me some years ago to provide an endorsement to the European Commission I had concerns. Would the partners be able to make the transition to positive impacts from the traditional approach of

minimizing environmental impacts? Results in the C2CBizz Guide clearly show you found the right pathway!

It was an honour for our institute to be invited to support your progress and contribute as quality assurer to make C2C BIZZ with its Guide a success in leading the circular economy by example. In that context I would like to extend my warmest personal congratulations to each and every one of the C2CBizz partners but also offer you a challenge.

The publication of this Guide marks only the beginning rather than the end of C2CBizz. The challenge you face as partners and as competitors is to scale up the lessons learned during this multi-year journey and transmit it to other business communities across Europe and beyond. Our institute is supporting C2C-Inspired business parks to fulfil their goals and roadmaps so they become truly *Cradle to Cradle*® entities. I look forward to the day in the near future when I will be able to say; 'there is a truly C2C business park!'

Michael Braungart



1. INTRODUCTION

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1.1 PURPOSE OF THE GUIDE AND TARGET GROUPS

The present C2C BIZZ guide is primarily conceived to provide systematic and practical guidance on how to implement C2C-inspired projects on business sites.

There are many reasons why somebody might think about developing a new or existing business site according to the principles of *Cradle to Cradle*®. This Guide lists some of these reasons in Chapter 2 **'WHY TO APPLY C2C TO BUSINESS SITES?'**

It depends on stakeholders if such an idea becomes reality. Thus, the project's vision needs to be communicated in a way that aligns with individual stakeholder interests. They must have a clear understanding on how and in what timeframe their intentions and goals will be achieved. Chapter 3 **'HOW TO APPLY C2C TO BUSINESS SITES'** is devoted to this process. It gives advice on how to bring stakeholders on board at the point where they - or the project they are involved in- find themselves at the beginning of the journey.

Such C2C-inspired projects can be launched from different starting points. They either can start from scratch as a **new business site** (greenfield project) or they are part of a **redevelopment of an existing site** or a **regeneration** of an abandoned area (brownfield project). This necessitates the Guide to be flexible. Therefore, it has a modular structure with six modules that can be used independently, according to specific needs. They are accompanied by a set of tools (in Chapter 4) that have been developed by the C2C BIZZ-Partners and tested with the help of pilot sites (see Chapter 5).

Depending on the project type, different stakeholders may be involved in a C2C project development. The C2C BIZZ-project refers to spatial developments and business sites. The following list is a typical selection of stakeholders for such projects:

- ◆ Municipal authorities
- ◆ Owners of land
- ◆ Owners of buildings
- ◆ Developers
- ◆ Investors.
- ◆ Anchor tenants
- ◆ Construction team (builders, suppliers)
- ◆ Property managers / Operation managers / Governance team
- ◆ Environmental public interest organizations

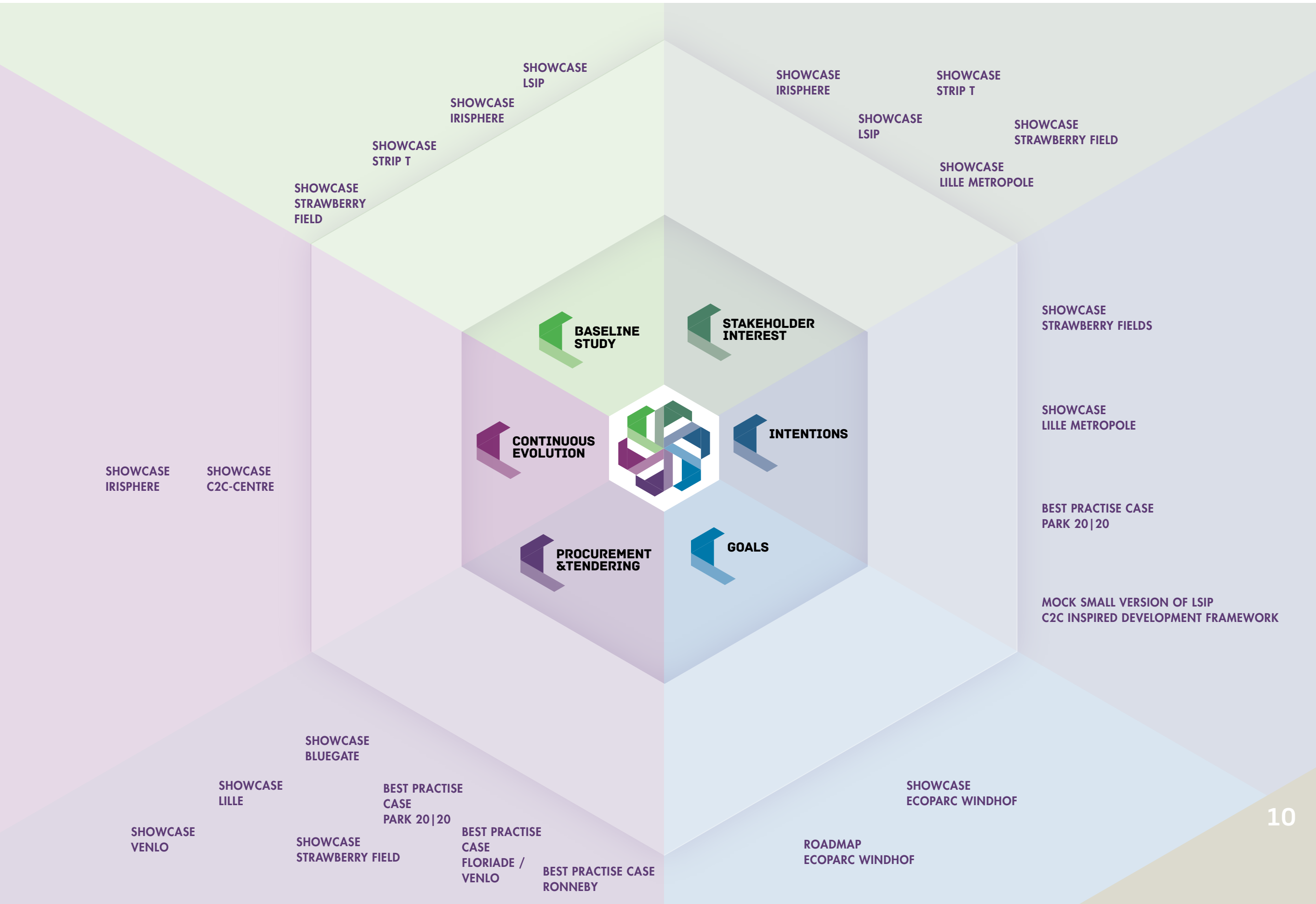
The way how stakeholders may read this Guide depends on their position in their organization. Whilst those who are in charge of effectively putting a project in practise (e.g. planning departments, architects and engineers, consultants) might read this guide from the beginning, decision-makers in most cases might not have the time to do the same. Therefore, this Guide has been produced to provide primary stakeholders with a roadmap and specific advice at the beginning of the document. The section below sets out a group of tags with links to pertinent parts of chapters. This enables easier navigation to the areas of most interest to each stakeholder and should help to quickly find relevant information.

Try it out !

Please feel encouraged to evaluate these tools and discuss them with the C2C BIZZ-partners who developed them or with those colleagues who tested them at their pilot sites. The C2C BIZZ-Team gladly will give you support and share their experiences.

Finally, visit other C2C-inspired sites. Be yourself inspired by the solutions that have been found there and discuss with the site developers how they achieved their goals.

6 MODULES



1.2 CRADLE TO CRADLE® DEFINITION¹

Cradle to Cradle® is an innovation platform for generating positive impacts by improving the quality of products, systems and services. C2C designs positive economic, cultural and environmental qualities into materials, buildings, neighbourhoods and regions.

C2C combines chemistry with design based on the expertise of its co-founders; Michael Braungart, a chemist and William McDonough, an architect. C2C applications began in the 1990s by designing innovative water systems in developing economy neighbourhoods, as well designing buildings and products in advanced economies.

To achieve holistic quality the C2C framework consists of:

- ◆ Philosophy describing why C2C exists (e.g. to generate positive impacts).
- ◆ Principles translating philosophy into qualitative guidelines (i.e. what is the right thing to do).
- ◆ Tools describing how to measurably apply the philosophy and principles.

The C2C design approach can be used at different levels in order to achieve a positive impact.

- ◆ On the **material and product level**, importance is given to use only healthy materials and to design products that could be disassembled again, in order to be able to re-use them 100%.
- ◆ On the **building level** an example of a positive impact could be that the building as such is helping to clean the air or that it capable of generating more energy than it needs.
- ◆ For **spatial development** C2C is a business and design model distinguished by its aspiration to have a positive impact (instead of minimizing the negative impact). An example of a positive impact could be the multiple and flexible use of an area that subsequently allows to adapt to future needs.

¹ (EPEA Internationale Umweltforschung GmbH, 2014)

1.3 CRADLE TO CRADLE® PRINCIPLES

According to C2C philosophy, **three basic principles** have to be considered in all developments, in order to be beneficial to humans and the environment:

THE PRINCIPLE

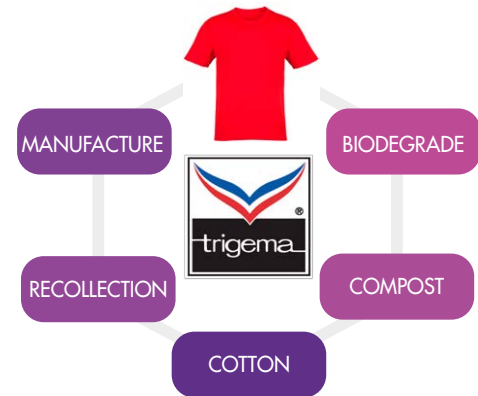
“EVERYTHING IS DESIGNED AS A RESOURCE FOR SOMETHING ELSE”

This principle promotes the use of materials as nutrients to be safely cycled in continuous metabolisms: biological and technical.

Cradle to Cradle® distinguishes between two planned pathways. Consumption pathways, where products are designed to safely enter biological systems, and Service pathways, where products safely enter technical systems to be part of new future product generations.

THE BIOSPHERE

Consumption products are distinct from ‘consumer’ products. Consumption Products are designed so that (by-)products generated during their use support the biological systems they enter. Through those biological systems, products become resources for next generations of products. Examples are biodegradable textiles, cosmetics or pharmaceuticals.



THE TECHNOSPHERE

Service Products are designed to be chemically stable during use and get dismantled into technical resources, known as ‘nutrients’ after they fulfil their function. The ingredients in these renewed technical nutrients are carefully defined so they can be resources for producing next generations of service products. Examples of technical nutrients are electronic appliances and cars.

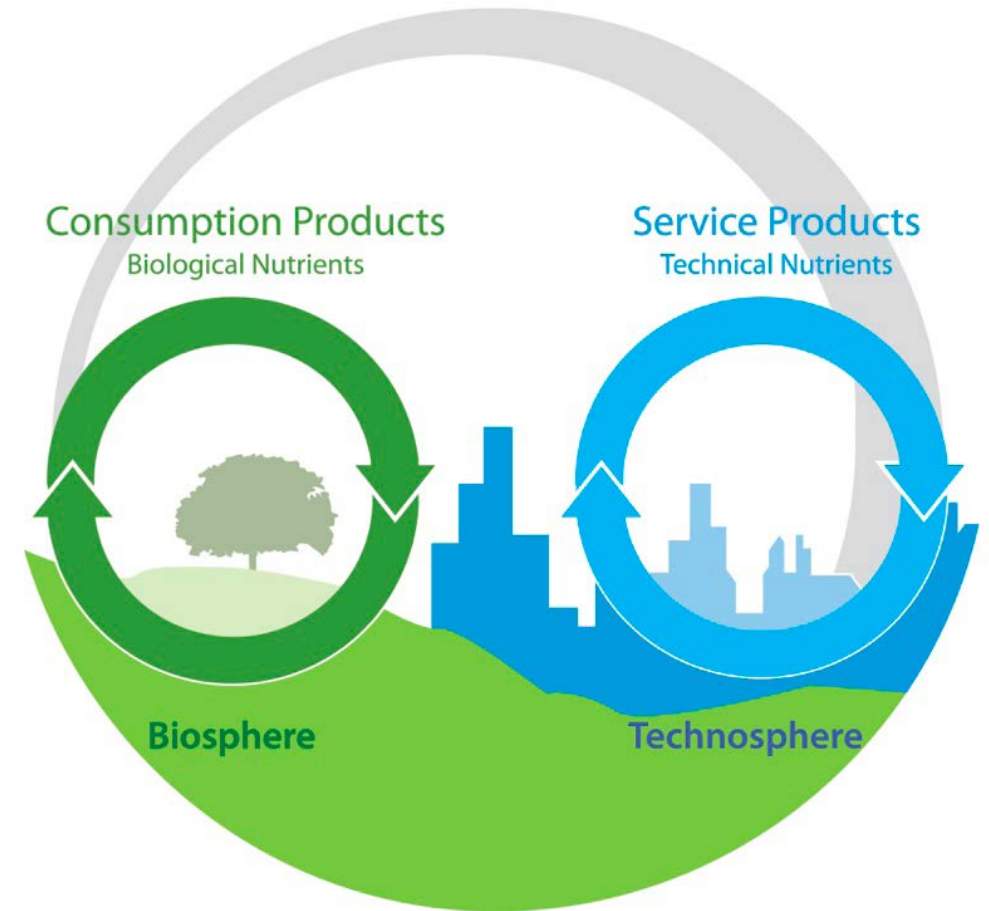


Figure 2: C2C metabolism cycle by EPEA Internationale Umweltforschung GmbH 2002-2013 in (EPEA Internationale Umweltforschung GmbH, 2014)



THE PRINCIPLE “USE CURRENT SOLAR INCOME”

The use of solar radiation as an energy source makes it possible to renew energy as it is used. And this without jeopardising the environment and thus the future of human society, as is the case with fossil or nuclear energy. Sunlight can be used directly (photovoltaic or solar thermal) or indirectly, for example in the form of wind.

Theoretically, only a small part of the energy provided permanently by the Sun is needed to cover the entire energy needs of mankind. The technology to convert these energy sources into the required forms of energy and its distribution needs to be further developed. Hence, C2C related energy concepts also aim at the **optimal effective utilization of solar energy** (smart grid, energy-saving and energy storage concepts).

THE PRINCIPLE “CELEBRATE DIVERSITY”

Diversity makes ecosystems more responsive and resilient in changing conditions. In imitation of a multiplicity of healthy (complex) eco-systems, various forms of variety based systems are promoted and combined.²

A C2C-inspired business site actively supports **biodiversity**. It contributes to enhance the natural diversity of the local environment. This may be, for example, through plants improving indoor air quality, or a green roof providing habitat for indigenous species, or a constructed wetland treating water and enhancing the ecological quality of an area. The consideration of **conceptual and socio-cultural diversity** implies:

- ◆ Being conscious of a variety of concepts, uses and cultures.
- ◆ Adapting to local circumstances.
- ◆ Specifically on business sites, the promotion of a varied mix of business sectors.
- ◆ Enhance stakeholder well-being and enjoyment.

² (Public Waste Agency of Flanders, 2011)



1 INTRODUCTION

1.4 C2C AND THE CIRCULAR ECONOMY³

The Circular Economy is an economy that enables producers to show the value and quality of the performance of their products to the customer. Products are designed for performance and also for re-use of all materials in different phases of sharing parts up to recycling of (almost pristine) resources. The Circular Economy is the logical descendant of the linear economy that dominated since the start of the industrial revolution. In a sense, it seems as if we are about to enter a revolution, but in practicality it is evolving from existing business models.

The introduction of the Circular Economy provided a new vision on the treatment of resources, energy and new ways of value creation and entrepreneurship. It is based on the principles and ideas of *Cradle to Cradle*[®], introduced by William McDonough and Michael Braungart. Circular economy pioneers found solutions in *Cradle to*

³ Taken from (EPEA Internationale Umweltforschung GmbH, 2014) and (Joustra, et al., 2013)

Cradle[®] protocols, particularly in (McDonough & Braungart, 2002) which define characteristics for materials and energy, as well as value chain enablers.

DOING THE RIGHT THING IN THE CIRCULAR ECONOMY

Already many published diagrams describe the circular economy, so why another one?

- ◆ **RE-DESIGN**
Recycling is often un-economic when products not designed for recycling are processed. Redesigning materials makes them safer and more economic for circularity. The diagram here describes re-design at the start of the process, as well as feedback loops for improvement.
- ◆ **MATERIALS USE IS DEFINED BY THE INTENDED CYCLE RATHER THAN THE MATERIAL ITSELF**
Materials like biobased plastics, as well as inert materials like sand are resources for the biosphere and technosphere. However circularity

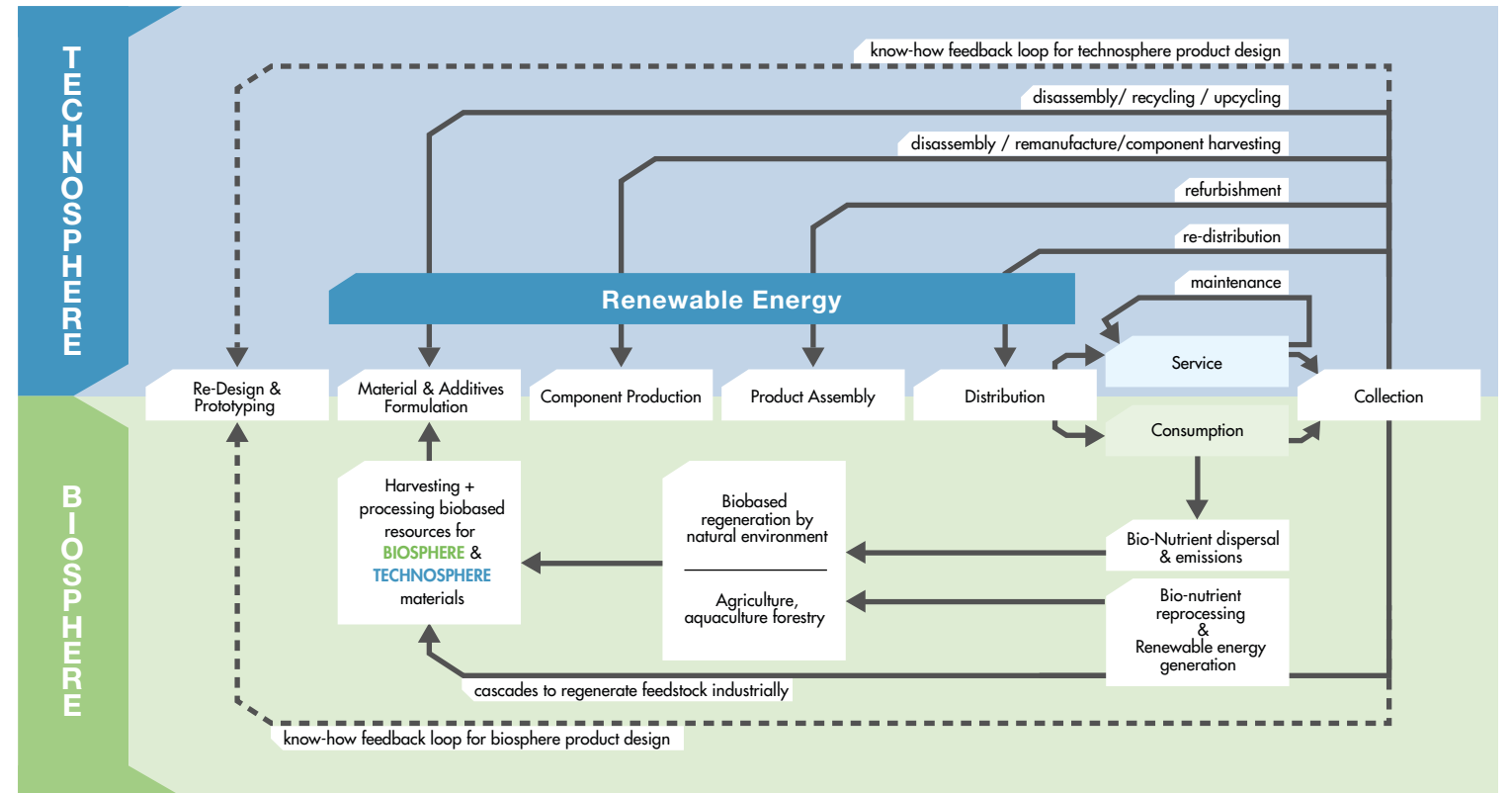


Figure 3: The diagram illustrates where the circularity transition is heading. Today many materials are lost along the chain through ineffective methods. Those 'take, make, waste' pathways are described by other diagrams in other publications, whereas the diagram here describes the optimal approach.

diagrams usually describe only the use of non-renewable resources like metal for the technosphere, and the use of renewable resources like plants for the biosphere. Other diagrams describe the biosphere as "biomaterials", which creates confusion for product developers who want to understand what is suitable for the biosphere. Those are clarified in the diagram here.

- ◆ **NUTRIENT EMISSIONS**
Emission of materials into the environment is a major pathway for nutrients. For example it occurs when effluent enters rivers, tires run on the road, or clothes are worn, or when materials are burned or off-gas. If materials are designed for their intended use, their emissions regenerate or are inert for the environment, but today many emissions are still harmful. Nutrient emissions are basic design & safety considerations for many products and are described in the diagram.

- ◆ **ADDITIVES**
The additives which give materials their functionality are often missing from circular diagrams. Examples include smoothers, fillers, hardeners, plasticisers, fire-retardants and thousands of other substances used in products. The challenge is to design those to make them suitable for their intended use in the biological cycle or technical cycle.

1.5 HISTORY AND CURRENT STATE OF C2C-APPLICATION

C2C applications began in the 1990s by designing positive social and economic impacts into innovative water systems in developing economy neighbourhoods, as well as designing buildings and products in advanced economies.



Source: Bionorica Headquarters, EPEA Internationale Umweltforschung GmbH

Meanwhile, hundreds of companies have adopted the C2C-certification methodology for their **products**. These companies include industry giants, such as Puma, Nike Europe, Steelcase, Herman Miller, Desso and a government leader, the United States Postal Service. Accordingly, over 400 product certifications have been issued for *Cradle to Cradle*® Certified products, since product certification began in 2005.⁴

All certified products can be found in the **'C2C-Centre'** which is one of the tools developed within the C2C BIZZ Project.

C2C not only has been developed for (industrial) producers, but also for **buildings** being designed by architects and engineers. Thus, a clear set of C2C-design rules for buildings had to be developed. The manifesto *'Cradle to Cradle® in Architecture'* (Braungart & McDonough, 2009) and

⁴ (Cradle to Cradle® Products Innovation Institute, 2014)

the publication *'Cradle to Cradle® for the Built Environment'* (Braungart & Mulhall, 2010) provide general guidelines.

Perhaps the most authoritative definition of *Cradle to Cradle*® as applied to buildings is by (Braungart & Mulhall, 2010), the very proponents of the concept. It stipulates:

"A Cradle to Cradle® building contains defined elements that add value and celebrate innovation and enjoyment by: measurably enhancing the quality of materials, biodiversity, air and water; using current solar income; being deconstructable and recyclable; and performing diverse practical and life-enhancing functions for its stakeholders."

At present, the implementation of C2C on the building level is focused on C2C-certified products as well as tools and systems which improve positive impacts by improving flexible use potential, biodiversity, air quality and renewable energy generation, with a focus in each case on innovation.

Although the number of best practice examples for C2C-inspired buildings has risen over the last few years, a 100% C2C-defined building does not yet exist.

The *'C2C-Centre'* takes a closer look at such instructive examples, i.e. 'Venlo City Hall' / The Netherlands, 'Solarwind' / Luxembourg (pilot project C2C BIZZ, see Chapter 5.2.1) and 'Covent Garden' / Brussels, Belgium.

1.6 C2C-INSPIRED ELEMENTS AND FEATURES

This Guide will help stakeholders understand the positive impact and business reality when integrating C2C inspired elements and features where possible within the design of their projects.

Even if it is not (yet) possible to develop projects completely according to the C2C philosophy, already a continuously increasing number of **C2C-inspired elements** can be integrated, which go beyond green or sustainability to add value for stakeholders⁵.

C2C-inspired elements celebrate innovation and enjoyment at a substantive level by:

- ◆ measurably enhancing the quality of materials, biodiversity, air and water;
- ◆ being deconstructable and recyclable,
- ◆ achieving diverse practical and life-enhancing functions for its stakeholders.⁶

These elements are broad categories with several **innovative features** that may be integrated to achieve holistic quality:

- **Integrated biodiversity / Biodiversity Enriching Feature**

- Functional indoor and outdoor landscaping
- Aquaponics and fish ponds
- Promotion of grey water use
- Incorporation of materials that ensure biodigestion
- Living walls, balconies and roofs
- Attracting diverse beneficial plant and insect species to the site.

- **Architectural Design Diversity amenable to:**

- diverse energy source
- several water sources
- diverse uses.

- **Land use Design Diversity**

- Mixed compatible land utilization
- Design for future redevelopment
- Suitability alignment with several land use processes.

- **Water Protection and Cleansing Feature**

- Rainwater harvesting and storage system
- Rainwater cleansing system
- Integrated water recycling system with nutrient recycling
- Green walls.

- **Air Cleansing Feature**

- Exposed Window Frames
- Air cleaning plants
- Mould Inhibitors
- Green Walls
- HVAC Systems with C2C coating.

- **Sun as the Ultimate Source of Power**

- Solar panels and photovoltaics
- Optimized natural lighting
- Biogas plant
- Geothermal plant.

- **Environment Enriching Materials**

- Green walls, doors and windows
- Self-cleansing walls
- Air cleaning vegetative walls
- Availability of areas for accessibility to outdoors and fresh air.

- **Health Enriching Materials**

- Designs with defined materials whose contents are known and safe.

- **Material Separation with regard to**

- foundation and roof,
- floors and walls
- doors and windows.

5 See (Braungart, 2013)

6 (Braungart & Mulhall, 2010) adapted.

A good example of applying C2C-inspired building elements is Covent Garden in Brussels. This building has been designed and constructed with C2C as its core philosophy. There are many examples of C2C

materials being applied particularly in the Atrium that demonstrate how these work together to measurably articulate the three key C2C principles.

BEST PRACTICE CASE COVENT GARDEN / BRUSSELS

- ◆ Design allows increased density on the site without adding stress to the municipal sewage system.
- ◆ Interior garden and its leisure areas generating ideal conviviality and meeting points for buildings' occupants.
- ◆ Dense and varied green spaces, Mediterranean type in a permanent 18°C minimal temperature.
- ◆ Some plants are participating in the building's wastewater treatment process using advanced biological and bacteriological purification techniques.
- ◆ Black and grey waters are recycled in the building's consumption cycle.
- ◆ Rain water is also collected, stored and reused.



Courtesy of Ariane Zielonka

OTHER EXAMPLES ARE:

BEST PRACTICE CASE VENLO CITY HALL

The green façade is one of the Cradle to Cradle inspired elements of the newly built City Hall Venlo.

The aim of the green 2.200 m² green façade is to improve both indoor- and outdoor air quality. Combined with a greenhouse on the roof and solar chimney, the green wall is serving to promote healthy air quality. Research proved that the green wall will purify the outdoor air in a radius of 500 m.

Additionally, the green façade will have positive impacts on biodiversity, aesthetics and labour productivity.



Source: Kraaijvanger

BEST PRACTICE CASE SOLARWIND

- ◆ Increased amount of renewable energy sources geothermal, photovoltaic, wind, thermal, Canadian dwell, free venting
- ◆ Increased biodiversity: green walls and green roof and bees
- ◆ Improved water usage: rainwater collection system
- ◆ Sharing of installation. Conference rooms fitness
- ◆ Using of C2C materials on the top floor
- ◆ Increase business diversity child care, restaurant and many different activities and organization of internal presentations and meetings.



BEST PRACTICE CASE FORD

Living Roof at Ford River Rouge Complex¹

(Dearborn, Michigan)

FORD installed one of the largest living roofs in the world. This roof generated significant capital and operating savings by:

- ◆ **Cleaner storm water**
Collect and filter rainfall as part of a natural storm water management system. Working together, the living roof, porous pavement, underground storage basins, natural treatment wetlands and vegetated swales significantly reduce the amount of storm water flowing into the Rouge River, while also improving water quality.
- ◆ **Cooler surroundings**
Planted with sedum (a drought-resistant perennial ground-cover also known as stonecrop) the living roof helps reduce the urban 'heat effect' created by tarred and paved surfaces. It also insulates the building, reducing heating and cooling costs by up to 5 percent. The sedum traps air-borne dust and dirt, absorbs carbon dioxide, and releases, all of which help

improve air quality. The living roof also creates habitat for birds, butterflies and insects.

- ◆ **Longer roof life**
By protecting the under-lying roof structure from ultraviolet radiation and the thermal shock (expansion and contraction) caused by warm days and cool nights, the living roof is expected to last at least twice as long as a conventional roof. This could save millions of dollars in roof replacement costs.
- ◆ **Lightweight design**
Sedum on the living roof is planted in a thin, four-layer, mat-like system instead of loose soil. Even when soaked with water, this innovative vegetation blanket weighs less than 75 kg per m².

¹ (The Henry Ford, 2014)



2. **WHY TO APPLY C2C TO BUSINESS SITES ?**

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2.3	Added values	23

2 WHY TO APPLY C2C TO BUSINESS SITES?

2.1 DEFINITION OF A BUSINESS SITE – A HISTORICAL OVERVIEW

Making an evening walk ...

Voluntarily and joyously working overtime on a hot summer day ...

Passing a low-price power refuelling station of a warehouse with an electric car ...

'Washing' the children's old school books and printing new contents on them ...

Borrowing the bulbs for the apartment at a specialized 'light-manufacturer and leasing house' ...

Do you associate these activities with industrial and business parks?

The purpose of this section is to summarize available definitions of business sites, provide a historical perspective on business site development, distinguish the main characteristics of a 'C2C business site' and how it differs from a traditional business site and establish the definition and boundaries of the term 'business site' within the context of the C2C BIZZ Project.

Traditionally, business parks merely consisted in agglomerations of businesses and industries in close proximity, evolving over time into deliberately developed economic activity areas with the provision of common services, such as infrastructure for transport, energy and water or common facilities as waste collection, waste treatment, recycling, tool rooms, refrigerated storage, security and recreation areas, among others (Falcke, 1999).

Business sites are generally considered as a driver to accelerate economic development through innovation and job creation. These parks provide the institutional framework, modern services, physical infrastructure and services of local companies to support new enterprise incubation, start-up's and knowledge sharing for the mutual benefit of all stakeholders.

Business parks differ according in their size, type and organization. Their characteristics are determined by the individual mix of industries and companies on the site. They can thus be classified according to different features (United Nations Industrial Development Organization UNIDO, 2012) (United Nations Industrial Development Organization UNIDO, 1997):

- ◆ **Park composition:**
 - Composite: containing businesses engaged in a variety of unrelated industries.
 - Ancillary: containing businesses, usually small, in various fields, but all serving one large establishment and frequently supervised by the parent enterprise.
 - Single trade: often called 'functional,' accommodating either establishments engaged in the same trade or producing the same class of articles.
- ◆ **Ownership: public, private or public-private partnership.**
- ◆ **Land development:**
 - 'brownfield' if the park is established on existing, but disused, facilities of former companies.
 - 'greenfield' if developed in a new area.

Different variants of industrial or business parks exist and can be categorized based on their function as science/technology parks, research parks, light industrial areas, heavy industrial areas or export processing zones/parks (United Nations Industrial Development Organization UNIDO, 2012). However, business and industrial parks have been associated with poor environmental management, pollution, traffic congestion and reduced quality of life (Memedovic, 2012), even though they present a good model for economic development. Often allocated by local, regional or national governments (Snep, et al., 2009), business sites are typically located outside of urban areas and accommodate companies

2 WHY TO APPLY C2C TO BUSINESS SITES?

that provide services or that produce, transfer or store goods, with accompanying heavy traffic from logistic activities. For historical sites (brownfields), land contamination is often an issue. Industrial processes usually involve high use of energy and waste materials from the production process. Thus, linear end-of-pipe models for business/industrial park development contribute to economic development at the expense of negative environmental and social impacts.

To overcome these negative effects, the field of industrial ecology advanced the concept of eco-industrial parks (EIP), seeking to minimize environmental impacts through industrial symbiosis of materials and energy flows between companies in an eco-industrial system in a collaborative way. Still, like other conventional sustainability strategies, the objective is to create more elegant and less wasteful industrial systems, based on the premise that industrial systems are bound to still cause harm to the environment. The question remains as to how business/industrial parks as economic growth hubs can be designed to have positive impacts on the environment and local communities.

The *Cradle to Cradle*[®] philosophy (McDonough & Braungart, 2002) (McDonough & Braungart, 2003) (McDonough, et al., 2003) (Braungart, et al., 2007) currently provides the most innovative framework for the definition and development of business sites.

Under the *Cradle to Cradle*[®] methodology a business site is one that, for example:

- ◆ is designed for multiple uses,
- ◆ facilitates maximum flexibility,
- ◆ leads to a truly beneficial positive relationship between eco-industrial systems and natural ecosystems and
- ◆ creates positive impacts: an outcome commonly regarded as eco-effectiveness.

2.2 INCENTIVES, IMPLICATIONS AND BENEFITS

Public and private business site developers normally do not think of bike paths or solar charging stations at the launch of their projects. In most cases the following questions are in their focus of interest:

- ◆ How to create jobs in the region?
- ◆ How to meet the needs of local business and retain them in the region?
- ◆ How to settle new businesses?
- ◆ How to work with as little effort as possible to meet legal requirements (e.g. concerning spatial planning, protection of environment and nature) and the expectations of interested companies?

Unfortunately, the answers to these questions are still very often 'conventional', as follows:

- ◆ The developer drains, levels and bulldozes a blank rectangular area and divides it into rectangular parcels. Electricity, water and sewage systems are connected to the public network. The area is first and foremost accessible to motorized traffic.
- ◆ The company, willing to situate itself at the business site, needs an ostensible cost-effective and short-term solution for a new factory building. Hence, a plot is quickly chosen and a standard factory hall is erected.

Business sites planned in such a conventional way do respect the basic needs of the stakeholders. If they comply with the generally acknowledged state of construction and operation and if they meet current environmental standards, they will be (compared to older business sites) perhaps less harmful for workers, the neighbourhood and the environment. From a C2C perspective, they are, anyhow, only 'less bad.'

The challenges of such traditional business sites are, for example:

- ◆ Lack of diversity (example: dead sites at night or during weekends).
- ◆ Derelict sites when the purpose they were built for no longer exists.
- ◆ Sites that become demolition liabilities due to poor materials design.
- ◆ Sites that lose their tax base value for local governments over time.
- ◆ Sites that are efficient but not productive or healthy for occupants.

C2C aims to solve these challenges by taking an holistic approach. A business site is not considered as an isolated site, but always as a part of its economic, environmental and socio-cultural surroundings. The same perspective is applied for individual firms and buildings in a business site.

Business sites that embrace this philosophy strive to turn C2C-objectives into those elements and features shown in Chapter 1.6. The following Table 1 gives some implications of C2C objectives for business sites and shows how these could be addressed.

2 WHY TO APPLY C2C TO BUSINESS SITES?

CRADLE TO CRADLE® QUALITY DIMENSION	IMPLICATIONS FOR BUSINESS SITES
ENVIRONMENTAL OBJECTIVES	
<ul style="list-style-type: none"> ◆ To design materials, products and systems in a way that they are resources for other processes and products. ◆ Ensure that energy is wholly derived from solar and other renewable energy sources. ◆ Ensure that biodiversity is promoted. 	<ul style="list-style-type: none"> ◆ Support the use of healthy and defined materials in the development and operation of business parks. ◆ Design individual building units so that they can easily be disassembled and recycled without reducing material value. ◆ Cluster businesses/companies to support industrial symbiosis. ◆ Design business park to be wholly dependent on renewable energy sources. ◆ Design individual units that can clean the surrounding air, generate energy, recycle water and serve as habitat for flora and fauna. ◆ Design flexible and mix-use building units that can be easily adapted for different functions. ◆ Create habitats for flora and fauna in the business park.
ECONOMIC OBJECTIVES	
<ul style="list-style-type: none"> ◆ Ensure that businesses are more profitable. ◆ Engender local and regional economic development. ◆ Increased commercial attractiveness of the business park. 	<ul style="list-style-type: none"> ◆ Exchange materials as nutrients across businesses to turn disposal costs into income from selling resources. ◆ Operate the facility on solar and renewable energy sources to alleviate energy costs. ◆ Treat and reuse water to alleviate water costs. ◆ Reduce disassembly costs.
SOCIAL OBJECTIVES	
<ul style="list-style-type: none"> ◆ Improve the quality of life of the local community. ◆ Conserve local culture and heritage by promoting cultural diversity. 	<ul style="list-style-type: none"> ◆ Integrate features that create livelihoods for local communities. ◆ Use locally available materials for development as well as design to reflect local heritage.

Table 1: Cradle to Cradle® quality dimensions and corresponding principal features in business sites.

2 WHY TO APPLY C2C TO BUSINESS SITES?

2.3 ADDED VALUES

Spatial developments that substantially integrate C2C-features will result in benefits and added-values. The best measure of the performance of a C2C development is the added value (in its various forms) gained by virtue of the C2C attributes present in the development. The success of a project is generally measured as the return on investments, considering a given period of time. The short-term yield in this sense is not suitable to measure the overall success of a project or a business undertaking. It does not take into account the values that are not or only indirectly monetarily quantifiable. From the above it is clear that *value* will mean different things to different stakeholders. Therefore, it is important to specify the stakeholder perspective from which value is being assessed.

Whilst a key purpose of site development is to enhance the economic value of the site through the application of capital, technology, skills and effort, making economic or market value a prime concern, it is also the case that site development offers value in various ways which require exploration.

Added values benefit different stakeholders or groups of stakeholders. They can be found in various places. Distinction is to be made between hard and soft values:

- ◆ Hard values are such that may be estimated by standard accounting procedures.
- ◆ Soft values are based on a subjective assessment of the value for specific stakeholders.

Indeed, it is difficult to trace the factor(s) that directly or indirectly lead to the value generated and how much they actually individually contribute to the value generated. Some can be directly attributed to particular C2C choices and investments e.g. *Savings generated from leasing equipment and systems*. The contribution of others is less obvious.

A further complication is that data for working out the value generated emanate from a wide range of sources; some reliable and others of questionable reliability.

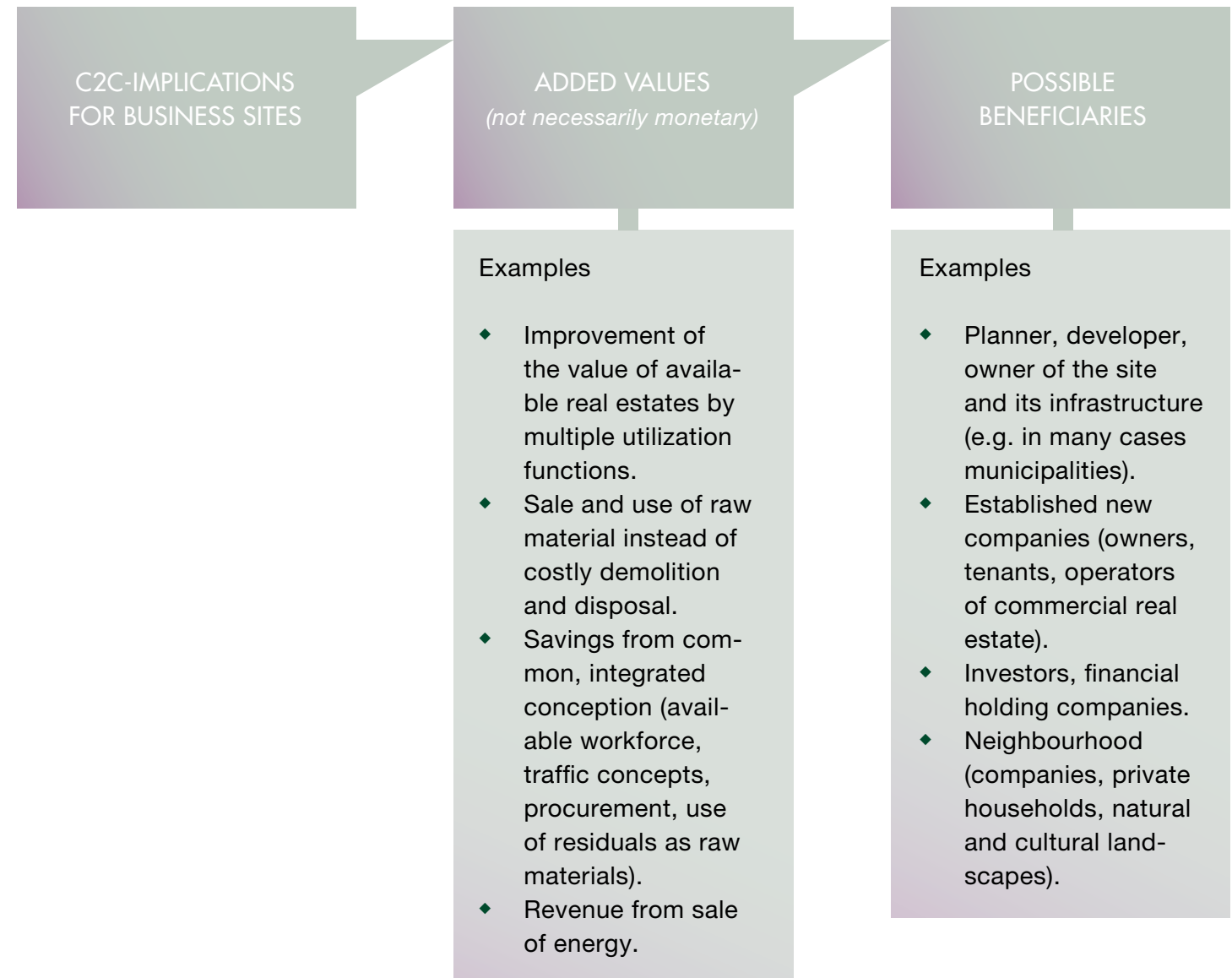


Figure 4: C2C-implications of business sites and resulting benefits.

2 WHY TO APPLY C2C TO BUSINESS SITES?

The challenge that remains is to develop methodologies that can overcome these difficulties and provide a robust basis for justifying (or otherwise) investments in C2C elements in business site developments. Such a methodology has been developed by C2C BIZZ. [See Chapter 4.4.](#)

DEVELOPERS, OWNERS, OPERATORS OF COMMERCIAL REAL ESTATES AND TENANTS		
Added value	Nature of value	Balance sheet entry
Selling excess C2C-defined renewable energy to grid	hard	Revenue
Revenues from diversified space use	hard	Revenue
Carbon credits gained	hard	Revenue
Urban farming revenues generated	hard	Revenue
Increased investment available per m ²	hard	Revenue
Reduced vacancy	hard	Revenue
Increases in productivity	hard	Revenue
Improved spatial productivity due to after-hours use	hard	Revenue
Improved access to subsidies and grants for innovation	hard	Revenue
Residual value from C2C building components and materials	hard	Capital value
Increase in capital value generated by innovative landscaping	hard	Capital value
Improved value of available space per m ²	hard	Capital value
Improvement in capital value due to ability to attract high value tenants	hard	Capital value
Improved payback periods	hard	Capital value
Sub-leasing has become very attractive	soft	Capital value
Time and cost savings due to proximity of services, such as kindergartens	soft	Capital value
Adaptability to future heating and cooling requirements	soft	Capital value
Reduced risk from use of trusted materials and products	soft	Capital value
Opportunities to develop new innovations	soft	Capital value
Savings generated from leasing equipment and systems	hard	Capital savings
Savings on renovation costs due to ability to disassemble and re-use	hard	Capital savings
Collective purchasing savings	hard	Capital savings
Insurance savings	hard	Capital savings
Landscape maintenance savings from using on-site generated fertilizer	hard	Capital savings
Reduced absenteeism and staff turnover	hard	Capital savings
Savings in energy costs	hard	Financial security
Savings in water costs	hard	Financial security
The investments have guaranteed energy security	soft	Supply security
The investments have guaranteed water security	soft	Supply security
Attracting high quality tenants	soft	Marketing
Projecting a positive image of development	soft	Marketing
Added value to occupants' own businesses	soft	Marketing

Table 2: Examples for added value for Developers, owners, operators of commercial real estates and tenants
[Source: (Mulhall, et al., 2014) adapted].

2 WHY TO APPLY C2C TO BUSINESS SITES?

MUNICIPALITIES AND SOCIETY		
Added value	Nature of value	Balance sheet entry
Selling excess C2C-defined renewable energy to grid	hard	Revenue
Income from taxes, letting and leasing	hard	Revenue
Increased investment available per m ²	hard	Revenue
Improved access to subsidies and grants for innovation	hard	Revenue
Desirable place to work or live	soft	Social benefit
Municipality is more attractive	soft	Social benefit
Reduced stress on municipal water supply	hard	Social benefit / Capital savings
Reduced stress on health facilities due to health improvements	hard	Social benefit / Capital savings
Reduced stress on public drainage systems/reduced flood risk	hard	Social benefit / Capital savings
New jobs created through development	hard	Social benefit
Attracting high quality tenants	soft	Marketing
Projecting a positive image of city/town (local pride)	soft	Marketing

Table 3: Added value for Municipalities and Society [Source: (Mulhall, et al., 2014) adapted].

BANKS AND INVESTMENT COMPANIES		
Added value	Nature of value	Balance sheet entry
Residual value from C2C building components and materials	hard	Capital value
Increase in capital value generated by innovative landscaping	hard	Capital value
Improved value of available space per m ²	hard	Capital value
Improvement in capital value due to ability to attract high value tenants	hard	Capital value
Increase in rent	hard	Revenue
Improved payback periods	hard	Capital value
Time and cost savings due to proximity of services, such as kindergartens	hard	Capital value
Adaptability to future heating and cooling requirements	soft	Capital value
Reduced risk from use of trusted materials and products	soft	Capital value
Opportunities to develop new innovations	soft	Capital value
Readily adaptable to future requirements (future-proofing)	soft	Capital value
Attracting high quality tenants	soft	Marketing
Projecting a positive image of development	soft	Marketing

Table 4: Added value for Banks and investment companies.
[Source: (Mulhall, et al., 2014) adapted].



3. HOW TO APPLY C2C TO BUSINESS SITES

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3 HOW TO APPLY C2C TO BUSINESS SITES

3.1 BUSINESS SITES – A NEW DIMENSION FOR C2C

With regard to business sites, we refer to area developments with C2C-inspired elements, hereinafter as '**C2C inspired business sites.**' Due to their size and scope, spatial developments open up possibilities for C2C-applications, which cannot be achieved on the level of buildings or products. A distinction can be made between two factors⁸:

- ◆ **Economies of scale**
Economies of scale cause the average production cost per unit to fall as the output volume increases. For example it might cost \$3,000 to produce 100 copies of a magazine, but only \$4,000 to produce 1,000 copies. The average cost in this case has fallen from \$30 to \$4 a copy because the main cost elements (editorial and design) are unrelated to the number of magazines produced.
- ◆ **Economies of scope**
Economies of scope make it cheaper to produce as some cost can be shared with other (external) companies/partners. Such economies can come from businesses sharing centralized functions, such as finance or marketing. Or they can come from inter-relationships elsewhere in the business process, such as cross-selling one product alongside another, or using the outputs of one business as the inputs of another.

It is the economy of scale and scope that significantly facilitates the achieving of mid- and long-term goals. It needs for instance a certain critical mass of companies to realize a innovative material management on site.

⁸ Compare 'The Economist', 20 October 2008: <http://www.economist.com/node/12446567/>

BEST PRACTICE CASE
ECONOMY OF SCOPE AND SCALE AT
SOLARWIND / LUXEMBOURG

- ◆ Shared conference rooms:
Inside the building the conference rooms are shared in between the occupiers of the building. This creates a total lower cost for each occupant, while having access to larger conference rooms on site.

This does allow even smaller companies to organize larger events on site and having all the facilities available.



BEST PRACTICE CASE
ECONOMY OF SCOPE AND SCALE AT
PARK 20|20 / THE NETHERLANDS

- ◆ A central feature of Park 20|20 is a grey water treatment in a central plant clarification basin with a helophyte filter. The average cost (cost per treated unit) for grey water recycling was reduced, because the amount of grey water increased by connecting several buildings to the basin. Thus the fixed costs are spread out over more units of output.
- ◆ The same applies to using the buildings as 'material banks'. The design of intelligent, weight reduced buildings allows every component to be reused in another production process or returned as raw material. To think about such 'Materials banks' only makes sense if the amount of material is adequate.
- ◆ All buildings at Park 20|20 were equipped with glasses from AGC, a manufacturer of C2C-certified glass. This reduced the average cost (cost per unit) in furnishing several buildings. The same applied to engineering and landscape services, where the fees per building went down because the size of the project grew.
- ◆ Other economies of scope and scale at Park 20|20 are:
 - Site-wide heating and cooling, which reduces mechanical room costs for each building.
 - Thermal balancing between buildings, only possible with site-wide heating and cooling.

- Site-wide capacity to use e.g. solar panels which reduces per unit and inverter hardware cost.
- Capacity to negotiate common services, such as recycling.
- Energy company servicing the site with integrated solutions.



Figure 5: Park 20|20 as an example of C2C-inspired elements at business sites (Courtesy of Park 20|20 C.V.).

3 HOW TO APPLY C2C TO BUSINESS SITES

Business sites focus far more than buildings on **site systems integration**, that means on implementing system and infrastructure solutions that should be used by all companies on site. They rely on systems and services for manufacturing, distributing and managing products, water, air, materials, light, energy, logistics and biodiversity.

Those systems and services can be designed as tools for generating C2C added value. They are incentives for other projects and may serve as catalysts to transform parts of cities or regions.

Due to their complexity there are no 100% *Cradle to Cradle*[®] business sites which completely fulfil the C2C-principles. But, experience increases with each project that contains C2C-elements in buildings and spatial developments.

It's again the **'C2C-Centre'** that gives impressive examples of C2C-inspired business sites, i.e.

- ◆ [Park 20|20' / The Netherlands.](#)
- ◆ [London Sustainable Industries Park \(LSIP\) / UK \(pilot project C2C BIZZ, see Chapter 5.1.1\).](#)
- ◆ 'La Lainière' / Lille Métropole, France (pilot project C2C BIZZ, see Chapter 5.3.1).

The difference between 'conventional' and 'C2C inspired' business sites is not the number of elements used within the project. It is rather the holistic mindset and methodology that stands behind it and its modular approach, which offers the opportunity to transform the site into a site with positive impacts.

For example, the technology for producing energy from existing on-site renewable sources may already be available, but in a C2C mindset the question is could it produce more renewable energy than required, or could the employed materials for creating this energy be of better quality.

In order to achieve holistic quality the technical equipment needs to be recovered as high quality raw material after use and ideally upcycled before returning it into technical or biological cycles.



Figure 6: The green façade of City Hall Venlo as a shining example of a C2C-inspired element.



3.2 C2C INSPIRES THE MARKET!

Designing buildings and business sites according to the C2C principles is not yet a standard. Rather, it's a **thinking out of the box** that necessitates enthusiasm and involvement of all relevant stakeholders, including innovative suppliers of C2C-certified products and technologies.

The earlier a **comprehensive team** is built, the more eco-effective the outcomes are. Being part of such a team creates a new movement and **inspires the market**.

The key to business success is to transpose the ideas into viable economic concepts. There are differences between the national markets of the EU Member States. What works in The Netherlands does not necessarily work in Germany or Italy. It depends on the local adaption of C2C in those markets. Therefore, it might be necessary to virtually wake-up the market, particularly urban planners, architects and engineers, construction companies, suppliers or producers to participate in this innovation.

BEST PRACTICE CASE
RONNEBY WANTS YOUR HELP! (CITY OF RONNEBY, SWEDEN)

This is the key message of a small brochure that has been distributed to the Swedish market in 2013. With this brochure Ronneby Municipality invited teams to formulate visions for a new centrally located urban area (locally known as the Kilen Project)- and to do this with a starting point in the design concepts laid down in the *Cradle to Cradle*® concept.



Kilen brochure

BEST PRACTICE CASE
MARKET CONSULTATION BY CITY OF VENLO

After all the advisors were selected, the design process took off. A *Cradle to Cradle*® Certified Consultant of C2C ExpoLAB was part of the design team and was involved during the design process. In spring 2009, the design team started the preliminary design phase, with a design studio and workshops, which lasted a week. This initiated the integral design process, in which the different disciplines strengthened, rather than hampered, each other. Besides the general project team meetings, all the different stakeholders within the design team came together every month to monitor the continuity and synergy between the disciplines. The meetings were used to examine what the contribution of the market could be to realize the City of Venlo's requirements and ambitions with this building.



3.3 DEVELOPING C2C PROJECTS IS A CIRCULAR PROCESS WITH MULTI-DIRECTIONAL CROSS-LINKS

The realization of a C2C-project is often described as a journey, knowing that there is no 'direct flight' between the starting point and the destination.

The traveller, indeed, knows where he wants to go. But at the beginning of his planning, he does not know how to get there, how long the travel takes, how many stopovers are necessary, or how many attracting and worthwhile places to stay are there along the route.

This picture of a journey illustrates important aspects of the process to develop a C2C-inspired business site:

- ◆ The destination, which is a C2C inspired business site, cannot be reached by one single attempt, although there are certainly immediate gains to be made.
To approach the goal, there are many single steps to make; of which some may not fully comply yet with C2C principles. Therefore, these steps have to be permanently rethought, so they can be continuously optimized according to technical progress or innovative economic or social concepts.
- ◆ There are guidelines for measurable progress, but there is no standard roadmap or travelling plan (i.e. no easy-to-use template for planning and developing a C2C-inspired business site is available). Planners have to find their own way to realize their ideas, and this under specific circumstances. They can rely on experiences gained in other projects and shared by the C2C-community.

Even if there is a broad support from all stakeholders, C2C-inspired business sites start in most cases as a 'conventional site' with a modest number of C2C-elements and a limited set of C2C-intentions and goals.

As soon as they are achieved, new technologies or C2C-certified products may be available. In addition experiences gained during the operation of the site might suggest new innovative concepts.

New or more advanced C2C intentions and goals will be established accordingly and increasingly diffuse over the site.



This shows that the whole process is not a one-way-street, but more a roundabout with feedback loops for continuous improvement, a circular workflow that consists of several modules.

Those are listed hereinafter and described in the following Chapters:

1. Taking a baseline study
2. Identifying stakeholders
3. State your intentions
4. Set goals
5. Procurement and tendering – from design to construction
6. Continuous evolution

The numerical sequence of the modules applies to the planning and implementation process of Greenfield projects and new business sites. Such projects start normally from scratch with module 1 and end up with module 6.

The starting points vary for all other kinds of projects – brownfields, existing business sites, re-dedication of sites, etc. In addition, there are plenty of cross-links and shortcuts between the modules.

When looking at the entire use period of a building or a business site we have to consider that there is no standard sequence of modules to undergo. Rather, the specific conditions of a project decide on the order of modules.

The following three examples may illustrate this:

- ◆ The evaluation of bids according to the tendering specifications (module 5) shows that the budget is not sufficient to put into practise the technologies or systems, that are necessary to meet the stakeholders interest.

Go back to module 2 and discuss again with stakeholders.

- ◆ A new funding framework opens the economic possibility to integrate new breakthrough technologies into an existing business site (module 6). As a result the site has a new potential for earlier conversion to an energy-positive spot.

Apply modules 2 to 6.

- ◆ In the course of module 5 authorities reject installing wind turbines on the site, because rare bats or birds might be at risk.

Amend a report on the effects of the wind turbine on birds and bats to your basic inventory (module 1) and adapt modules 2 to 6 accordingly (if necessary).

That is the reason why this guide is written in a way that users can just pick the modules that they find interesting or that they need and plug them into their own process.



3.4 HELPFUL TOOLS

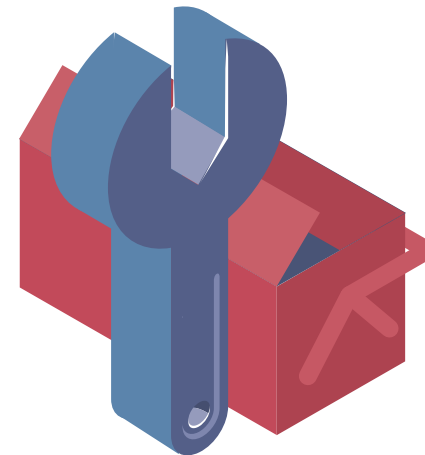
The 11 C2C BIZZ-partners developed different tools that shall serve as auxiliary means for the implementation of a C2C-inspired business site.

Some tools are helpful for all phases of the project, while others refer to a specific module.

Table 5 gives a short description of these tools.

A detailed description of these tools is to follow in Chapter 4.

The **storage media** annexed to the C2C BIZZ guide contains the complete tools, including all features, checklists and technical explanations. There is also a **data dial wheel** enclosed, which allows a quick allocation of tools to corresponding work steps and vice-versa.



TOOL NAME	TYPE	DESCRIPTION	SYMBOL
Inventory of C2C added value potential for business site developments	MANAGEMENT TOOLS	The inventory is a compilation of questionnaires with detailed information on the background of the different aspects (Governance and stakeholders, Finances, Procurement and tendering).	
Communication strategy tool		Tool to analyse stakeholders' dominant value priorities to enable deployment of effective communication strategies and secure their commitment to C2C business site projects.	
Charter		The Charter is a strategic document. It is part of the site definition and shows how, deriving from a general political decision-making process, C2C-ideas can be integrated in a policy strategy.	
Development Framework (combined with a Memorandum of Understanding)		The Development framework (DF) provides a scheme to articulate the C2C related goals in terms of a specific site development parameters and exploitation. It also is part of the site definition. The Memorandum of Understanding is a template for a collaboration agreement between the site owner (or promoter or operator) and the tenants who want to settle in the area. It refers directly to the DF.	
Operational Framework		The Operational Framework (OF) refers to the operational phase. It shows how to formulate substantial and measurable parameters to be fulfilled by the actors during site establishment and operation. Charter and DF are part of the site definition, the OF is not.	
C2C Centre		The C2C-Centre is a platform for knowledge exchange, and a hub of Cradle to Cradle® knowledge. It gives <i>inter alia</i> an overview of C2C CertifiedCM products; an extensive library, profiles of companies working with Cradle to Cradle® and an overview of projects that are Cradle to Cradle® inspired projects.	

TOOL NAME	TYPE	DESCRIPTION	SYMBOL
Continuous loops Online database	CONTINUOUS LOOPS TOOLS	TECHNICAL TOOLS	
Guideline for C2C inspired material management on business sites			
Guideline for energy assessment of business sites			
Guideline for diversity			
Valuation tool			
Guided Choices towards a Circular Business Model			
		The 'Continuous loops tool' can be useful in almost each phase. It helps to learn about organizations and material flows. Intentions and Goals can be defined based on possible exchange of material flows. During Operation, Optimization, Renovation more and more synergies between organizations can be established. The aim of the online database is to link nutrient offers (material flows available) with nutrient demands (material flows required).	
		This guideline provides practical recommendations to managers and businesses on the site on how to improve their material management practises by using C2C concepts.	
		This guideline supports the maximization of implementation of renewable energy solutions production in business sites according to the C2C approach by assessing the renewable energy potential of the site.	
		This guideline offers information about the ways to realize more diversity on a business site in a biological, social/cultural and economical/conceptual way.	
		This tool suggests a decision making framework for the selection of optimal funding sources and types and for building a business case, including the evaluation of the feasibility, viability and financial implications of C2C business parks, as well as the related building projects and business activities.	
		The workbook 'Guided Choices towards a Circular Business Model' answers the question how to benefit from the circular economy.	

Table 5: C2C BIZZ tools at a glance.



3.5 HOW TO DEVELOP A C2C-INSPIRED BUSINESS SITE

3.5.1 MODULE 1: TAKING A BASELINE STUDY

Gathering information is a fundamental work to be done before the actual launch of a C2C-project development.

You need to know what you have!

A comprehensive knowledge of the characteristics of the selected location is necessary to reveal its potentials and to maximize benefits. Therefore, a baseline study is recommended, which is used to:

- ◆ Establish a baseline to compare C2C value-added results with the starting point later in the development.
- ◆ Identify which site and building systems have the highest local potential for introducing C2C added value.
- ◆ Identify stakeholder capabilities and goals which have C2C potential or are already on the way to C2C.
- ◆ Identify priorities for C2C goals which can best support existing stakeholder goals.
- ◆ Identify potential for quick C2C wins.

The extent and content of an inventory depends on type and size of the project. Multi-structure business sites are distinct from inventories for individual buildings. One of the most important distinctions to an inventory for buildings is the **site definition**, which:

- ◆ Determines basic functions, services and features of a site;
- ◆ often is part of feasibility analysis;
- ◆ Is strongly influenced by existing zoning and other standards;
- ◆ Has to focus on involving stakeholders in the site definition (see module 2 'stakeholder interests'), as well as tendering (see module 5 'Tendering and procurement').

USEFUL C2C BIZZ-TOOLS

A template '**inventory tool**' has been developed within the C2C BIZZ Project. It helps business site developers to "know what you have." Because this is a C2C-inventory there is a second purpose: "know what C2C possibilities you have." On the one hand this is done by gathering information to answer the questions of the inventory, on the other hand by explaining why each question is asked and which specific C2C objectives are addressed by the information that is gathered. A third purpose is to give people an idea of "how good they already are". There is an online version of this tool as well as an Excel version.

In addition, a publication "**Guided Choices Towards a Circular Business Model**" was compiled that answers the question how to benefit from the circular economy.

The '**valuation tool**' can be used in planning and implementing C2C projects to address the following three financial aspects as far as possible:

- ◆ Availability and infusion of funds;
- ◆ Financial feasibility and viability of C2C business parks;
- ◆ Right allocation of available funds.

C2C BIZZ SHOWCASES MODULE 1



IRISPHERE

BERTRAND MERCKX, ECORES, BELGIUM

In the context of the Irisphere Project a preliminary diagnosis has been done, which was organized in different sections. Those sections are described below.

AREA ANALYSIS

We began with a geographical situation of the project at different scales (region, municipality, project zone) where we located the area on maps. Then there is a description and a geographical situation of the companies established in the project zone. The description of the enterprises is brief and was synthesized in tables where we listed the sector of the industry (electricity production, construction materials wholesale, etc.), the type of activity (production, sales, offices, etc.) and finally the number of people employed in each company. We also identified the companies with an environmental policy and/or an interest in industrial ecology, as well as the enterprises outside of the scope of the project but with a potential interest in it.

This analysis enabled us to identify and characterize the companies and their situation in the territory. That way we were able to know the project area better and identify the dominant sectors present in the zone which may be helpful in later research for synergies.

TERRITORY FEATURES AND FUNCTIONS

Firstly, we analysed the biological and physical characteristics of the area, which include the ground allocation (rented, bought or unused surface) and the study of the biodiversity through the analysis of the existing Green spaces. We also studied the infrastructures present on the zone, such as the water, gas and electricity supply. Then we investigated the mobility features: roads, traffic, bicycle lanes, public transportation systems etc. We also analysed which services were present on-site (post, catering, security, waste management, etc.). We concluded that section with the actions to be conducted to develop synergies.



STRAWBERRY FIELD

MARITA MESS, WEGE MBH - BIELEFELD, GERMANY

The Bielefeld Project deals in a study with the development of an area called 'Strawberry Field'. This undeveloped area is intended to serve as a model for a planned C2C-inspired business-site. The basic idea is the concept of the total area 'in the circuit'. That is, the agricultural area becomes a business site. After giving up this business-site, the area is dismantled leaving no traces and returned to nature. This is the 'Strawberry Field' concept from the beginning in a structure as a park which progressively developed. Thus, the business site added in the period of its existence makes sense in the overall landscape and settlement structures, and provides the City even after the end of its life a spatially-designed area of environmental and social value. Instead of a

mono-functional business site area, a high quality, multi-functional city block with synergistic relationships to its environment develops. After dismantling the business-site there is no fallow ('brownfield') and thus is no 'down cycling' of the total area. The first step for the development of C2C inspired commercial area is the basic research / inventory. This can only be determined by an exact analysis of the area, which includes potential and how it can be used for further development, in terms of the C2C philosophy. But also the involvement of stakeholders and the financial aspects have to be taken in to consideration for planning a business park. For this, the tools which have been developed by C2C-BiZZ Project team are excellent.

C2C BIZZ SHOWCASES MODULE 1



LONDON SUSTAINABLE INDUSTRIES PARK (LSIP) LALI VIRDEE, INSTITUTE FOR SUSTAINABILITY, LONDON, UNITED KINGDOM

The 25 hectare LSIP is proposed to be at the heart of the largest concentration of environmental industries and technologies in the UK, centred within the wider 'East London Green Enterprise District,' bringing new life and opportunities to the area and an aspiration to be an exemplar park for innovative and emerging technologies industries. In designing this vision, before the C2C BIZZ project arrived, the development team put together a detailed 'wish list' for the Park. Subsequent assessment has shown that many of the vision details align and embrace the three Cradle to Cradle (C2C) principles and are embraced by the LSIP Development Framework. The Development Framework sets out how to locate this spectrum of complimentary industries on the LSIP to accommodate, support and grow environmental technology businesses, embrace eco-effectiveness and encourage symbiotic and sustainable industries. The long-term vision is to create an integrated area where a symbiotic hub is created which can have C2C at its heart. The aim is to create a development model which others can follow. The development team undertook a variety of assessments in populating the site inventory, setting out the baseline for the new park which included the following deliverables:

- ◆ 65,000 m² of eco-effective and diverse business space.
- ◆ Managed infrastructure, including heat/hot water, surface water, site generated electricity and waste, enabling a 'plug and play' approach.
- ◆ Integration into the local transport systems.
- ◆ Positive environmental integration, with high proportion of diversity and safety being key in the design process.

The following were considered as key elements of the development framework:

- ◆ Environmental diversity and an integrated resource management are key distinguishing features of the LSIP.
- ◆ Buildings on the park achieve high benchmarks for energy efficiency, continuous loop and energy resource effectiveness.
- ◆ How synergies between businesses are exploited to ensure that opportunities to minimize the production of and maximize the reuse of by-products are taken, and moving towards a continuous loop system which is enabled through geographical proximity.



STRIJP T HELMA SMOLDERS, SRE, THE NETHERLANDS

For the basic inventory of Strijp T we used the online version of the C2C BIZZ tool 'Inventory of the C2C added value potential for business site developments'. The application of the tool was a real eye-opener. The inventory tool contains inspiring ideas and really made us think about possibilities. The tool is worth while using. It helps you to get a

clear picture of your starting point and at the time it offers inspiring new insights on how to apply C2C. In our case it contributed to the fact that stakeholders are prepared to take the next step in the process. The tool offers the opportunity to keep, add and compare data.



3.5.2 MODULE 2: IDENTIFYING STAKEHOLDERS⁹

The identification of stakeholder interest is another essential factor of each project, which also belongs to each baseline study.

Learning your stakeholders needs will let you improve revenues and savings by focusing on their priorities as well as avoiding things they do not want.

Therefore, a separate chapter is devoted to this aspect.

Learn what your stakeholders want!

A business site is the ‘home’ of companies and must fit their expectations and needs.

A C2C-inspired business site has to fulfil all of these needs, while integrating the C2C-methodology in terms of social, cultural, business and ecological conditions.

Beside enterprises, there are other stakeholders whose interests have to be taken into account. At first these interests must be identified.

IDENTIFYING STAKEHOLDERS

Stakeholders are those people who may be affected by or have an effect on an effort. In the given case of a business site these may be, for example, private persons living in the neighbourhood, potential tenants of the site, nature conservation organizations, public institutions or professional organizations.

In most cases it is convenient first to focus on **Primary stakeholders**. These are people or groups that are directly affected, either positively or negatively, by an effort or actions of an agency, institution, or

9 Compare (The World Bank, 2014)

organization. In some cases, there are primary stakeholders on both sides of the equation: a regulation that benefits one group may have a negative effect on another.¹⁰

In identifying stakeholders, it is important to think beyond the obvious. Some of them are easy to identify, whereas indirect effects are sometimes harder to see.

There are a number of ways to identify stakeholders:

- ◆ Brainstorm. Get together with people in your organization, officials, and others already involved in or informed about the effort and start proposing categories and names.
- ◆ Collect categories and names from community representatives, particularly members of the local population or residents of a geographic area of concern.
- ◆ Consult with organizations that either are or have been involved in similar efforts, or that work with the local population or in the area of concern.
- ◆ Get more ideas from stakeholders as you identify them.

10 Compare (University of Kansas, 2014)

UNDERSTANDING AND ANALYSING STAKEHOLDERS INTERESTS

Having identified the relevant stakeholders for a proposed development, it becomes necessary to secure their buy-in and commitment to the project.

This task could be hampered by particular characteristics of the stakeholders concerned. These characteristics may derive from the extent of influence such stakeholders have, their level of interest in the proposed development or other socio-cultural factors.

Understanding the influence of stakeholders is a first step that helps to establish a priority list of whose engagement is critical for realization of the project.

Beyond this, efforts would have to be made to communicate the **project's vision** in a way that **aligns with individual stakeholder interests**. Whereas some of these interests are largely economic in nature



Figure 8: Stakeholders involved in the 21st century Business Park Charter
© Lille Métropole/Vincent Lecigne.

(see also valuation tool in Section Chapter 4.4), securing actual stakeholder commitment in implementation of any new innovative paradigm can also be influenced by socio-cultural factors that create 'lock-in' (barriers). People and organizations tend to be 'locked-in' to existing practises and are resistant to change despite potential benefits¹¹.

These socio-cultural issues and their lock-in effects would have to be understood and incorporated into promotional materials. It is in this regard that a 'communication strategy tool' has been developed to map the C2C vision to stakeholder interests and needs. The tool is based on the Competing Values Framework (CVF)¹² in Figure 7.

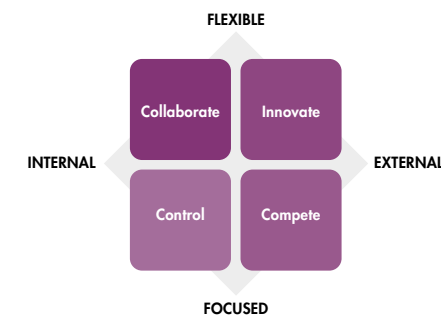


Figure 7: Competing values framework.

The CVF is based on the theory that organizations promote different values. Organizations are more likely to pursue new strategies or invest in change only when this aligns with their value priorities. The CVF presents four organizational value priorities that are in constant competition: collaboration, innovation, competition and control. These value priorities determine orientations towards risk, collaboration and new knowledge.

The 'communication strategy tool' identifies the dominant value priority of a stakeholder and maps this onto a C2C value proposition that most resonates with this value priority. This allows promotional materials to be designed to fully reflect C2C value propositions that align with different expectations.

11 (Petersen, 2009).

12 (Quinn, 1988).

3 HOW TO APPLY C2C TO BUSINESS SITES – MODULE 2

Possible value priorities and their corresponding C2C value propositions are summarized in Table 6 and elaborated upon in the tool (see ‘communication strategy tool’ in Section 4.2.2.).

STAKEHOLDER VALUE PRIORITIES	VALUE PROPOSITIONS TO COMMUNICATE AS BEING SUPPORTED BY C2C APPROACHES.	EXAMPLES ³
COLLABORATE		
This stakeholder promotes human resource development, internal flexibility and knowledge sharing across functional units.	<ul style="list-style-type: none"> ◆ Fosters collaboration ◆ Delivers healthy, inspiring and comfortable work environments. ◆ Reduces employee turnover. ◆ Attracts best talent. 	Developer in Case 3 recognized importance of an environment that attracts high calibre employees. This translated into design of an inspiring countryside business park with nature trails, cycle paths, etc.
CONTROL		
This stakeholder strives for risk minimization and conformity to existing procedures and regulations and is internal-focused.	<ul style="list-style-type: none"> ◆ Future-proofing for new regulations ◆ Showcases good practise standards. ◆ Increases control of future operating costs. ◆ Provides security of energy and water supply. 	Case 8 was an internal-focused organization that recently switched from partial to full ownership of a science park to pursue the goal of increasing the employability of their graduates.
COMPETE		
This stakeholder focuses on overcoming external competition and efficiency through cost minimization.	<ul style="list-style-type: none"> ◆ Offers competitive market advantage. ◆ Increases commercial attractiveness of property to potential tenants. ◆ Reduces running cost of operating environment. ◆ Attracts marque clients or increases customer base. ◆ Increases commercial diversity. ◆ Increases business productivity. 	Case 7 was a developer whose prime focus was competitive advantage over other business parks. C2C allowed them to pitch their park as a high quality premier brand that would attract marque clients, and ultimately achieve higher rents.
INNOVATE		
This stakeholder promotes constant change and dynamism, encourages risk taking and is very flexible and adaptive so as to accommodate new technologies.	<ul style="list-style-type: none"> ◆ Creates dynamic environment to develop and get the newest technology/product to market. ◆ Offers flexible and easily adaptable facilities. ◆ Offers highly ambitious and visionary developments that inspire creativity. 	Case 1 was an R&D organization. Their facility was designed to be flexible and readily adaptable to changing manufacturing processes and new technologies. This reflects the premium placed on innovation.

³Examples from nine case studies undertaken into stakeholder value priorities and how these reflected in their business sites.

Table 6: Stakeholder value priorities and corresponding C2C value propositions.

This approach will help unlock socio-cultural barriers to C2C adoption on business sites. Securing stakeholder commitment based on their value priorities prepares the ground for **setting appropriate goals** for different stakeholders and for exploring **appropriate governance, financing and ownership models** to translate such goals into reality.

These issues are addressed under **Procurement Method**, which defines the involvement and relationships between different stakeholder organizations.

USEFUL C2C BIZZ-TOOLS

After an intense consultation and participation procedure the Stakeholders gain a common understanding. This should be **documented on paper** prior to proceeding with the process.

The C2C BIZZ-partners developed a template for such a strategic document, called **'Charter'**. It shows how C2C targets can be set out in a general way on a political level, not necessarily related to a specific area or a fixed timetable and has been applied at different C2C BIZZ pilot sites (see examples).

It is closely related to other templates (Development Framework, Memorandum of Understanding and Operational Framework) to be set up at a later stage in the site development process. See Chapters 3 and 4.

The **'inventory tool'** provides basic knowledge about the potential of the site.

The publication "**Guided Choices Towards a Circular Business Model**" provides inspiration and support for small- and medium enterprises (SME's) to enter the Circular Economy.

The **'valuation tool'** can be used in planning and implementing C2C projects to address the financial aspects.

C2C BIZZ SHOWCASES MODULE 2



LILLE MÉTROPOLE

JAMILA BENTRAR, AMELIE COUSIN, RACHEL PHILIPPE
LILLE MÉTROPOLE, FRANCE

COMMITTING STAKEHOLDERS THANKS TO A QUALITATIVE APPROACH FOR BUSINESS PARKS

In 2011, Lille Métropole launched a qualitative approach for business site planning. To engage all the economic urban development stakeholders, several working meetings were organized.

This co-production work leads to the 'Charter of the 21st Century BP', which describes: the method; the objectives; the organization of stakeholders' governance and the identification of **six intentions**: density, diversity, mobility, energy-efficiency, ecologic performance, and governance.

Twenty-five important public and private stakeholders participated in the co-creation and signed the Charter. Beyond the Charter, this strong mobilization of stakeholders, especially of the operators, leads to an economic planning governance.

STAKEHOLDERS' INVOLVEMENT THROUGH THE DIVERSITY GUIDELINE

The guideline for diversity, which aims at defining and implementing diversity for business parks, was based on the intentions of the above-mentioned Charter. This guideline was also co-created and involved stakeholders at different stages. Two brainstorm sessions were organized to 'think out of the box' and involved very different stakeholders. To have different points of view, the involvement of stakeholders from different territories and countries was helpful to create an open-minded way of thinking and discussing diversity in business parks.

CIVIL SOCIETY'S INVOLVEMENT IN THE PROJECT DESIGN

The civil society (inhabitants, associations, companies...) was also involved in each project's development steps. Three public meetings were organized: one at the beginning of the competitive dialogue, one

in the middle and the last at the end of the competitive dialogue. It was helpful to define important aspects of the Project and diversity elements. Additional workshops were settled for those essential stakeholders. Public investigation was also organized before the signature of the contract with the chosen operator.

INVOLVING STAKEHOLDERS THROUGH THE COMPETITIVE DIALOGUE: CO-CREATION OF SITE DESIGN

The tendering method allows us to co-create the project with several candidates and with the population in parallel; thanks to the above-mentioned workshops. It was not a 'one shot' tendering process. Several auditions were organized in a few months, the Project evolved continuously during the procedure with these candidates. Lille Métropole also asked them to integrate the feedback and the opinion of the population in their proposals.

CONTINUING THE COMMITMENT OF STAKEHOLDERS THANKS TO LA LAINIÈRE 'HOUSE OF PROJECT'

The 'House of Project' will be the place of site development, exhibitions and a meeting place for people living around the site and future tenants of the sites (notably companies).

It will turn into a house of mutualized services: kindergarden and other services for companies, employees and inhabitants. This place will be the main tool to encourage stakeholders involvement in the Project.

Stakeholders were not the necessary the same at the beginning and at the end of the Project. Different stakeholders have been identified at each step of the Project. However, the diversity of stakeholders is a way to have a better Project acceptability.

C2C BIZZ SHOWCASES MODULE 2



STRIJP T

HELMA SMOLDERS, SRE, THE NETHERLANDS

Strijp T is an existing business site, so only on many stakeholders are on the site. The Municipality of Eindhoven is another stakeholder and also the owners of the adjacent areas.

The first challenge was to convince the Municipality of our ideas for Strijp T to make a diversity design. Their condition for participation was that the design should focus on the usefulness for the companies on the site. The Municipality organized a meeting for the companies on Strijp T and introduced the C2C BIZZ project, which was very helpful. Then the individual companies were contacted to be interviewed. Al-

though a list of questions was prepared, each interview was different and not according to the list. Many dynamics appeared to be present on Strijp T, a good breeding ground for a joint workshop. Based on an Atlas of Abundance (to show opportunities) the stakeholders together formulated their intentions for Strijp T. These intentions were a very good support for the final diversity design.



STRAWBERRY FIELD

OLAF LEWALD, CITY OF BIELEFELD, GERMANY

The C2C-BIZZ Project group in Bielefeld focused on the development of a specific greenfield site ('Strawberry Field'). Inspired by C2C philosophy, we looked for dialogue with the general public and other stakeholders.

In the first year of the Project, a series of events called 'Planning the Future' was launched. Among the different topics 'new building concepts,' 'energy management for business sites' and 'buildings as resource storage' were discussed with external experts, citizens, politicians, architects, planners and entrepreneurs. These discussions proved to be very fruitful. Through the presentations and discussions

with the various stakeholders, we received many suggestions and ideas, which we incorporated into our work. Furthermore, we developed intensive contacts with the companies that decided to locate on Strawberry Field. The purchaser and its planners received both free consultation and a guide, including a checklist, after which they could verify that C2C philosophy had been incorporated into their project planning. Thus, it was ensured that C2C philosophy was taken into account from the outset in project planning.

The collaborations were viewed very positively, which confirms our belief that dialogue and contact with stakeholders is essential.

C2C BIZZ SHOWCASES MODULE 2



LONDON SUSTAINABLE INDUSTRIES PARK (LSIP) LALI VIRDEE, INSTITUTE FOR SUSTAINABILITY, LONDON, UNITED KINGDOM

In the UK alone, over 4 million tonnes of waste are produced every year driving a waste management industry worth nearly £5 billion. As global demand for resources and as the cost of disposing of unwanted materials increase, continuous loop and C2C principles present an alternative approach of using these materials as resources for something else. They aim to design and create production techniques that are efficient, treat by-products as nutrients and convert them into raw material or energy to be fed into other processes or products. However, take up and investment in the UK is slow, partly due to concerns about financial viability and risk management.

The demonstrator will help businesses work together to understand how synergies between their production processes can result in creating additional value from their waste or by-products that would otherwise be down-cycled, sent to landfill or discharged back into the environment, usually for a negative value, but importantly to reintroduce nutrients into the use chain again.

Synergy and symbiosis:

- ◆ Incoming occupiers chosen due to the symbiotic potential they may have with other occupiers.
- ◆ Interdependent and mutually beneficial relationships between occupiers on the Park as it becomes an exemplar within the European context.
- ◆ Site-wide environmental infrastructure for heating and waste management established utilizing on-site energy sources.
- ◆ Site-wide sustainable drainage system serves each development plot, taking surface water from hard standing and attenuating it.

- ◆ Using collaborative agreements, to reduce waste products leaving the LSIP by 5% per annum.
- ◆ In 20 years (by 2025), to have influenced initial production design to assure that ALL waste leaving every individual plot on the LSIP becomes a resource for the other industrial/commercial businesses on the site.

However, to bring this ambition together the owners of LSIP have over the recent years had to carry out meetings, workshops, presentations and information sessions to several stakeholders:

- ◆ The local Planning Authority: to agree a protocol which would set the planning standard by way of Special Planning Guidance which sets out the quality of the buildings, how the infrastructure will work together, the mix of hard and soft development, integration of green spaces, etc. This was important to do to ensure that the basis of any future application had a good basis and that tenants know about the minimum acceptance levels for details etc.
- ◆ Business community: the owners have devoted much time in advertising and marketing the site to potential investors, financiers and businesses to highlight the advantages of the site and how the medium to long term advantage needs to be considered.
- ◆ Industrial community: to set out how this collaborative and alternative way of managing commercial and process information sharing can work as an advantage rather than seeing it as giving away commercially sensitive information.

C2C BIZZ SHOWCASES MODULE 2



IRISPHERE

BERTRAND MERCKX, ECORES, BELGIUM

In the context of the Irisphere Project a preliminary diagnosis of **Policies, programmes and stakeholders** has been performed. We started our analysis by studying the existing plans related to the environment and to sustainable development (e.g. Local Agenda 21, mobility development plans, green spaces management plans). We then investigated the policies concerning waste management. Finally we met the principal stakeholders in order to look into their concerns and understand their point of view.

We focused our efforts to contact keystakeholders with a broad and strong control or knowledge of the territory and the economic actors. For example: Development Agencies, Chamber of Commerce, Park Manager or Entrepreneurial Agencies. It was also very useful to meet the organizations and associations representing or working with the companies, for example: Companies Community, Industrial Associations, etc. To do so, they were invited to seminars and lunches to discuss the Irisphere Project and to learn about other projects in which those stakeholders are involved. That way, we could know the ongoing development strategies (for example concerning waste management) and eventually try to connect those developments with the Irisphere Project.

Others meeting were organized with companies that were identified as key actors. Those actors had some specific features such as: a proactive environmental policy, large capital sums to invest, material/equipment that may be useful in the project (trucks, waste management facilities, etc.) or a strategic workforce (experts or cheap labour force). Finally, we also contacted other structures which could be involved in the development of synergies as a beneficiary (e.g. hospitals, restaurants...) which could benefit from the synergy of specific collection and pooling of organic waste in the surroundings.

BENEFITS

Studying the area, the policies and the stakeholder's point of view offers a great overview of the territory covered by the Project. It allows us to have a better knowledge of the area, the companies working in the zone and the relations between the stakeholders. Indeed, knowing our interlocutors and their activities is very important when it comes to convincing them to join the Project. Doing this preliminary diagnostic is a great way to define the potential and conditions needed to develop synergies amongst the companies located in the area of the Project and its surroundings. For example, finding out that there are many employees in an area where public transportation is very limited is a good indicator that a mobility synergy may interest stakeholders working in the zone. Another example is the existence of brownfields on the area, which offers possibilities for further developments in symbiosis with existing companies.

LIMITS

This preliminary diagnostic allows us to identify certain types of synergies that may be implemented (mobility, collective renewable energy installation investments), but it is important to be aware that many other synergies are also possible. To identify them, it is necessary to go to the field and meet stakeholders in order to know their needs and analyse their material flows.



3.5.3 MODULE 3: STATE YOUR INTENTIONS

The purpose of stating intentions is to let stakeholders know where you are going and where they can join you. This is done by breaking down the C2C principles (waste equals food, use of current solar income, celebrate diversity) to the level of **qualitative guidelines**.

These are addressed as **intentions**¹³ here.

Defining project-specific intentions at the start of a site-development and reflecting on them during the succeeding site development process is a powerful tool to safeguard the original vision. (Out, et al., 2010)

The long-term objective always should be to arrive at a business site that fulfils the C2C-principles in full. As stated in Chapter 3.5, it is recommended to **start with a few C2C-inspired elements**, which will be amended by others in future.

Table 7 illustrates that the formulation of realistic intentions shall be based on the results and conclusion of the former work steps.

C2C-PRINCIPLE	RESULT OF BASELINE STUDY	INTENTION
Continuous loops	<ul style="list-style-type: none"> ◆ Specific type and extent of the required infrastructure. 	<ul style="list-style-type: none"> ◆ Modular design of infrastructure systems for value-added materials recovery¹⁴.
Renewable energy	<ul style="list-style-type: none"> ◆ Determination of wind conditions. ◆ Potential surfaces for PV and solar thermal systems. → Possible net energy production is sufficient. → Supply during times of peak consumption is unsure 	<ul style="list-style-type: none"> ◆ Production of electricity from renewable sources. ◆ (At least) self-sufficiency in current- and heat-supply. ◆ Integrating technical improvements in terms of energy consumption (breakthrough efficiency¹⁵).
Diversity	<ul style="list-style-type: none"> ◆ Strained local traffic situation, causing high costs for the economy (e.g. transport delays, dissatisfaction). 	<ul style="list-style-type: none"> ◆ Establishing a balanced traffic concept. ◆ Promotion of integrated public transport, non-motorized individual transport and electric vehicles.

Table 7: Examples for intentions, according to the three C2C-principles.

¹³ In C2C-literature, intentions are also referred to as 'ambitions' or 'aspirations' or "quality dimensions".

¹⁴ (Braungart, 2014)

¹⁵ Unifying intentions for each of those terms is the focus on quality as a priority. First be qualitative then later be quantitative. (compare Mulhall, et al., 2013)

Other examples, how the **qualitative dimension of intentions** can be projected into C2C-inspired elements are¹⁶:

- ◆ Measurably recycle biological nutrients and water by integrating biomass production into buildings, landscaping, and spatial plans to generate more biomass, soil and clean water than before development of the site.¹⁶ i.e. integrated greenhouses, winter gardens, climate walls.
- ◆ Use materials whose quality and contents are measurably defined in technical or biological pathways from manufacturing through use and recovery.
- ◆ Use materials whose impacts are measurably beneficial for human health and the environment.

- ◆ Modular design of buildings for value-added materials recovery.
- ◆ Integrate measurable species diversity so the area supports more diversity than before development.
- ◆ Integrate renewable energy (current solar and gravitational income) into buildings and areas so the building and site generate more energy than they use. Use exergy as a way to guide energy effectiveness i.e. solar chimneys, heat/cold storage.
- ◆ Rainwater management and harvesting including integrated rainwater and effluent reuse at building level for value. especially added water savings.

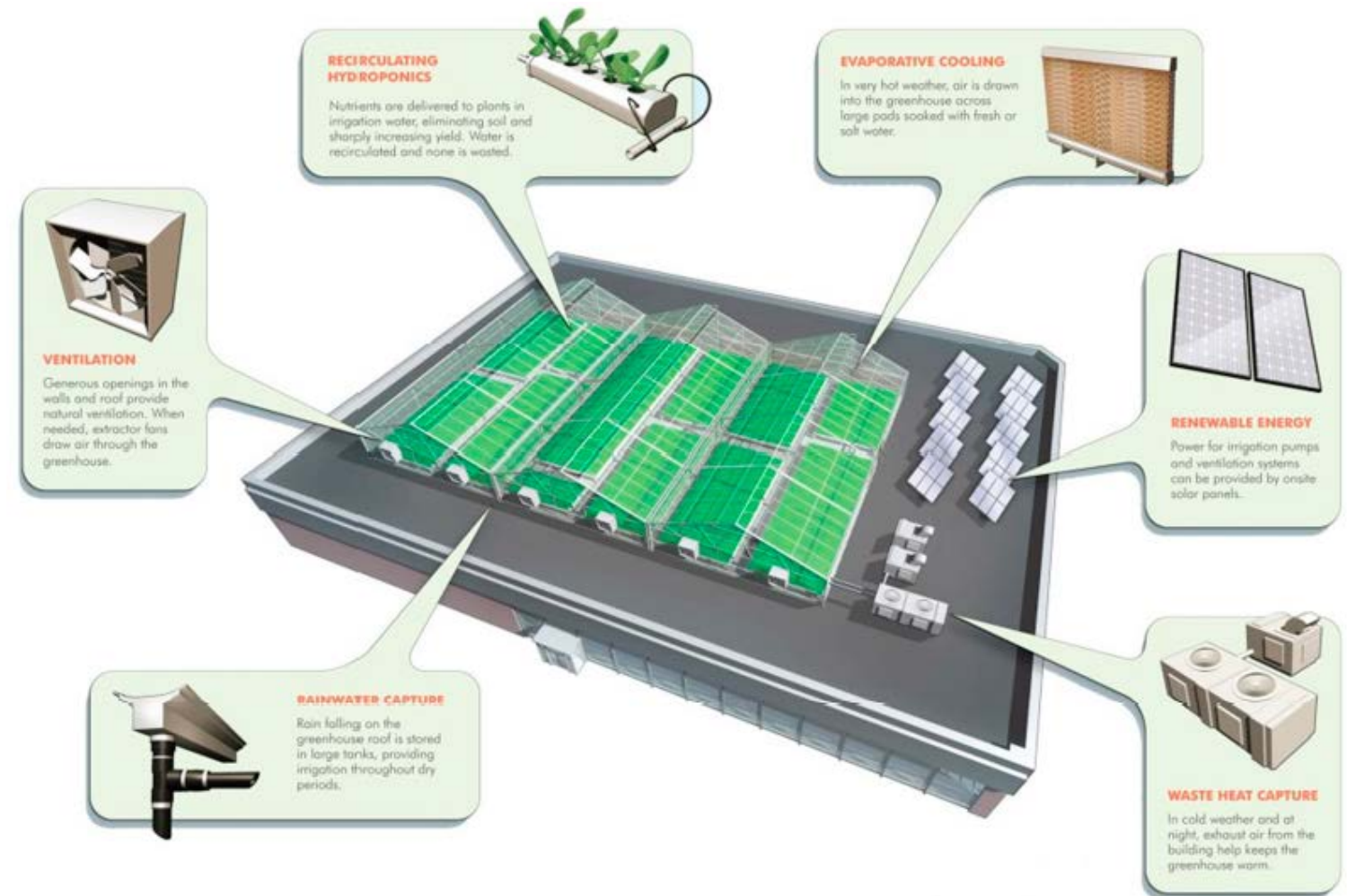


Figure 9: Building Integrated Greenhouse, Courtesy of BrightFarms Inc., N.Y.

¹⁶ compare (Braungart & Mulhall, 2010) and (Braungart, 2013)

PUTTING INTENTIONS ON PAPER

As it comes to finding a common understanding, there might be different approaches according to the specific situation and to the composition of the stakeholders. There are two examples:

- ◆ An existing business site is about to be redeveloped. The alignment of C2C intentions with the tenant's perception is considered essential for successful project realization. This means that innovative enterprises (Front runners), as well as conservative companies (Adopters) must accept and support the intentions. Intentions for Front runners may be more ambitious than those for Adopters. Regarding the latter, successful and reliable examples of C2C transformations are important to awaken their interest in the concept. Thus, a showcase

demonstrating the C2C-idea may motivate a neutral stakeholder more than a written concept for the business site.

- ◆ A municipality intends to create a new business site. Market studies did not clearly identify, which companies potentially will show interest. The municipality hesitates to define specific intentions in order not to discourage companies. In this case, a 'catalogue' of intentions and C2C-elements may be attractive for open-minded enterprises. It may be the nucleus for a complete C2C-business site, regarding C2C-ideas from the beginning.

BEST PRACTICE CASE

INTENTIONS STATED AT PARK 20|20, THE NETHERLANDS

- ◆ Use of defined products and materials for healthy buildings.
- ◆ Integration of optimum solar and wind orientation (to reduce energy demand) for building within the context of the tight urban block and the development programme requirements by adjusting the building fabric to ensure solar access in winter.
- ◆ Integration of regenerative landscape strategies respectful of the 'cultural landscape' and the distinct planning template of the 'polder grammatical' (narrow lots and orthogonal roads, vegetation and canals) by: introducing a more ecologically diverse plant palette, using the landscape standards in exterior planting and creating a more biologically robust interior gardens, connecting the interior gardens to regional ecology

with landscape corridors, creating additional landscape area on roof surfaces and parking decks.

- ◆ Implementation of effective district-scaled sustainable infrastructure approaches by aligning scale and types of land uses (i.e. hotel demand for hot water using office wastewater treatment output of biogas fuel for heating) and creating a centralized treatment facility for wastewater, energy and stormwater on site.
- ◆ Implementation of C2C agenda of waste-free design by treating wastewater on site, capturing energy and soil amendments, and eliminating sewage discharge.

USEFUL C2C BIZZ-TOOLS

The **'inventory tool'** provides basic knowledge about the potential of the site.

The publication "**Guided Choices Towards a Circular Business Model**" gives inspiration and support for small- and medium enterprises (SME's) to enter the Circular Economy.

The **'valuation tool'** can be used in planning and implementing C2C projects to address financial aspects.

The **'continuous loop tools'**, the **'guideline for energy assessment'** and the **'guideline for diversity'** enable the planner to discover the possibilities to implement the three main C2C-principles at the site.

The C2C BIZZ-partners have developed several templates to record and set out clearly the jointly agreed intentions in writing. One of these is called the **'Development Framework'** (DF). The DF provides a significant amount of detail about the site, its intentions, the defining parameters, the final goals, planning and other restrictions and the aspirations for the whole site. The DF should be accord with a **'Charter'**, which has been signed before the DF and sets out the broad principles which parties will follow.

It should ideally be combined with a **'Memorandum of Understanding'** (MoU), which is a proposal template for a written agreement between the owner/developer and the tenants of a business site. It sets out the common objectives in terms of the implementation of C2C and defines the responsibilities and obligations of both partners, especially around sharing commercial information and data about operations.

C2C BIZZ SHOWCASES MODULE 3



STRAWBERRY FIELD

MARITA MESS, WEGE MBH - BIELEFELD, GERMANY

The 'Strawberry Field' site in Bielefeld is being developed as a business area. A study confirmed that it is an ideal site to locate a C2C business park. The first step for the development of the overall concept is dialogue, which the C2C Project team in Bielefeld has sought with all stakeholders. In events, workshops and counselling sessions, intentions and C2C elements have been discussed and defined. Then, external experts who are familiar with C2C philosophy, such as Cityförster (Architecture and Urban Design), Drees and Sommer (Advanced Building Technologies) and the law firm Streitböcker / Speckmann Bielefeld, have been integrated into the process. Explored topics include:

- ◆ Preparation of a development plan, with stipulations that correspond to C2C philosophy.
- ◆ Representation of the industries that work well with each other, in accordance with C2C philosophy.
- ◆ Finalization of contracts, determination of development plans and voluntary commitment of companies, in collaboration with the external experts.

As a result, a summary of intentions and C2C elements is being developed, which can generally serve as a prototype for the development of other industrial estates.

C2C BIZZ SHOWCASES MODULE 3



LILLE MÉTROPOLE

JAMILA BENTRAR, AMELIE COUSIN, RACHEL PHILIPPE /
LILLE MÉTROPOLE, FRANCE

To state the intentions, Lille Métropole developed the 21st century business parks charter, with the strong mobilization of stakeholders (see Module 2). The ambition is centred on six key values:

- **Density:** Developing business parks which are dense and intense so as to make intelligent land users. This also involves improving local employment and the social value of these inner-city areas.
- **Diversity:** Making business parks open and permeable areas, which are living areas for companies, employees and residents, and which fit perfectly into their environment and the city, making the park an area for all types of economies, developing a diversity of urban and economic functions; in short, genuine city segments.
- **Energy efficiency:** Innovating in energy efficiency for business parks by designing these in an efficient manner, and also favouring the production of energy, so as to be self-sufficient and to create other synergies.
- **Mobility:** organizing the business park as an efficient location for all kinds of mobility (public transports, freight, data).
- **Ecological performance:** Improving the ecological performance of business parks by making parks diverse in terms of biodiversity (animal and plant life).
- **Governance:** Adopting dynamic and shared governance, establishing a relationship between companies, local authorities, professional stakeholders and residents.

Lille Métropole also focused on diversity intentions for business parks, which are the following:

- **Diversity of uses in a Business Park,** to improve the quality of life and employment of all (a business park as a part of the town in its diversity and quality); to raise consciousness (awareness of the importance of economy/business in society, citizens' appreciation projects).
- **Economic Diversity,** to create complementarities and synergies in the economic system (constitution of natural clusters); to offer

flexibility to the territory (diversity and flexibility against difficulties within different economic sectors, ways to avoid the use of brown-fields).

- **Governance for the diversity of stakeholders:** it has to be adapted to each step and each stakeholders, to improve the co-operation of the actors.
- **Biodiversity in a Business Park:** necessity of increasing biodiversity; developing biological corridors, choosing local plants to ensure continuity.
- **Diversity in design and uses of land:** public transport policy, modularity of constructions.

The Lainière urban reconversion plan is based on the principles of the 21st Century Business Parks Charter (denser, job-intensive, transport and energy efficient) and on the diversity principle: 70% of activities and 30% housing; creating and restructuring public spaces, road systems, various networks and soft links for pedestrian/cycling travel; urban/parcel services; small and medium production and logistic activities; and related tertiary activities (offices). The purpose of the Project is also the proposal of a balanced and diversified housing programme that meets the needs of the territory and to target the public at large by proposing a wide range of service provisions and prices with public rental housing, home ownership at a controlled price and free accession to property. These mixed functions accord with the Cradle to Cradle diversity principles. The business park will also serve as a biodiversity tool. Within the context of the operation, a 'House of Project' will be implemented and it will be inspired by the Cradle to Cradle diversity principles. It will enable to put the redevelopment site project in the context of its history. It will be a friendly place and open to all, and will facilitate the creation of relationships between residents and workers. It will be used as a place for conferences, meetings and company seminars, it will let the residents participate (photo exhibitions, testimonies ...), it will associate the district committee and the associations for its animation. It will be the driving force of local activities (sports activities, community restaurants, discussion cafés for citizens ...).

For other C2C BIZZ Showcases see Chapter 5
(pilot site descriptions).



3.5.4 MODULE 4: SET GOALS

Within a C2C-planning process, this work step marks the transition from a general level (idea, vision, intention) to a more technical level where substantial project-elements are defined in detail. This necessitates intentions to be transferred into quantitative targets, which are hereinafter referred to as ‘goals.’

Goals provide the network to let you break down intentions into time-tables and specific operational plans. They have a **quantitative dimension** and are **measurable in economic, technical, productivity related or ecological terms**.

At this level, different business models, such as leasing, fee per use or service contracts, can be discussed and included in the goal setting process.

By focusing a goal on the intended effects, the planners and developers give themselves criteria for decision-making processes and fitting technical solutions. The clearer the results to be achieved are quantifiably defined, the easier will be their realization.

With reference to the example intentions in module 3 possible goals are listed in the following table:

C2C-PRINCIPLE	INTENTION	GOAL
Continuous loops	<ul style="list-style-type: none"> ◆ Modular design of infrastructure systems for value-added materials recovery.¹⁷ 	<ul style="list-style-type: none"> ◆ Use at least 20% of C2C-defined materials for business site infrastructure.
Renewable energy	<ul style="list-style-type: none"> ◆ Production of electricity from renewable sources. ◆ (At least) self-sufficiency in current- and heat-supply. ◆ Integrating technical improvements in terms of energy consumption (breakthrough efficiency¹⁸). 	<ul style="list-style-type: none"> ◆ In 10 years the site as a whole (including the capacity of companies’ buildings) is a net generator of energy.
Diversity	<ul style="list-style-type: none"> ◆ Provide users with diverse options for accessing the site by establishing a balanced traffic concept. ◆ Promotion of integrated public transport, non-motorized individual transport and electric vehicles. 	<ul style="list-style-type: none"> ◆ Flexible connection to regional public transport network meeting at least the needs of 50% of staff working on site, ◆ Connection to the local cycling track network and establishment of a bicycle rental system within a 5 year-period.

Table 8: Examples for goals, according to the three C2C-principles.

It is recommended by (Mulhall, et al., 2013) to integrate stakeholders potential C2C goals with generic C2C goals and site-specific goals. The best way to do this is to focus on a few **C2C-inspired elements** that integrate those goals to maximize their effectiveness.

17 (Braungart, 2013)

18 (Mulhall, et al., 2013)

PUTTING GOALS ON PAPER

Goals can be graphically described in a framework document. Roadmaps can be used to define the timeline. As an example; the 10-year roadmap of Ecoparc Windhof (Pilot site C2C BIZZ) is shown in Figure 10.

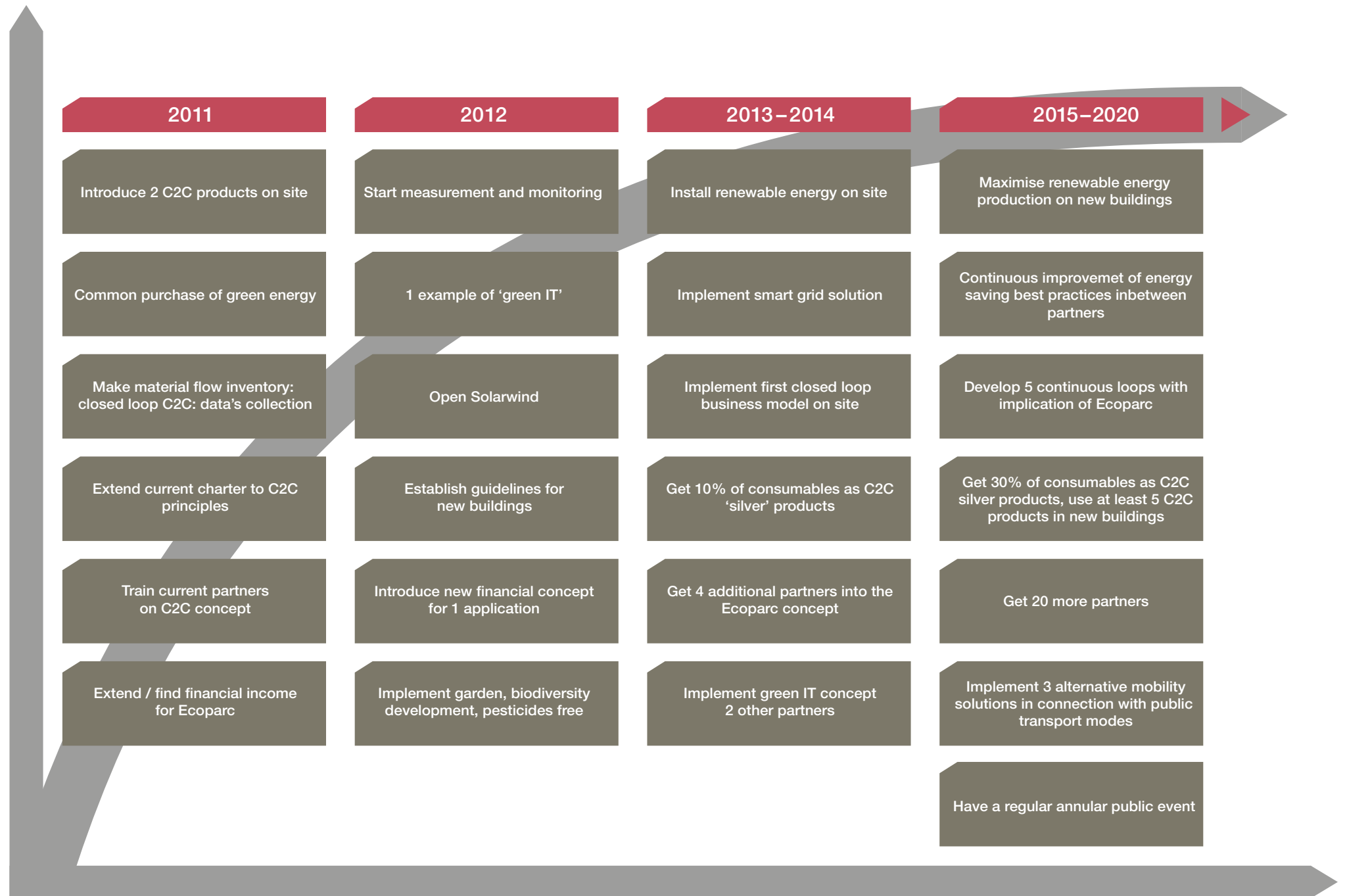


Figure 10: Roadmap Ecoparc Windhof (see also Chapter 5.2.1).

USEFUL C2C BIZZ-TOOLS

Beneficial goals can be put in writing by using the different C2C BIZZ-templates – ‘**charter**’, ‘**development framework**’ and ‘**memorandum of understanding**’ as well as ‘**operational framework**’.

The ‘**inventory tool**’ provides basic knowledge about the potential of the site. The publication “**Guided Choices Towards a Circular Business Model**” gives inspiration and support for small- and medium enterprises (SME’s) to enter the Circular Economy.

The utilization of the ‘**continuous loops online database**’, the ‘**guideline for C2C inspired material management on business sites**’, the ‘**guideline for energy assessment**’ and the ‘**guideline for diversity**’ allow conclusions on the possible degree to which a goal could be attained.

The ‘**valuation tool**’ can be used in planning and implementing C2C projects to address the financial aspects.

C2C BIZZ SHOWCASES MODULE 4



SHOWCASE ECOPARC WINDHOF

JEANNOT SCHROEDER,
CSD S.A. MEMBER OF PROGROUPE GEIE,
GRAND DUCHY OF LUXEMBOURG

The aim of the Ecoparc Windhof co-operation is to make the business park more sustainable, by improving economic and social development and creating a positive impact on the surroundings. On the site the willingness to apply a revolutionary way of making business already exists. Different companies work together on a voluntary basis to go beyond sustainability by applying C2C principles. The companies are creating value by using synergies.

LET'S FIRST LOOK AT ELECTRICITY

In a first instance the partners decided to have a competitive bidding process for the supply of 'green' electricity. By putting together all the purchasing power, we were able to reduce the total cost and to be supplied with electricity produced via renewable resources. In a second step a best practice office building has been built, which integrates all possible renewable energies together in a revolutionary concept: geothermal, solar photovoltaic, solar thermal, wind, and biomass. The biomass is actually provided by another member that has surplus of wooden pallets.

In addition, smart metering in several buildings monitored the use of energy, the best ways to save electrical energy, so that we can share best practices.

In addition, a quick scan method has been applied on site in order to obtain an overview of the total potential for renewable energy on site.

THE CONTINUOUS LOOP PROCESS

First of all we investigated the total amount of waste generated on site and the quality of the materials. In three different areas, the waste streams are well segregated in order to maximize the quality of the materials. By so doing, there is a way to generate a small income from this material flow, instead of paying for it.

In addition, we have implemented a separate on site waste collection system for high quality paper. This paper quality can be returned to a paper manufacturer and the loop can be closed in such a way. We are financing his additional effort, because we combine this with an additional service: preservation of confidentiality. The process put in place ensures that the confidentiality is reserved until the paper has been shredded on site. This is an illustration that you can add a positive effect to a positive effect.



3.5.5 MODULE 5: PROCUREMENT AND TENDERING – FROM DESIGN TO CONSTRUCTION!

3.5.5.1 WHAT MAKES THE DIFFERENCE?

The question is if there are any differences between designing and constructing a C2C-inspired business site compared with a traditional site. The answer is that there are **no fundamental differences** to traditional design and construction processes, but manifold intentions and goals have to be considered and established.

The design team has to merge them into a **holistic design** and to enable positive impacts on economy, society and environment, at present and in the future.

The design should be set up in such a way that innovations may be simply and flexibly integrated at a later stage.

This challenging demand has been discussed in ‘Module 3 - State your intentions’ and ‘Module 4 – Set goals.’

DESIGN TEAM

Achieving a holistic design is only possible by involving those consultants and those suppliers from the beginning, which have knowledge of sustainability concerning environmental, social and economical issues, preferably with a special focus on *Cradle to Cradle*®. **Early team building** facilitates stakeholder intentions to turn into innovative solutions.

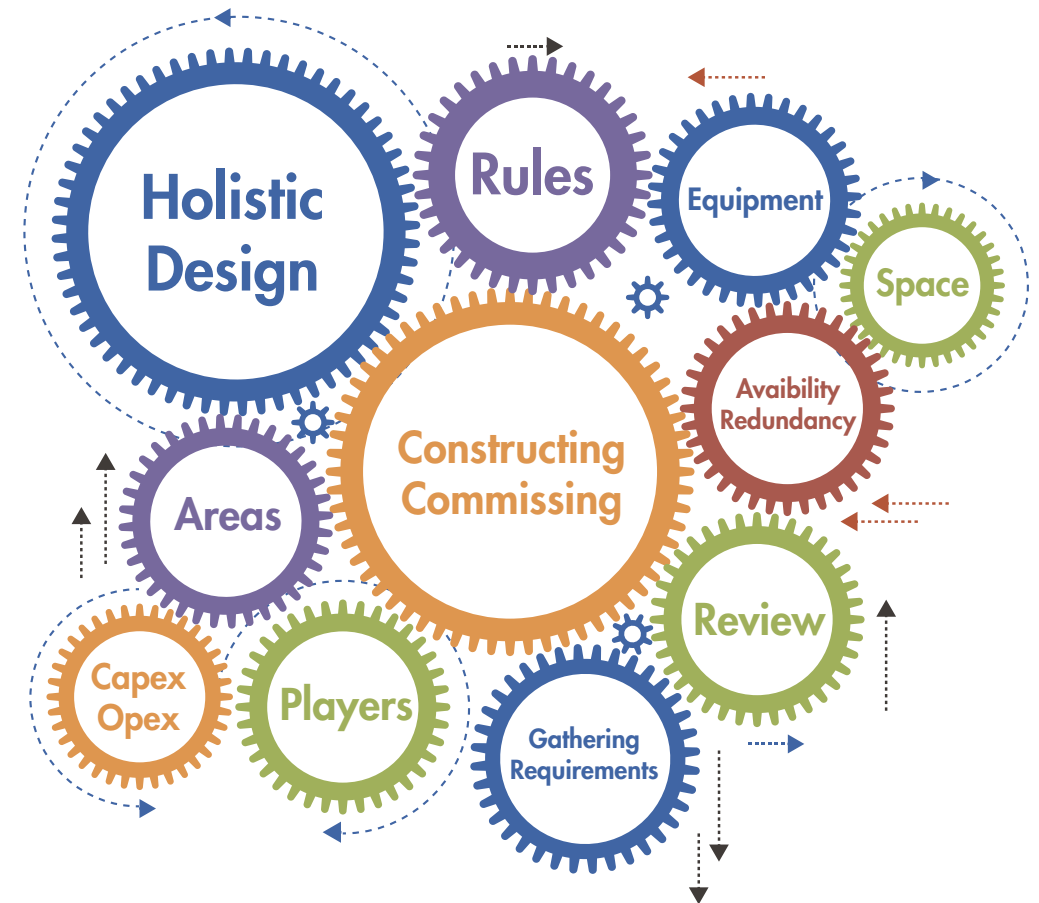


Figure 11: Factors that influence Holistic design (Courtesy of Belden Inc.).

CONSTRUCTION

The procurement procedure for a business site is usually split into two phases: first comes the site definition, then the tendering for individual building designs or groups of building designs, depending on results of the site definition. After that the construction tendering is done.

Once the contract with one or several companies is signed, construction work starts.

The EU reports that “*construction and demolition waste is one of the heaviest and most voluminous waste streams generated in the EU. It accounts for approximately 25-30% of all waste generated in the EU and consists of numerous materials, including concrete, bricks, gypsum, wood, glass, metals, plastic, solvents, asbestos and excavated soil, many of which can be recycled.*” Construction and demolition waste therefore has been identified as a priority waste stream by the European Union¹⁹ (http://ec.europa.eu/environment/waste/construction_demolition.htm). Some of these components have a high resource value. Accordingly, such material must be recycled or re-used without a loss of quality after use.

As stated in (McDonough & Braungart, 2013), a **C2C strategy** does not only contain possibilities to reduce the amount (and cost) of waste by, for instance, consequently collecting and separating it on the construction (and demolition) site. It is more an innovative design development process that includes the construction period itself and reveals added-values by using **C2C-compliant construction methods**.

Examples and recommendations are set out below:

- ◆ Use defined, non-energy intensive construction materials, ideally from local sources.

19 (European Commission, n.d.)

- ◆ Use modular building techniques for maximizing flexible use potential.
- ◆ Use precast-elements, instead of manufacturing those elements on-site.
- ◆ Prefer construction methods that place a strong focus on the re-use of materials through easy disassembly once the useful life of the building has been reached.
For instance, use ‘dry’ constructions instead of traditional masonry. When the building reaches the end of its useful life, it can be dismantled through an easy separation of materials used in construction, with the potential to use them in recycling processes and/or reuse.

PLANNING THE CONSTRUCTION PERIOD AND BUILDING SITE FACILITIES

Construction measures which may have impacts on habitats on the site should be co-ordinated with experts. For example the cutting down of hedges should not be done during the breeding season or it should be checked if area-typical plants could be resettled to gardens, green zones or green roofs in the business site.

MATERIAL RE-USE APPROACH

Considering the easy disassembly of structures after use and their use as a ‘material bank,’ it is absolutely necessary to document materials used for construction, as well as the applied construction methods (‘reverse construction’).

BEST PRACTICE CASE
DISMANTLING OF WORLD GARDEN EXPO FLORIADE 2012
(CITY OF VENLO)

About 90% of the developed Floriade Park was transferred to the Venlo Greenpark, consisting of most of the technical infrastructure; roads and paths and the developed, landscaped park. Temporary buildings like greenhouses, restaurants, kiosks and service facilities were returned to the producers or found their second life with in another horticultural exhibition. The high percentage of reuse was possible because of an integrated masterplan approach for Floriade and Greenpark.

Nevertheless, for some projects it was not possible to define a longterm reuse in advance. The Floriade Organization had to dismantle these projects without having a reuse concept. For these projects innovative reuse solutions were developed in co-operation with the dismantling and demolition companies. Due to this additional sustainability effort less than 1% of the Floriade materials passed through a down-cycling process.



3.5.5.2 FLEXIBLE PROCUREMENT IS THE KEY!

The composition of the design team, the role of the different parties within the design development process and the selection of a procurement procedure in essence goes back and is influenced from the decision on the Governance / Ownership model to be used. It is highly dependent on the participation of the public sector.

While **Private developers** are often free to use the procurement method that fits their needs best, the possibilities of **public bodies** are defined and limited by national and EU procurement law.

GOVERNANCE/OWNERSHIP MODELS

As shown in Figure 12, available Governance/Ownership models range from traditional public procurement (low degree of private sector risk and involvement) on the one end to complete privatization (high degree of private sector risk and involvement). **Public-private partnership** models fall in the middle of this spectrum. They involve a contract between a public sector authority and a private party, in which the private party provides a public service or project and assumes substantial financial, technical and operational risk in the project.

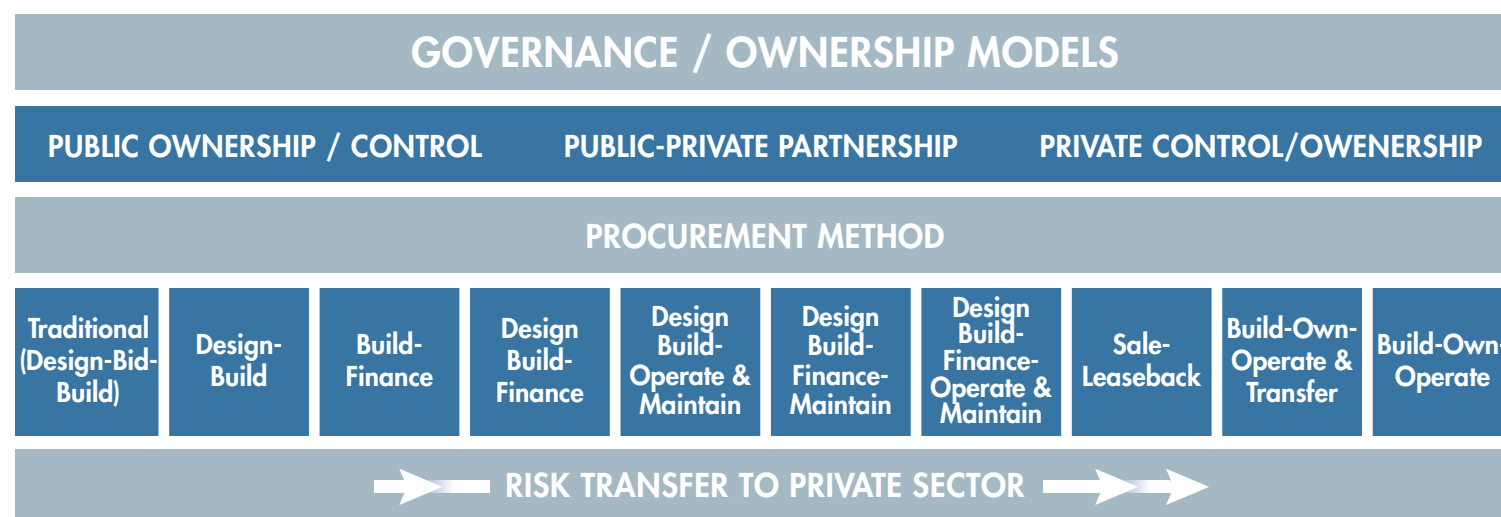


Figure 12: Governance/Ownership models and procurement methods.²⁰

²⁰ Compare with (PPP Canada, 2011).

PROCUREMENT PROCEDURES

There are different procurement procedures used to award contracts.

THE OPEN PROCEDURE

This is where all interested suppliers are asked to return tenders by a set date. These are then evaluated and the contract is awarded. This procedure is often used by local councils, but is usually not feasible for large projects.

THE NEGOTIATED PROCEDURE

In this procedure, the buyer enters into contract negotiations with one or more suppliers. This procedure is used by private and public buyers. The latter have to take into account EU thresholds, typically 5,186,000 EUR for works contracts, works concessions contracts, subsidized works contracts and 207,000 EUR for all service contracts, all design contests, subsidized service contracts and all supplies contracts. Due to size, the cost of a business site development in many cases exceeds these EU thresholds.

Thus, for large contracts the procurement procedures with participation of the public sector usually are limited to the two following options.^{21,22}

THE RESTRICTED PROCEDURE^{21,22}

The restricted procedure traditionally comes along with the **Design-Bid-Build-method** (also referred to as Competitive Bid), which specifically is used for construction purposes.

It is a linear process, where one task follows completion of another with no overlap possible. Plans and specifications are completed by the architect/urban planner and engineers with various expertise. Then bids are issued. Contractors bid the project exactly as it is designed. The design consultant team is selected separately and reports directly to the property owner. Suppliers join the construction team at a very late stage in the process.

Such methods constrain competitive innovation between suppliers and prohibit negotiations. Once the award process has started, the Contracting Authority in essence is required to have defined the service specification (what was to be done, how and to what standards) and the contractual terms and conditions in advance of the process.

This often does not lead to the desired result, because:

- ◆ The use of synergies, the conscious consideration of the specific regional and local circumstances and the co-ordination with adjacent uses require the co-operation of all involved bodies.
- ◆ The C2C-concept, with its aspirations, requires and stimulates innovative design and new developments. Fitting measures and concepts are often developed during the planning and implementation phases.
- ◆ When competing architects / urban planners are asked to give site definition input or input with regard to the Master Plan, they often do not contribute their best concepts, due to fear of losing them to competitors. As well, good ideas are often lost when one concept ‘wins’ over others.

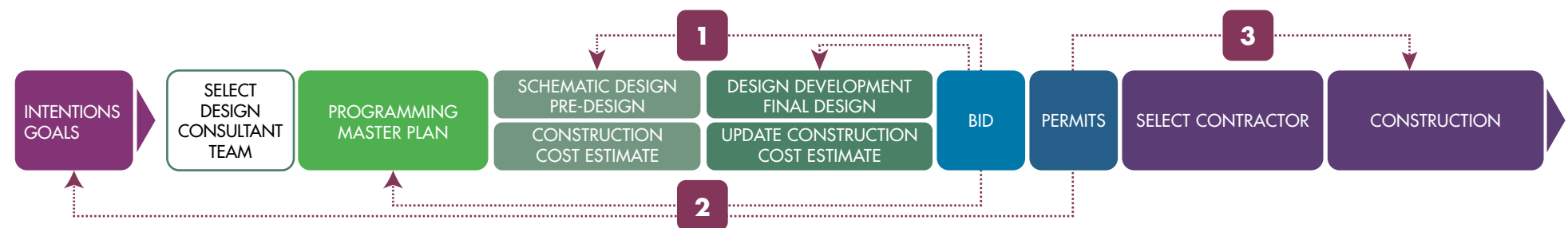


Figure 13: Flowchart Design-Bid-Build DBB (Competitive Bid) method.

21 (The Office of Government Procurement, 2010).

22 (Burnett, 2009)

HOW TO ADAPT EXISTING RESTRICTED PROCUREMENT PROCEDURES TO C2C?

Procurement law allows public bodies to carry out a so called **two-stage procurement process**. This method is favoured in more complex projects; as it is the case, for example, with C2C inspired business sites, where the contractor and its suppliers may have significant design input.

In the **first stage** the Contracting Authority does a market consultation. It advertises its requirements and invites expressions of interest. This enables contractors and its suppliers to become involved and to issue their ideas at a very early stage of the planning process at an earlier stage. So the tenders are submitted on the basis of minimal information.

In the **second stage** the public procurers team will develop the precise specification in conjunction with the selected contractor.

Another provision known as the Innovation Provision, is included in European as well as national legislation. It allows no-bid or limited-bid procurement if a special innovation is demonstrated.

THE COMPETITIVE DIALOGUE PROCEDURE ^{21,22}

Experience suggests that it is more effective to pay a small number of architects to collectively define the site. The resulting platform is used as a level playing field to invite competing building designs later. It is more cost-effective for the owner and architects, because it integrates the best concepts. In addition, C2C-inspired leasing concepts possibly can be identified, that generate value and cost-benefits, as well as advantages by moving assets from CAPEX to OPEX²³ ((Mulhall, et al., 2013).

This is a major reason why the EU introduced the ‘**Competitive Dialogue**’ as a new procedure for awarding public contracts. It allows a public entity to discuss, in confidence, possible solutions in the dia-

²³ “Operating expenditure (OPEX) is an ongoing cost for running a product, business, or system. Its counterpart, a capital expenditure (CAPEX), is the cost of developing or providing non-consumable parts for the product or system”. Source: Wikipedia (http://wikipedia.sfstate.us/Operating_expense)

logue phase of the tender process with short-listed bidders before calling for final bids. This can often occur in the case of complex and high value infrastructure projects, such as C2C-inspired business sites. To achieve this aim, Art. 1(11)(c), Directive 2004/18 defines Competitive Dialogue as “a procedure in which any economic operator may request to participate and whereby the Contracting Authority conducts a dialogue with the candidates admitted to that procedure, with the aim of developing one or more suitable alternatives capable of meeting its requirements, and on the basis of which the candidates chosen are invited to tender...”

The procedure is outlined in Figure 14.

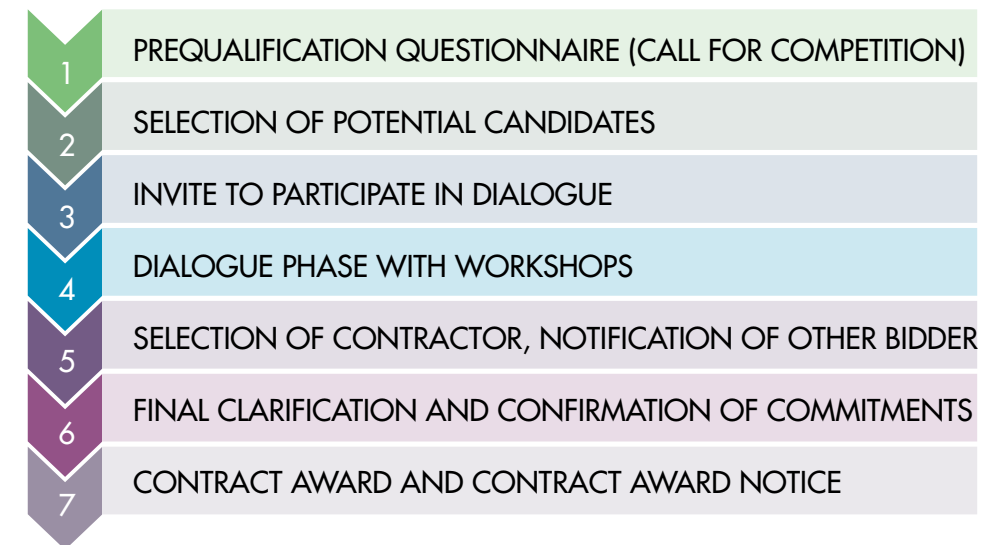


Figure 14: Flowchart Design-Competitive dialogue method.

It cannot be assumed that potential candidates are familiar with this procurement method. Therefore, it is advisable **to actively invite and attract** the participation of such companies that can support the realization of a C2C-inspired business site.

Here are two best practice cases on how this can be done.

BEST PRACTICE CASE PROCUREMENT AND TENDERING AT PARK 20|20 THE NETHERLANDS²⁴

- ◆ “In a traditional process, developers design the building and tender it out. Down the whole chain, everyone is hitting the bottom of your quality needs and at the lowest price, which isn’t creative or efficient” says Coert Zachariasse, Owner and CEO of Delta Development Group, the private developer of Park 20|20. “Since everyone in the supply chain gets contracted after the design has been done, you don’t benefit from their know-how in those early stages.”
- ◆ Delta Development Group chose a C2C-inspired approach with early involvement of suppliers. They were asked, which C2C-certified materials they had available. “There was discouragingly little, so we asked 72 suppliers to give us products they thought came close to what we needed,” said Coert Zachariasse. “We ended up with 320 materials, and we involved McDonough Braungart Design Chemistry in the testing process.”



- ◆ Park 20|20 was able to attract 41 suppliers that have either obtained C2C certification or have been confirmed as a supplier of an acceptable alternative where no certified product exists. In addition, they devised financial leases with material suppliers that allow those suppliers to retain ownership of materials used in construction. Detailed plans are kept on file showing the exact materials used and where they were placed. The developer pays rent for use of building materials, with the supplier having the potential to recover the value of the material when the lease expires and take the components back if the building is disassembled. “This makes our upfront construction costs lower because we only invest in the use of the material. And it makes sense for suppliers because materials are valued on the expectation of rising commodity prices” said Zachariasse.

This procurement method does not necessarily have to be just narrowing to one bidder. As described in the following show case, three bidders were selected for the site definition process.

²⁴ (Scott, 2014)

BEST PRACTICE CASE

RONNEBY PRE-SCHOOL PROJECT
 (RONNEBY MUNICIPALITY, SWEDEN)

Laura Vidje and William Lavesson, Ronneby Municipality


When the decision came to replace the pre-school in the village Listerby, *Cradle to Cradle*® thinking had just gained momentum in the Municipality. The planning started based on the quality programme that embraces Cradle to Cradle values.

As a first step a **number of workshops and stakeholder dialogues** where conducted. This included the staff working at the pre-school, the facility management, the public servants, the neighbours as well as the kids and their parents. Every stakeholder had the chance to bring forward their concerns and wishes for the new pre-school. The kids from age 1-5 drew and explained their drawings to the staff, so that their input could be included in the resulting **document with all intentions and goals** for the new pre-school. The document was categorized into Cradle to Cradle principles and in detail into ambitions for quality in different areas, e.g. healthy air and climate, renewable energy, healthy materials, biodiversity enhancement and more.

During this whole stakeholder dialogue the municipal architect was present and listened to stakeholder wishes and incorporated all C2C goals. The architectural drawings where produced and adapted during the whole process.

When the document included all ambitions and intentions of the stakeholders, it became the basis for the continuing work of consultants. These consultants have been involved in previous projects and were conscious about the upcoming procurement process, but they lacked knowledge on C2C. Therefore they were educated in C2C principles to be able to include these values in the tender request document (förfrågningsunderlag in Swedish). The consultants combined a very comprehensive tender request document of almost 400 pages, including 20 architectural drawings of the building. This tender request document included all ambitions within the different C2C categories, plus measurable goals that can be evaluated. One example was the requirement for healthy materials, as a support the material-database Sundahus and their criteria for healthy materials were chosen and had to be in compliance with every material used in the building. Other

examples were on functional requirements, and 3D-planning to avoid errors and losses.

The **procurement process was open and direct, no staged process or competitive dialogue**, and all under EU-law (Government procurement in the European Union – in Swedish: Lag (2007:1091) om offentlig upphandling LOU). Ronneby Municipality is also enforcing green public procurement. The usual method for design and built contract (in Swedish: totalentreprenad) was chosen, as the public servants were used to this method. That means that required functions were described, but the contractor had to solve issues in further detail.

Three companies applied with a tender, and all of them were eligible. The company who was awarded the contract was well known and had a reliable background, so no extra proposals or evidence of experience was required. The choice was made based on the most economically advantageous tender.

The next step included Cradle to Cradle education for the contractor and later on even for sub-contractors. Further discussions were conducted with the contractor to choose the right sub-contractors, e.g. for electrical installations. The suppliers were also contacted at an early stage, as all materials had to be checked in advance by the material-database to see if they fulfilled the criteria for healthy materials. In case the suppliers did not deliver sufficient information to make a check via the material-database, they did not get to deliver the building materials either.

Finally, the building was constructed on the same budget as a conventional pre-school building with a comparative size, and it consumes less than half the energy and consists of known and healthy materials. The budget included three controllers who visited the building site regularly to check up on the progress and ensure all used materials were in the database. All ambitions with measurable goals will be evaluated after the building is finished but also when it is in use (e.g. indoor air quality will be measured and evaluated continuously).

Summing up, we **recommend to listen to all stakeholders and educate everyone that is involved in the project on the values of C2C, create a clear tender request document** where you describe in detail what is required, establish measurable goals and have resources to evaluate and follow up.

Kilen brochure

3.5.5.3 TRANSPARENT INFORMATION POLICY DURING CONSTRUCTION

An open and up-to-date information policy serves to inform both the stakeholders directly involved in the project and other interested parties concerned, about the current status of the work and its progress.

This contributes to the creation of a climate of trust. Misunderstandings, open questions and concerns may thus be avoided. For example, delays or schedule changes necessary due to unforeseen events (e.g. weather conditions, foundation work and bottlenecks in supply) will be notified in advance. In this manner, the acceptance and support of the project will be promoted at all levels.

Public relations already executed during the construction phase, for instance by means of an INFOBOX on site, illustrates the fundamentally positive planning approach of the *Cradle to Cradle*® methodology. It is a multiplier for C2C and may motivate other promoters to develop C2C-inspired projects.



Figure 15: Infobox SKIP, Esch-Belval. © Fonds Belval

USEFUL C2C BIZZ-TOOLS:

The '**inventory tool**' gives advice on identifying stakeholder intentions with regard to governance / ownership and possible procurement methods.

The '**continuous loops tools**' and the '**guideline for energy assessment**' may be helpful. It becomes more complex as soon as area development and 'soft factors' (i.e. social and cultural diversity) are involved.

One focus of the C2C BIZZ-Project therefore was to develop a '**diversity guideline**', which gives a better understanding on how to celebrate diversity in business park design and use. You can find this guideline together with other tools on the attached storage media.

The templates '**charter**', '**development framework**' and '**memorandum of understanding**' as well as '**operational framework**' include information about procurement strategies.

The '**valuation tool**' provides the financial / economical background for decision-making.

C2C BIZZ SHOWCASES MODULE 5



SHOWCASE SEMI-OPEN DIALOGUE IN BLUEGATE

GABRIËLLE VAN ZOEREN,
PROJECTLEIDER DUURZAME ECONOMIE EN ECO-INNOVATIE,
CITY OF ANTWERP, BELGIUM

Blue Gate Antwerp has chosen a 'competitive dialogue' as the method to tender the site 'Blue Gate Antwerp.' The development will be realized by a Public Private Partnership (PPP). The choice for a 'competitive dialogue' has been made because in this way, the private sector could incorporate their ideas into the Project.

The competitive dialogue has different phases:

1. Call for candidates: Blue Gate Antwerp published a paper proposing the project. Private partners could make their candidacy based on this paper.
2. After selection of the candidates, there are three dialogue-rounds with each individual candidate. Each round starts with a negotiating paper, including the 'must haves' and 'nice to haves'.

3. After every round the candidates must make a proposition. Further selection by Blue Gate Antwerp is possible.
4. After the third round, Blue Gate Antwerp makes a final tender and receives offer to develop from each remaining candidate (preferably only two). The partner with the best offer becomes a partner in the PPP.

The advantage of this method is the possibility to incorporate ideas from the candidates. The project grows through the dialogue. The disadvantage is the labour intensive aspect of this method. It takes more time and effort from both sides.



SHOWCASE OPEN-DIALOG PROCEDURE IN VENLO

MILÈNE BEKKERS,
PROJECT MANAGER CITY OF VENLO, THE NETHERLANDS

We integrated C2C in our tender procedure. Parties could gain extra points by presenting a C2C vision on the building. At that time we ourselves had limited knowledge about C2C, so we asked the market for a vision. The parties were challenged and got inspired to search for ideas and possible solutions." As you can read in the description of Kraayvanger, it was not common to follow this procedure. But parties became very enthusiastic about the idea.

After selection, we established a working group which consisted of all parties who would be involved in the building process. So all parties (the architect, building company and other technical companies) were thinking about solutions together from the very beginning. So all the construction and solutions were thought over by all the parties with their specific knowledge. All these parties were searching and experimenting with C2C, which was rather unknown to them. But they build

new expertise for their own company and could create a new market for themselves. By doing these things together, a new inspiration group was born to experiment with C2C.

For instance Kraayvanger has developed knowledge on C2C which they can apply in other projects. And Kraayvanger tells the Venlo story all over the country (and of course their own success, too).

"For the building, a business case was developed. Investing 3.4 million EUR in C2C measures, would gain 17 million EUR after 40 years. For instance, the green façade costs money, but because the building generates its own energy, there was a major saving on energy costs. So the green façade is actually paid by the energy concept. This is if you would compare it with energy provision in the traditional way, in which you have to pay the energy company for gas and electricity.

C2C BIZZ SHOWCASES MODULE 5



LILLE MÉTROPOLE

JAMILA BENTRAR, AMELIE COUSIN, RACHEL PHILIPPE /
LILLE MÉTROPOLE, FRANCE

Lille Métropole chose the competitive dialogue procedure in order to select the planner who will be responsible for the achievement of the development project. It is a procedure in which the client leads a dialogue with the candidates qualified to participate (financial capabilities, human and material resources), to define or develop one or several solutions to meet its needs. The solutions proposed will inspire the subject of a final tender by the candidates at the end of the dialogue. The dialogue cannot be compared to a negotiation. The competitive dialogue procedure is indeed special that goes against the obligation for the preliminary definition of needs. It is adjusted to the conclusion of complex contracts.

TENDERING STAGE

A call for tender was launched, based on a detailed master programme. It is a document describing the ambitions expected by Lille Métropole regarding the 'Lainière' Project (kind of specifications). At this stage, only the main lines of the project are given in terms of programming (e.g. activities, housing and equipment) in terms of urban fabric, landscape and environmental quality, and considering the requirements for public equipment. The detailed master programme also describes Lille Métropole's intentions (see Module 3). Tender rules are also established from that step on. These rules make provision for the selection criteria of the candidates fit for dialogue, the number of meetings with candidates and the subjects that will be discussed during each meeting. The call for tender cords with the publication period imposed by European Directive 2004/18/EC.

ANALYSIS OF PROPOSALS

Two tenders were submitted concerning the Lainière Project. The SEM-VR/Nacarat and IRD/KIC teams were selected for the competitive dialogue, according to their financial capabilities and technical and human resources.

STEERING OF THE COMPETITIVE DIALOGUE

Six dialogue sessions with the competing teams were organized to discuss all the above-mentioned subjects. The content of the contract, the legal and financial aspects of the operation, and the responsibility for the risk of the operation were also discussed. A presentation session of both competing teams' proposals was organized for the elected members of municipalities and Lille Métropole. After the dialogue sessions, specifications were established by the project manager at the end of the competitive dialogue. This was in accordance with ambitions and the initial intentions of the Project (see module 3). It also considered all the contributions and expectations of all stakeholders (see module 2), based on realistic financial and technical approaches.

SPECIFICATION: RULES RELATED TO THE END OF THE DIALOGUE

At this step, the objective is to translate the refined order of Lille Métropole after the competitive dialogue process with the two teams. This was about: urban, architectural, landscape and environmental orientations; programme of reference; and legal and financial aspects. On the basis of the end of dialogue rules, submitted to both competing teams, two tenders were submitted. On the basis of the end of dialogue rules, submitted to both competing teams, two tenders were submitted. After analysis, the operator was chosen and a concession contract was signed for 12 years and 64 m EURs, to develop the following programme: job creation by choosing a predominant economic programme; proposing a housing programming; enhancing the living environment; and developing the biodiversity of the operation area.

C2C BIZZ SHOWCASES MODULE 5



OPEN DIALOGUE AT STRAWBERRY FIELD

OLAF LEWALD, CITY OF BIELEFELD, GERMANY

The Bielefeld Project team has developed, in collaboration with external experts, a study for the development of a C2C-inspired business site. The achieved results have been transferred to 'Strawberry Field.'

A substantial part of the development plan is the representation of 'common areas' that should be available to all companies that settle on the business site. The management and organization of the industrial area should be guaranteed by a park management plan. In the plans, the industrial park will be open to all citizens, as a contribution to the entire city community. This will be achieved through many multifunctional commercial zones. Furthermore, it is planned to build an information building within the planned community area of the business site, which will inform interested parties of commercial space based on C2C philosophy and its implementation.

There is also an open dialogue with businesses, citizens and other interested parties and this will be continued. The collaboration was built during the C2C BIZZ Project in Bielefeld through events, workshops and consultations.



3.5.6 MODULE 6: CONTINUOUS EVOLUTION

As soon as construction work is finished the operation starts, which is mainly driven by economic factors.

OPERATION

A key question for the operation of a business site and its park management companies is how to achieve and steadily preserve high occupancy rates. The fact that the business site is inspired by *Cradle to Cradle*[®] and the mindset that stands behind it already contributes much to meet this objective.

The C2C-methodology provides some major advantages. On the one hand being part of a C2C business site is a perfect **marketing tool**, not only but particularly if your business includes environmental issues. Companies appreciate that and make it part of their strategy.

On the other hand, C2C actively promotes **service and leasing concepts**, for instance for energy generating systems, lights, C2C-certified office furniture, windows and carpets. This ensures that the producers of such prod-

ucts take care of their product quality. It is in their interest to use energy-effective solutions and to design the product for re-assembling in order to close the materials loop. Pay per use-concepts (e.g. for paper copies) can be complimentary to this.

From the occupants point of view such leasing concepts **save capital costs or cash flow** on systems and equipment. There is no risk of owning the products for their entire life cycle.

Certainly one of the most attractive features of a C2C-inspired business site is its diversity in economic, ecologic and social terms. The C2C diversity also provides **added value** for enterprises that will develop a favourable brand image to consumers and, last but not least, to employees who can work but also live in a better quality and more pleasant area.

OPTIMIZATION

In many cases, business sites are developed in phases. Infrastructure, systems and networks have to cope with that. This is part of

the design addressed in Step 5.

The design of a new business site and its systems or the conversion of existing sites is based on assumptions. These affect, for instance, the type of companies and businesses that are already on site or will settle there later.

The experience in operating the site starts with the first tenant. It increases with each company that moves into the area. As each business is unique, there may be exigencies that derive from the initial assumptions. Thus, it may be necessary to continuously adapt or optimize the design of the park and its systems and to re-calibrate the goals that have been set.

Another aspect of management and operation of a C2C-inspired business site is to continuously **measure** all parameters that have been quantified as goals. Analysing the measurement may result in an **optimization of systems**, thus including the **integration of new technologies**.

Ecoparc, the C2C BIZZ-pilot site, is a good example in this matter, too. It focuses *inter alia* on the production of renewable energy to cover energy demands. Due to the variability of the sources (e.g. variations in wind and clouds) renewable energy production does not always match energy demand, which has been measured since its inauguration in December 2012. In order to better match energy production and demand, a smart grid system has been installed as a management tool. See **'Energy guideline'** for more information.

CASCADING MATERIAL VALUES

Every product has a defined use period in a business site. The defined use period varies depending on how the product is designed. For example, products are designed for these value-added functions:

- ◆ **Re-purposing:** The first and highest value use period is



flexible use by re-purposing the existing building.

- ◆ **Renovation:** Products, systems or buildings are (partially) substituted by new technologies.
- ◆ **Disassembly:** If there is no longer a need for having a business site on this specific location and if there is no possibility to use the site and its buildings for other purposes, it should be disassembled. In a fully achieved C2C-environment everything is designed for disassembly. This guarantees the recyclability of materials and their re-introduction into the biological and technical cycle without loss of quality.

USEFUL C2C BIZZ-TOOLS

The '**continuous loop tool**', the '**guideline for energy assessment**' and the '**guideline for diversity**' help to analyse measurements and to possibly adapt systems.

The '**valuation tool**' may illustrate the economic effects of optimization and give advice on capital cost or cash flow savings that result from leasing concepts.

The C2C-Centre is a platform for knowledge exchange, and a hub of *Cradle to Cradle*® knowledge. It gives inter alia an overview of C2C CertifiedCM products; an extensive library, profiles of companies working with *Cradle to Cradle*® and an overview of projects that are *Cradle to Cradle*® inspired projects.

The '**inventory tool**' gives an idea "how good you already are" and what further C2C-possibilities you can evolve.

C2C BIZZ SHOWCASES MODULE 6



IRISPHERE

BERTRAND MERCKX, ECORES, BELGIUM

WATER

The Campus of Solvay (chemical company) waste 60,000 low mineralized water (rainwater and demineralised water) a year. After a workshop to identify synergies, it appears that three companies were interested to use this water as a nutrient: ZF company (SME in automotive industry sector) for washing their mechanic pieces, Restoduc for washing of their plastic box (washing tunnel) and Scania for washing their trucks. The most interesting track was the use by ZF Belgium and so this synergy is now implemented: the water is actually used for free and this waste water offers better washing characteristics, because of the improved effectiveness of the soap.

This synergy is now on track between a company in our Project (2ingis) which produces dental prosthesis for their production process.

WOOD PALLET

In our companies, there are some which have wooden pallets left and ones which need them. We matched the needs of ZF Belgium which need more pallets with VC –CPS, an education company for the metal sector which wants to provide those end of use specific pallets (euro pallets).

ORGANIC WASTE

Some companies (catering, restaurants, hospital) have trouble with the management of the organic fraction of their waste (odour, liquid, sanitary risks...). The project here is to create a complementary service for a social company, which will invest in two ecodigestor to collect and treat those organic waste in order to sell the fertilizer generated in their shop. At this time, the regulation does not allow it, but this project will be a pioneer project in the region for the local looping of this matter.

ECONOMY OF SCOPE/OR SCALE

Concrete take off: Along the canal of Brussels, we engaged 4 company which produce concrete for the Brussels region. After their round, the trucks which provides the liquid concrete come back to the central area with the remaining concrete used for internal needs but some is poured on the ground to be exported as a waste by truck. The idea here is to favour the use of the canal to take this waste concrete back in a single ship shared between different companies for a reuse in the construction sector.

RE-ENJOY THE SITE

Recreate a restaurant on the site: in the zone, there was a restaurant before which provided a local service (snack, restaurant), easy access and meeting point for conviviality for the company. The restaurant closed because it was too expensive for the company which offered the place (Scania Company, member of Irisphere). The idea here is to find a specific solution to be more economic viable and fitted to the needs of the companies. This synergy is on track with our local catering company Restoduc.

C2C BIZZ SHOWCASES MODULE 6



*C2C-Centre
BROCHURE*

C2C-CENTRE (FURNITURE LEASING)

EVA STARMANS MSC.,
CRADLE TO CRADLE® CONSULTANT, C2C EXPOLAB

The office space of the C2C ExpoLAB consists of 250 m². The C2C ExpoLAB asked the market for a solution for five years. All elements of the furnishing concept have been leased for this period, with fees determined based on the functionality of the product. Because the manufacturers retain ownership of the products and taking the products back at the end of the lease period, they are incentivized to think about reusing as many of the nutrients as possible that are inside their products. This in turn stimulates innovative product development and improves business models.

For C2C ExpoLAB, this structure worked out 31% cheaper than if the products had been purchased.

4.

C2C BIZZ-TOOLS

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4.1 PURPOSE AND TOOL TYPES

A major goal of C2C BIZZ was the development of appropriate new tools. Another one was the testing and assessment of existing tools, supporting and facilitating the planning and implementation of C2C-elements at different project phases. Tools can be used to design new developments and to scan existing situations.

All project partners contribute with their own experience to the tool's creation. They did so by testing and assessing them in different contexts, by discussing them with partners and by continuously improving them.

In general, a 'tool' is an instrument or apparatus that is used in order to perform an operation, or which is necessary in the practice of a profession. In short, a tool is everything used as a means of accomplishing a task or purpose.

In terms of C2C BIZZ, a tool contributes to the implementation of C2C on business sites. It may express itself in different forms, such as:

- ◆ A guideline with a methodological description in order to reach certain goals.
- ◆ A checklist with possible measures to be taken.
- ◆ A format of documents that can be easily customized and used in different situations.
- ◆ A database for gathering information on a business site.
- ◆ A questionnaire to collect data on a business site and make people more aware of C2C.
- ◆ Software containing information on the business site (input) and the results of calculations (output).
- ◆ Books and references.

Three categories of tools are to be distinguished:

- ◆ Management tools.
- ◆ Economic tools.
- ◆ Technical tools.

The tools are briefly presented hereafter. A comprehensive explanation, as well as the complete tool versions, are available on the annexed data carrier, and, furthermore, accessible on the C2C BIZZ website.



4.2 MANAGEMENT TOOLS

4.2.1 INVENTORY OF C2C ADDED VALUE POTENTIAL FOR BUSINESS SITE DEVELOPMENTS

PHASES OF C2C BUSINESS SITE DEVELOPMENT TO WHICH THE TOOL APPLIES

- ◆ The inventory, established at the beginning of project development and adapted continuously, can be applied or influence decisions and solutions during the entire project.

SHORT DESCRIPTION

This tool is an online compilation of questionnaires about detailed information on the background of a (future) business site and its surroundings. The inventory enables the planner of a C2C inspired business site to come to know what he has got, in other words to find out in a systematic way what the essential initial conditions of his project are. But it also shows the possibilities for the application of C2C.

The different questionnaires concern:

- ◆ Governance and stakeholders.
- ◆ Finances.
- ◆ Procurement and tendering.
- ◆ Quality dimensions (including renewable energy positive, healthy air, water, materials and quality of life, nutrient recycling, enhancement of mobility, biodiversity and cultural and functional diversity).

Every point of the list consists in principle of three items: first the question, second an explanation of the question (why it is important to have the requested information asked from a C2C perspective, which opportunities should the answer identify) and third a list of possible answers (simplifying the question and showing how detailed the answer should be).

*Related document
Inventory.pdf (For EXCEL-version see USB storage media)*

OUTCOMES AND LIMITATIONS OF THE TOOL

The completed inventory allows a first estimation and assessment of existing and realizable C2C-possibilities in the context of a project. Further it gives an idea to planners and developers 'how good they already are' in terms of C2C. A inventory is an advisable basis for the development of C2C activities.

USABLE DATA SOURCES

- ◆ Stakeholder interviews.
- ◆ Habitat maps, geological maps, research on flora, fauna and environmental systems.
- ◆ Spatial development plans, land development plans, other areal data.
- ◆ Studies and reports on the regional economic structure.
- ◆ Regional market analysis, marketing research.
- ◆ Studies and reports on the social structure.

AREA OF APPLICATION AND USERS

Any stakeholder that wants to start with C2C can use the tool at any stage of a development. In a case of a new business site or the re-activation/re-structuring of an existing one, the parties responsible are often municipalities, associations of municipalities or partnerships of public and private institutions.

In addition to the planner and developer companies resident on the site, promoters, tenderers and suppliers may benefit from the outcome of the use of the instrument.

TOOL DEVELOPER AND FURTHER INFORMATION AND ADVICE

The inventory is an online tool, which can be found online at: <http://inventory.C2C BIZZ.com> as well as an Excel-File on the attached USB-storage media.

Samenwerkingsverband Regio Eindhoven (SRE), Keizer Karel V Singel 8, 5615 PE Eindhoven, The Netherlands.



4.2.2 COMMUNICATION STRATEGY TOOL

PHASES OF C2C BUSINESS SITE DEVELOPMENT TO WHICH THE TOOL APPLIES

- ◆ Stakeholder interest

SHORT DESCRIPTION

This tool has been designed to diagnose stakeholders' value priorities to enable deployment of effective communication strategies and secure their commitment to C2C business site projects. The tool incorporates a questionnaire (input) section comprising five questions on organizational preferences and a diagnostic output that identifies the dominant value priorities of the concerned stakeholder. This output is then mapped onto various C2C value propositions that must inform the strategy for communicating with these stakeholders.

OUTCOMES AND LIMITATIONS OF THE TOOL

Application of the tool results in a description of the organizational value priorities of the stakeholder concerned and how the C2C vision can enable the realization of these value priorities. This insight is what must inform the approach to communicating C2C to this stakeholder. This capability can be used by promoters to target prospective business site developers or by both parties to target prospective tenants with effective messages that amplify the congruence between their organizational values and the C2C vision.

The tool is designed to support development of promotional strategies. The strategies that derive from application of the tool only focus on addressing socio-cultural, rather than socio-economic, barriers. The wider economic concerns also need to be addressed. The tool is developed for selected stakeholders (developers, property and park management agencies and tenants), but can be adapted as appropriate to other stakeholders.

USABLE DATA SOURCES

Data for the tool will be the responses to the questionnaire by stakeholders.

AREA OF APPLICATION AND USERS

The principal users of this tool will be promoters, developers, property and park management agencies and tenants. Promoters can use the tool to engage with potential developers or tenants. Developers and property or park management agencies can use the tool to inform their marketing strategies to attract high value tenants. Developers and tenants can also use the tool as a self-diagnostic application to understand how the C2C vision supports their value expectations.

TOOL DEVELOPER AND FURTHER INFORMATION AND ADVICE

University of Wolverhampton, Faculty of Science and Engineering, Wolverhampton WV1 1LY, UK.

Related document
Communication strategy tool.pdf
 (For EXCEL-version see USB storage media)

Related document
Communication strategy tool - user guide.pdf

4.2.3 GOAL SETTING DOCUMENTS

A bundle of three tools, helping to find and define C2C-criteria at different planning levels (from the initial idea to the specific project development and implementation to the steady review and optimization phases), can be used to exchange views and expectations between planners, companies and other stakeholders. The tools are the so called ‘Charter’, the ‘**Development Framework**’ (as the case may be, combined with a ‘**Memorandum of Understanding**’), and the ‘**Operational Framework**’.

The purpose of the *Charter* is to show how, on a political level, C2C targets can be set out in a general way, not necessarily related to a specific area or a fixed timetable.

The *Development Framework (DF)* provides a template in order to articulate the intentions and conditions for the development of a new or an existing business site. It is meant to become a pivotal document for reaching agreement with potential stakeholders and investors. It may be combined with a *Memorandum of Understanding (MoU)*. The *MoU* is a proposal in the form of a template to achieve a written agreement

between the owner/developer and the tenants of a business site. It sets out the common goals in terms of the implementation of C2C and defines the responsibilities and obligations of both partners in pursuing the objectives.

Last, but not least, the *Operational Framework (OF)* shows how rules and possible development lines can be fixed for a precise plot on which C2C-principles are to be realized.

Table 9 gives an overview of the characteristics and the differentiation of the three tools. A more detailed description is available in subchapters 4.2.2–4.2.4.

Altogether, the three goal setting documents reflect the planning and realization of a business site development: from the ‘first idea,’ via the conception and the subsequent construction, to the operation. The result is, to come back to the journey picture, a ‘roadmap’ which is zoomed in step-by-step.

Table 9: Differentiation between Charter, Development Framework and Operational Framework.

PROJECT PHASE / LEVEL	TOOL DESIGNATION	INTENTION / PURPOSE	TARGET GROUPS
Decision in principle / political decision on a regional / national level.	Charter	Definition and outline of a C2C-inspired business site development .	<ul style="list-style-type: none"> ◆ Politicians and developers / buy-in for local politicians, municipalities, developers (public, private, PPP). ◆ Public / communication paper.
Conception of the business site / regional level; spatial planning.	Development Framework	Setting of the strategic guidelines and technical conditions for a specified area (based on the Charter).	<ul style="list-style-type: none"> ◆ Developers / information paper and basis for negotiation. ◆ Public / communication paper.
Plot-plan / building-and operation-plan.	Operational Framework	List of (measurable) indicators to be met by developers, planners, tenants and tenderers (e.g. construction companies) on the C2C business site; design-precepts.	<ul style="list-style-type: none"> ◆ Developers / negotiation paper. ◆ Builders, owners, tenants, promoters / operational requirements and basis for implementation review.



4.2.3.1 CHARTER

PHASES OF C2C BUSINESS SITE DEVELOPMENT TO WHICH THE TOOL APPLIES

The charter is a document which gives orientation for all modules in a C2C project.

Particularly for the following modules the charter is helpful:

- ◆ Stakeholder interest.
- ◆ Intentions
- ◆ Goals.

SHORT DESCRIPTION

A *charter* sets the framework for the planning, realization and operation of a C2C business site on the political and administrative level. It is a kind of letter of understanding for the responsible bodies on these levels.

The charter is nothing more or less than a general principle for spatial planning and economic policy. It can, but need not have, exact space- and/or time-relations.

The tool exemplifies how deriving from a general political decision-finding-process C2C-ideas can be integrated into a policy strategy. It explains and gives suggestions how to research suitable C2C-objectives and how to combine them with public planning.

OUTCOMES AND LIMITATIONS OF THE TOOL

The charter-tool helps to determine and capture the fundamental ideas and notions of the political and administrative responsible bodies. It gives hints how to formulate the expectations and goals related to C2C-principles.

It serves as orientation point and compass for time and space related planning during the complete process of specific projects. But its specifications and regulations are rather general. They are not of a technical, economic or administrative nature. The planners and developers of a site have in every single case to search for suitable solutions which fit into the pattern of the charter.

USABLE DATA SOURCES

Literature on C2C in general, and more particularly on C2C in spatial development, construction and intercompany co-operation, can be used to define the basic intentions and contents of a charter for business sites. Moreover, the responsible stakeholders of governmental or municipal projects for C2C inspired business site developments can be directly contacted to learn about their experiences.

Strategic papers of representative organizations in the different economic sectors at regional, national and international level may give valuable advice concerning the alignment of manufacturing, trade and non-productive industries to innovative and future-oriented business models. Analysing these sources, the authors of the charter can come to know the expectations companies have for their development and can evaluate the overlap of the charter and the concepts of the economic actors.

AREA OF APPLICATION AND USERS

The charter is a tool used by these responsible for spatial planning and economic policy. These are usually political and administrative bodies. The mentioned tasks could at least be partly delegated to committees, which are composed of policy, administration and other economic players and social groups.

The formulated and approved charter is the important base for the planning and realization of business sites with regard to both construction (infrastructure and company buildings) and operation.

TOOL DEVELOPER AND FURTHER INFORMATION AND ADVICE

Lille Métropole Communauté urbaine,
1 rue du Ballon – CS 50749 – 59034 LILLE CEDEX

Related document
Charter.pdf

Related document
Charter - table of recommendations.pdf



4.2.3.2 DEVELOPMENT FRAMEWORK (COMBINED WITH A MEMORANDUM OF UNDERSTANDING)

PHASES OF C2C BUSINESS SITE DEVELOPMENT TO WHICH THE TOOL APPLIES

- ◆ Intentions.
- ◆ Goals.
- ◆ Procurement and tendering.
- ◆ Continuous evolution.

SHORT DESCRIPTION

The Development Framework (DF)-tool provides a scheme (model) to articulate the C2C related goals in terms of a specific site development. It is one of the pivotal documents used to reach agreement with several different stakeholders and investors (e.g. financiers, planners, developers, banks, governments and municipalities).

It sets out and provides parameters that:

- ◆ describe why C2C might be part of the development ([see Chapter 2](#)),
- ◆ describe in what way C2C might be part of the development methodology,
- ◆ describe the C2C implications and advantages in both the public realm and individual plots,
- ◆ introduce the Memorandum of Understanding (MoU) and its intentions.

The Development Framework builds on the C2C-inspired concept which underpins the development of the business site.

The DF can be combined with a MoU as an additional tool. This latter is a template for an agreement between the site owner, respective promoter or operator and the tenants who want to settle in the area. It refers directly to the DF.

The suggested model for a MoU contains four parts:

- ◆ objectives,
- ◆ new owners and occupiers,
- ◆ execution,
- ◆ statement of intent.

By signing the MoU the owner (promoter, operator) and the tenant agree to work together in good faith for a defined period from the date of the Memorandum of Understanding to implement the objectives in accordance with the DF.

OUTCOMES AND LIMITATIONS OF THE TOOL(S)

The DF does provide recommendations on how to depict the overarching site development strategy, the underpinning rationale of why it is being developed under C2C principles and the associated advantages for organizations investing in the business site. For existing sites, it will help to set out the guideline which moves the site closer to a C2C way of working and will enable the transitional process to be clearly established.

It is not meant to be an inventory and nor is it a detailed technical document, rather it represents an explanatory narrative which sets out the site development parameters which should be considered during its life.

The MoU-tool is a proposal in the form of a template for an arrangement between the site owner (respectively the promoter or operator) and the tenants/companies of a plot in a C2C-business area. It is not meant to be a pattern for a legal document, but gives a suggestion on how a formal agreement could look like and what substantive issues should be considered.

USABLE DATA SOURCES

The basic inventory and the stakeholder analysis as well as, if existing, the regional or local charter for economic promotion and/or the development of business sites, are fundamental documents for writing the DF. The content of the MoU refers to the DF.

AREA OF APPLICATION AND USERS

Users of the proposed templates for DF and MoU are at first planners and developers who want to create a new or convert an existing business site according to C2C-criteria. Nevertheless, companies which are open-minded to C2C or which just want to settle on the considered site can be involved in composing and writing the DF and MoU.

Generally, all tenants on the site should agree with the DF and sign the same MoU.

New tenants or tenants that are not interested in the strategic planning of the business site may later influence the contents of DF and MoU. For them both documents are the basis for decision-making, whether the settlement on a C2C-business area matches with their expectations and objectives or not. If they agree, the DF and MoU represent guidelines and timetables for their C2C-strategy.

All parties involved in planning the site or willing to operate on the site benefit from the two instruments. DF and MoU clearly show the expectations and requirements to the various stakeholders, so that these can assess and plan their strategies.

TOOL DEVELOPER AND FURTHER INFORMATION AND ADVICE

Institute for Sustainability, 49 -51 East Road, London, N1 6AH, UK.

Related document
Development Framework.pdf

Related document
Memorandum of Understanding.pdf

Related document
Mock small version of LSIP
C2C Inspired Development Framework.pdf



4.2.3.3 OPERATIONAL FRAMEWORK

PHASES OF C2C BUSINESS SITE DEVELOPMENT TO WHICH THE TOOL APPLIES

- ◆ Goals.
- ◆ Procurement and tendering.
- ◆ Continuous evolution.

SHORT DESCRIPTION

The Operational Framework (OF) is built on the Development Framework (DF). Whereas the DF sets out the general criteria and goals to consider by developing the business site in terms of (public) infrastructure, building facilities and operating businesses, the OF formulates substantial and measurable parameters which have to be fulfilled by the actors on the site.

The OF is developed incrementally. At first, the body responsible for the site lays down ideas and expectations concerning e.g. construction and the nature of business activities on the area in a concept paper. This document is used as a basis for negotiations with interested stakeholders. The results of the dialogue may flow in the definition of indicators to be regarded and complied with by companies and other stakeholders on the site.

OUTCOMES AND LIMITATIONS OF THE TOOL(S)

The tool is a scheme that shows how C2C-intentions and goals which have been determined before on higher political and administrative levels (see Charter and DF) can be transformed in fitting solutions for specific plot-related tasks and activities. To a certain degree conditions (technical, social) which do not or not yet correspond with defined C2C-aims can be tolerated if all concerned parties agree that these are objects of continuous revision and will be adapted and optimized according to new knowledge and technical progress as soon as possible.

USABLE DATA SOURCES

The DF and, as the case may be the MoU, are substantial platforms for the OF. Of course, the legal national and regional regulations are an important point to observe. The technical literature on C2C-solutions and references of realized C2C projects give examples and inspiration for the specific projects. Existing international or national standards for ecological and social space development and construction may be used to assess the measures and activities of planners and companies.

AREA OF APPLICATION AND USERS

The OF is elaborated by the responsible developers and planners of the site. It gives general provisions and partly precise clauses which have to be regarded by the settling companies and the other actors (e.g. building companies or suppliers of energy, services and goods) on the site. The OF comprises a constant evaluation during the process flow as well as incremental optimization and defined use periods as important elements in terms of the C2C-objectives laid down by the charter and the DF. The compliance of the realization and further development with the OF is reviewed and governed by the owner or operator of the business site.

TOOL DEVELOPER AND FURTHER INFORMATION AND ADVICE

Stad Antwerpen, Werk en Economie, Blue Gate Antwerp,
F. Wellesplein,1 |2018 Antwerpen, Belgium.

Related document
Operational Framework - building blocks for the Area Developer.pdf

Related document
Operational Framework - building blocks for the Company on Site.pdf

Related document
Operational Framework - Roadmap towards a C2C inspired business site.pdf



4.2.4 C2C-CENTRE

PHASES OF C2C BUSINESS SITE DEVELOPMENT TO WHICH THE TOOL APPLIES

- ◆ Intentions.
- ◆ Goals.
- ◆ Procurement and tendering
- ◆ Continuous evolution

SHORT DESCRIPTION

C2C-Centre is the leading international knowledge platform for *Cradle to Cradle*[®]. The C2C-Centre actively gathers information on *Cradle to Cradle*[®] related projects and innovations, and shares this knowledge with the aim of encouraging and supporting its further development on a large scale. The C2C-Centre invites you to share your *Cradle to Cradle*[®] inspired projects, products, documentation and information from your project or organization.

The physical showroom in Venlo and website: www.c2c-centre.com provide the following:

- ◆ An overview of projects that are *Cradle to Cradle*[®] inspired.
- ◆ A 'workflow' for managing *Cradle to Cradle*[®] inspired projects more effectively.
- ◆ An complete overview of products that are *Cradle to Cradle*[®] Certified^{CM} and a map with C2C activities in your area.
- ◆ Company profiles of companies and organizations working with *Cradle to Cradle*[®], including latest news.
- ◆ Member profiles of *Cradle to Cradle*[®] experts, consultants and enthusiasts that are involved in projects, work with companies or are otherwise interested - and the opportunity to engage with them.
- ◆ An overview of activities regarding *Cradle to Cradle*[®] education and courses.
- ◆ A virtual market place where matches can be made between students and internships, demand and supply.

OUTCOMES AND LIMITATIONS OF THE TOOL

Suitable for many different types of *Cradle to Cradle*[®] projects, the 'project workspace' is a useful online tool for facilitating implementation. Developed by C2C ExpoLAB for professionals and other enthusiasts, it helps formulate measurable goals and provides a structure for achievement. It provides you a structure which gathers all necessary information to create a *Cradle to Cradle*[®] roadmap and more.

AREA OF APPLICATION AND USERS

Everybody who is inspired by C2C can use the C2C-Centre. It can be used as an information platform, to collect information. But it can also be used as an interactive platform and discuss C2C with other enthusiasts and experts. Thereby the workspace of the C2C-Centre provides you guidance in your project and gathers inspired examples on C2C-Centre. Using this workspace makes it easier for you, and provides you with ready documents which will be filled out with your information, such as a roadmap.

TOOL DEVELOPER AND FURTHER INFORMATION AND ADVICE

C2C ExpoLAB (www.c2cexpolab.eu), Venlo, The Netherlands.

Visit the C2C-Centre at: www.c2c-centre.com

Please contact the C2C ExpoLAB to visit our physical showroom in Venlo – info@c2cexpolab or telephone +31 77 396 8007.

*Related document
Brochure C2C Centre.pdf*

4.3 TECHNICAL TOOLS

4.3.1 CONTINUOUS LOOPS TOOLS (CLT)

4.3.1.1 CONTINUOUS LOOPS ONLINE DATABASE



PHASES OF C2C BUSINESS SITE DEVELOPMENT TO WHICH THE TOOL APPLIES

- ◆ Intentions.
- ◆ Goals.
- ◆ Procurement and tendering
- ◆ Continuous evolution

SHORT DESCRIPTION

The purpose of the Continuous Loops tool is to identify possibilities for exchange of material flows between companies and organizations on a business park. The essential element which is taken into account is the quality of the material loops. They only apply to the C2C-criteria “*everything is a resource for something else,*” if the quality of the substances and products in them does not diminish or even gets better by every reuse. It is not about reusing only once, but continuously and infinitely. The tool considers all kinds of materials used on a business site, from comparative ‘premium’ industrial or manufacturing residues to non-specific waste of the service industry or office buildings. The Continuous Loops tool is an online database which holds a range of data field headings that could be completed for any particular business site, for example company details, physical and chemical data and information about intended use and defined pathways. The aim of the database is to link nutrient sources (material flows available) with nutrient demands (material flows required).

OUTCOMES AND LIMITATIONS OF THE TOOL

For the planner and developer of a business site the Continuous Loops tool can offer insights in the economic structure as a means to identify on a general level possible co-operations and synergies which can create valuable loops within the local framework. The result of the application of the tool may influence the commitment of desired and admitted branches and companies in the business park.

For companies the Continuous Loops tool is a support to find and provide high-quality and circuit-stable materials as nutrients for their manufacturing, commercial or service activities. Furthermore, the tool could be used for analysing the type, quality and quantity of locally offered resources and thus contribute for the development of new or the change of existing production-models or services according to C2C-criteria. The tool is a first filter. It allows to the demanders and suppliers of C2C-conformable resources a first evaluation of the feasibility and potential of their business activities according to the ‘waste = nutrient’ principle. It only partially deals with questions concerning technical details of material properties, transport questions or the time-wise and quantitative needs for the specific business case. The clearing of these aspects is subject to direct consultations, negotiating and contracting between enterprises.

The application of the tool requires the substantive contribution of a park manager. Therefore, the spatial reference is at first a single business site, but this can be extended. Depending on the specific situation of a business park (e.g. number, branches, size of the established enterprises and institutions) an extension of the catchment area could be necessary to create and maintain the required loops. The park manager should facilitate the extension.

USABLE DATA SOURCES

Existing platforms for the exchange of secondary resources.

- ◆ Local/regional professional directories.
- ◆ Chambers of commerce and industry or other trade and professional associations.
- ◆ Networks of forward-looking innovative companies (i.e. working or discussion groups on business or at the administrative or political levels).

AREA OF APPLICATION AND USERS

As far as the definition and admission of branches in a business area are concerned: planner and developer (e.g. often municipalities, associations of municipalities or consortia of public and private institutions) are suitable users. It is recommended that these stakeholders work together with C2C experts in evaluating local conditions and potential for further strategic orientation in the planning process.

As far as the planning, implementation and operating of specific production processes or service activities are concerned, companies are the correspondent users, with constructive input of a park manager. If planners use the instrument to analyse and assess the C2C-potential of a specific business park, companies could benefit from the results by employing them as orientation and support for their business developments. In contrast, the outcomes of companies' own research are usually very specific. So there are, in most cases, no other beneficiaries of the deliverables.

TOOL DEVELOPER AND FURTHER INFORMATION AND ADVICE

Samenwerkingsverband Regio Eindhoven (SRE), Keizer Karel V Singel 8, 5615 PE Eindhoven, The Netherlands
and

Institute of Sustainability, 49-51 East Road, London N1 6AH, UK.

The online Continuous Loops tool database can be found on:

<http://cltdatabase.C2C BIZZ.com>.



4.3.1.2 GUIDELINE FOR C2C INSPIRED MATERIAL MANAGEMENT ON BUSINESS SITES

PHASES OF C2C BUSINESS SITE DEVELOPMENT TO WHICH THE TOOL APPLIES

- ◆ Intentions.
- ◆ Goals.
- ◆ Procurement and tendering
- ◆ Continuous evolution.

SHORT DESCRIPTION

The purpose of the guideline for material management is to support the implementation of *Cradle to Cradle*® on business sites by providing practical recommendations to managers and businesses on the site on how to improve their material management practises by using C2C concepts.

Material management concepts, tools and approaches from a C2C perspective are addressed, in line with the relevant 'waste = food' C2C principle. The inter-relationship between 'waste = food' and other C2C principles is also explored. The aim is to clarify for the reader what is C2C and how it can be applied within the context of material management and business sites.

Key issues, opportunities and challenges for C2C material management on business sites are identified, demonstrating best practices and benefits for businesses, park management, community and other actors through relevant case studies and examples.

OUTCOMES AND LIMITATIONS OF THE TOOL

This tool analyses how C2C concepts apply to business sites and seeks to define key issues around material availability on the site, material 'cyclability' in biological and technical cycles, material design for end of life (disassembly, recycling, re-manufacturing), material composition and quality, material identification and tracking.

Material related processes associated with different activities on business sites are identified and mapped out in an organizational model of a generic mixed use business site. Typical types of materials used and generated on business sites are identified on a general level and C2C material management strategies for different types of materials are discussed for their take-back, recovery and reuse on business sites, according to C2C definitions. Special attention is paid to material exchange and pooling between companies and how they can collaboratively manage their materials and resources.

This tool is intended to provide business site and company level guidance on how to adapt a material management concept that will preserve high quality materials in continuous material cycles and extract the highest environmental and economic value from the materials used on the site. Although some typical classes of materials common to business sites are addressed on a general level, it is not the intention to provide a detailed inventory of all possible materials occurring on business sites, especially since, when it comes to manufacturing industry, inputs, outputs and processes are extremely specific to a particular factory or company. For this reason, we also do not attempt to describe all available recycling processes for each type of material.

USABLE DATA SOURCES

The following data sources can be used to identify materials available on the business site from buildings and companies, the types of companies present and their material input needs, information about the materials used and alternative replacement materials.

- ◆ List of companies, activities and industries on the site.
- ◆ Inventory of inputs and outputs used/needed and produced by the companies on site.
- ◆ Waste collection contracts and invoices.
- ◆ Inventory of construction materials, elements and technologies used on the site.
- ◆ Material safety information sheets from products.
- ◆ Material and product information from suppliers.
- ◆ Survey of available construction elements and materials for a given purpose.

AREA OF APPLICATION AND USERS

The intended users of this tool are site promoters, developers, managers and individual businesses present on the business site wishing to implement circular material concepts in their operations. Public authorities, constructors and suppliers and waste collectors and recyclers operating on the site might also find useful information in this guideline. The tool should allow management authorities with oversight of the site to identify material opportunities (such as, for example, material exchange or resource pooling) and to co-ordinate the necessary actors needed to realize the innovation concept.

This guideline should also provide business site managers, waste management entities, local authorities and companies a better understanding of material management and issues to take into account on a company and business site level, according to C2C principles. Individual businesses on the site will be able to identify key materials in their processes and useful strategies for dealing with those materials.

TOOL DEVELOPER AND FURTHER INFORMATION AND ADVICE

Public Research Centre Henri Tudor (TUDOR), 6A, Av. des Hauts Fourneaux, L-4362 Esch-sur-Alzette, Luxembourg.

Related document

Guideline for C2C inspired materials management on business sites.pdf



4.3.2 GUIDELINE FOR ENERGY ASSESSMENT OF BUSINESS SITES

PHASES OF C2C BUSINESS SITE DEVELOPMENT TO WHICH THE TOOL APPLIES

- ◆ Intentions.
- ◆ Goals.
- ◆ Procurement and tendering.
- ◆ Continuous evolution.

SHORT DESCRIPTION

The objective of the tool is to support the implementation of renewable energy solutions in business sites according to the C2C approach. Its main focus lies on how to access the energy potential of several renewable energies (solar, wind, geothermal) for a specific location. The considered technologies and potential barriers are reviewed before the implementation of a project. Calculation methodologies, and potential data sources and rules-of-thumb, are provided to rapidly estimate the potential for renewable energy generation.

The energy guideline also gives information on the various steps to be addressed to obtain an energy positive business site: energy optimization to reduce the general energy demand (breakthrough efficiency), as well as management of energy demand according to renewable energy availability (SmartGrid). The guideline concludes with some propositions on the next steps and the more detailed tools currently available.

OUTCOMES AND LIMITATIONS OF THE TOOL

The overview of the various steps, as well as the calculation methodologies presented in the energy guideline, allow a potential user to gain some insight into the possibilities to make the business site energy positive, but without going too much into details. If the outcomes of this first assessment are positive, further detailed analysis, with the corresponding data acquisition phase, are still necessary to take a final decision on what technology to implement.

USABLE DATA SOURCES

- ◆ C2C BIZZ-Inventory tool and Stakeholder Analysis.
- ◆ Energy bills.
- ◆ Maps (spatial, geological, wind intensity and direction, solar radiation).
- ◆ Simulation tools.
- ◆ Manufacturer data sheet.

AREA OF APPLICATION AND USERS

The tool is dedicated to the following users:

- ◆ As far as the development of business site areas and the equipment with infrastructure are concerned:
 - Planners and developers, usually municipalities.
 - Associations of municipalities.
 - Consortia of public and private institutions.
- ◆ As far as the building of functional facilities for business are concerned:
 - Companies or promoters.

The tool can be used by the above-mentioned stakeholders themselves or commissioned agents for first assessment of possible energy solutions according to C2C.

The detailed analysis of the renewable energy potential and its embedding in an integrated energy concept should be worked out by experts. The results of the application of the tool give orientation to project developers for further planning and implementation of the production, distribution and smart use of energy in a C2C-business site. They provide basic information for architects, engineers and building companies to consolidate the energy concept of their sub-projects.

TOOL DEVELOPER AND FURTHER INFORMATION AND ADVICE

Public Research Centre Henri Tudor (TUDOR), 6A, Av. des Hauts Fourneaux, L-4362 Esch-sur-Alzette, Luxembourg.

Related document

Guideline for energy assessment of business sites - calculator.pdf
(For EXCEL-version see USB storage media)

Related document

Guideline for energy assessment of business sites - report.pdf



4.3.3 GUIDELINE FOR DIVERSITY

PHASES OF C2C BUSINESS SITE DEVELOPMENT TO WHICH THE TOOL APPLIES

- ◆ Intentions.
- ◆ Goals.
- ◆ Procurement and tendering.
- ◆ Continuous evolution.

SHORT DESCRIPTION

The purpose of the Guideline for diversity is to offer information about the ways to realize more diversity on a business site in a biological, social/cultural and economic/conceptual way.

It helps target groups developing designs to (re)develop business sites incorporating diversity, so that they become more flexible in terms of current and future use, different types of users, more accessible and mixable with other forms of space use (including nature).

It contains a general guideline, a checklist and a scheme of consecutive steps.

The general guideline explains which aspects (flexibility, stability, attractiveness and sustainability) are implicated in the diversity objective and shows examples how they can be considered in planning.

A non-exhaustive checklist lists exemplify diversity factors and gives recommendations for realizing them in the planning and implementation of projects. The scheme of consecutive steps is an aid for systematically regarding the diversity goal during project development. In combination with the general guideline and the checklist, it enables the user to incorporate diversity in all relevant respects.

OUTCOMES AND LIMITATIONS OF THE TOOL

On a regional level the Guideline for diversity helps to determine diversity aspects which are relevant for planning of a business site according to C2C.

Some issues, such as biodiversity, are nowadays generally recognized. That means that the conservation or better the enhancement of the site-typical flora, fauna and habitats are self-evident goals. The tool provides a method on how to safeguard and improve biodiversity in the development of business areas or in building processes.

Other issues of diversity are less obvious. They have to be identified as a first step. The tool describes the different possible aspects and helps users to determine and chose diversity factors that should be considered in planning and implementation. Furthermore, it shows how these can be substantiated in the several planning and implementation phases of a project.

The Guideline for diversity supplies a methodology to identify relevant aspects of diversity within a specific context and explains why these factors can contribute to the realization of the C2C-principle 'Celebrate diversity.' The mode and extent of integration of the detected aspects in a specific project is subject to the assessment and decision of stakeholders.

USABLE DATA SOURCES

- ◆ Habitat maps, geological maps, research on flora and fauna.
- ◆ Spatial development plans, land development plans, other areal data.
- ◆ Studies and reports on the regional economic structure.
- ◆ Regional market analysis and marketing research.
- ◆ Studies and reports on the social structure.
- ◆ Transregional, regional and local traffic studies and analysis.
- ◆ Demographic development.

AREA OF APPLICATION AND USERS

The users of the Guideline for diversity are:

- ◆ Decision-making bodies on all political and administrative levels that are involved in developing business parks. They could use the tool to identify diversity which ‘deserves’ protection on business sites, such as biodiversity, cultural characteristics and historical contexts. On the other hand, the Guideline for diversity affords the opportunity to detect ‘gaps’ of diversity at the site level and in the local or regional catchment area. Closing these gaps may be an important factor for the stability, sustainability and longevity of a business area.
- ◆ Owners and tenants (potential and actual) of plots or buildings in the park.

The Guideline for diversity contains examples and schemes which help to recognize how to transcribe the diversity principle in practise and what added values could be realized.

Respecting and establishing diversity in all facets, orientated on stable natural ecosystems is extremely useful for all stakeholders of a business site.

The tool enables planners and developers (in many cases municipalities, other administrations or associations of public and private partners) to actively evolve concepts for and to implement business sites under the observation and utilization of diversity factors.

The ‘diversity-structure’ applied by the planners and developers is a basis and an inspiration for occupants and tenants to realize their own diversity goals.

Beside the mentioned ‘direct’ stakeholders, others can be beneficiaries of the outcomes of the Guideline for diversity-tool. For example, nearby residential areas may profit from a traffic concept or from social and supply facilities in the business area. Reverse relationships are, of course, possible. Perhaps other entities are inspired to use the tool as a basis for thinking of and developing diversity in their area of responsibility.

TOOL DEVELOPER AND FURTHER INFORMATION AND ADVICE

Lille Métropole Communauté urbaine, 1 rue du Ballon – CS 50749 – 59034 LILLE CEDEX, France.

Related document
Guideline for diversity.pdf



4.4 ECONOMIC TOOLS

4.4.1 VALUATION TOOL

PHASES OF C2C BUSINESS SITE DEVELOPMENT TO WHICH THE TOOL APPLIES

- ◆ Baseline study.
- ◆ Stakeholder interest.
- ◆ Intentions.
- ◆ Goals.
- ◆ Procurement and tendering
- ◆ Continuous evolution.

SHORT DESCRIPTION

A valuation tool, to be used in planning and implementing C2C projects, is required to address the following three financial aspects, as far as possible:

- ◆ Availability and infusion of funds.
- ◆ Financial feasibility and viability of C2C in business parks.
- ◆ Proper allocation of available funds.

It aims to be an instrument to provide a decision-making framework for the selection of optimal funding sources and types and for building a business case, including the evaluation of the feasibility, viability and financial implications of C2C business parks, as well as the related building projects and business activities. A further purpose is to assess the public policy consequences of the financial viability of C2C business parks.

The relative value of C2C products, buildings and facilities depends on the unique contribution that their C2C attributes satisfy particular desires of stakeholders. Since traditional finance tools do not come equipped with the ability to price C2C products, as the C2C ideology postdates many of these tools, they cannot readily be adopted to appraise the financial implications of C2C business parks. Adjustments or extensions to these traditional tools are required to make them adaptable to financial analysis of C2C business parks.

Therefore, the valuation tool comprises inbuilt facilities which allow pricing C2C attributes. These facilities enable planners, developers and other stakeholders to:

- ◆ Appraise the financial implications of C2C business parks.
- ◆ Evaluate the whole lifecycle of building projects and business processes which are realized by applying C2C principles.
- ◆ Assess financial and non-financial aspects, as non-financial indicators (e.g. productivity, social aspects, health and safety, image of the business site) are essential when achieving financial objectives and result in better financial outcomes.
- ◆ Be creative in, for example, ownership of materials and roles of stakeholders in the value chain, a new way of doing business, scenario planning and long-term thinking, since the determination of the value of the product/measure derives from the holistic view of the complete product chain and not only from 'classical' economic calculations.

The tool comprises three parts:

- ◆ An overview of suitable funding tools.
- ◆ An economic impacts assessment tool.
- ◆ A guideline on how to make C2C products, buildings and areas financially attractive.

OUTCOMES AND LIMITATIONS OF THE TOOL

The tool gives a detailed overview of current thinking for investing and valuing C2C site development projects and comments on it. In addition, it explains basic concepts around C2C site development valuation. Thus, it allows planners, developers, lenders and investors to become accustomed to the methods applied in practise for appraising C2C attributes in economic models and financial concepts. By using this 'background information' and analysing the examples shown, the target groups can determine the suitable valuation method and its crucial elements for their specific projects.

Based on the guideline, which is a main part of the tool and contains the methodology, models and principles to be followed in establishing the value of C2C features in specific projects, a complete business case can be formulated.

An outline of limitations complements the tool. This is meant to avoid unrealistic expectations or economic assumptions. For example, conventional elements of an entrepreneurial risk (general price level, changes in personnel policy and relocation) are not subjects covered by the tool and have to be considered additionally. So the tool provides a practical aid to C2C business decision-making by giving a method of economic assessment of C2C-relevant characteristics.

USABLE DATA SOURCES

Documents elaborated within the C2C BIZZ-Project:

- ◆ Survey of property owners, valuers and developers across the partner countries of C2C BIZZ to ascertain their perception of possible impacts of C2C on value.
- ◆ Survey of lenders and investors to ascertain the evidence they require to accept the risk of investing in C2C based site development projects.
- ◆ Case study review of known C2C building projects (including C2C BIZZ Projects).

AREA OF APPLICATION AND USERS

The potential users of the tool are:

- ◆ Decision-making bodies on all political and administrative levels involved in developing business parks.
- ◆ Owners and tenants (potential and actual) of plots or buildings in the park.

The tool helps developers and planners of C2C inspired business areas to create a business case in due consideration of specific C2C aspects and their economic effects. Companies interested in settlement on the planned or yet to be implemented C2C business area may use the instrument for the same reason. Exchange and discussion between the involved parties on 'site level' and 'company level' during the use of the

tool and at the stage of intermediate results afford the opportunity to optimize possible synergies and to clarify the business case. On the one hand, the valuation tool enables investors, lenders and promoters to reproduce the methodology of the business case. On the other hand, they can check and rate the results of economic evaluation of the project.

TOOL DEVELOPER AND FURTHER INFORMATION AND ADVICE

University of Wolverhampton, Faculty of Science and Engineering, Wolverhampton WV1 1LY, UK.

Related document
Valuation tool.pdf
(For EXCEL-version see USB storage media)

Related document
Valuation tool - user guide.pdf

Related document
Valuation tool - C2C Value Indexing Tool.pdf
(For EXCEL-version see USB storage media)



4.4.2 GUIDED CHOICES TOWARDS A CIRCULAR BUSINESS MODEL

PHASES OF C2C BUSINESS SITE DEVELOPMENT TO WHICH THE TOOL APPLIES

The tool can be used in almost all phases. It can be used to clarify stakeholders interests. Intentions and goals can be defined using the information in the document. During tendering and procurement the tool can be used to show suppliers the added value of working in the circular economy and during operation, optimization and renovation the document can inspire users to continuously improve processes.

SHORT DESCRIPTION

The workbook 'Guided Choices towards a Circular Business Model' answers the question how to benefit from the circular economy. It is meant to be a source of inspiration and support for small and medium enterprises (SMEs) that want to enter the circular economy. To involve companies and entrepreneurs, they are given more guidance on the circular economy topic to show how the *Cradle to Cradle*[®] methodology can lead to profits.

The focus of the workbook is on the choices that companies need to make in their search for a circular business model. Each company is different and makes different choices. The workbook shows there are multiple solutions for the same problem. Based on the given possibilities the best solution for each company can be created. The workbook supports raising awareness, learning about the situation of the company and its partners, product (re-)design, service redesign and testing concepts in a business model calculation. Tips and examples are given and with all this information, companies can get a good idea of the possibilities of the circular economy for them.

OUTCOMES AND LIMITATIONS OF THE TOOL

The content of the workbook was made based on questions that were asked by entrepreneurs. The questions were asked during interviews and round-table discussions with various businesses. The questions are used to cover several subjects related to the circular economy. The workbook shows the question that companies should answer. It also shows examples of answers of other companies, but each company should find its own answers to the questions in its own unique situation. The workbook can help companies to be inspired and start, but they have to take the next steps themselves.

AREA OF APPLICATION AND USERS

The target groups for this tool are small and medium enterprises (SMEs). The tool can be used as a workbook: which has to read in full. But it is also a clickable and interactive document. At the start there is a mind map that shows the different sections and the questions that are addressed. In this way it is also possible to just use the parts that are interesting in a specific situation.

TOOL DEVELOPER AND FURTHER INFORMATION AND ADVICE

Samenwerkingsverband Regio Eindhoven (SRE), Keizer Karel V Singel 8, 5615 PE Eindhoven, The Netherlands.

Related document
Guided Choices towards a circular business model.pdf



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5.1 PROJECTS WITH FOCUS ON MATERIAL FLOW (CONTINUOUS LOOPS)

5.1.1 LONDON SUSTAINABLE INDUSTRIES PARK (LSIP), UK

SHORT DESCRIPTION

The London Sustainable Industries Park (LSIP) is proposed to be at the heart of the largest concentration of environmental industries and technologies in the UK, centred within the wider context of the East London Green Enterprise District, bringing new life and opportunities to the area.

It will be an exemplar park for innovative and emerging technology industries who wish to operate within and embrace the *Cradle to Cradle*®

(C2C) principles of 'everything being a resource for something else, using solar income and respecting diversity.' All three principles are planned to become the cornerstone of the LSIP that will seek to become the first full C2C site in the UK.

Environmental diversity and integrated resource management are the key distinguishing features of the LSIP, which will provide eco-effective and environmentally diverse business space. Buildings on the park will be required

to achieve high benchmarks for energy efficiency, continuous loop and energy resource effectiveness and the environmental infrastructure that supports them will be exemplary in design and be self-sustainable, as much as possible.

Synergies between businesses will be exploited to ensure that opportunities to minimize the production of and maximize the reuse of waste are taken into account when designing process and production

techniques. The aim is to develop an industrial symbiosis over time, where businesses use each other's by-products and share resources, moving towards a continuous loop system which is enabled through geographical proximity.

This flagship development scheme will provide over 67,000 m² of high quality, environmentally-friendly business space for one of the fastest growing economic sectors in the world. A strong landscaping strategy will be central to creating an attractive investment proposition for green and eco-effective industries looking to locate on site.

ASSIGNMENT WITHIN C2C BIZZ

Demonstration of continuous loops using a scale pilot plant which will use input resources which are (resources) waste from other on-site production processes.

MOTIVATION FOR STAKEHOLDERS

In the UK alone, over 434 million tonnes of waste are produced every year driving a waste management industry worth over 6.0 billion EUR. As global demand for resources and as the cost of disposing of unwanted materials increase, continuous loop and C2C principles present an alternative approach of using these materials as resources for something else. They aim to design and create production techniques that are efficient, treat by-products as nutrients and convert them into raw material or energy to be fed into other processes or products. However, take up and investment in the UK is slow, due in part to concerns about financial viability and risk management.

PROJECT ORGANIZATION

The C2C BIZZ-partner Institute for Sustainability (IfS) is working in partnership with the Greater London Authority (GLA), formerly the London



Thames Gateway Development Corporation (LTGDC), the University of East London (UEL) and several tenants on the London Sustainable Industries Park to introduce *Cradle to Cradle*® inspired principles in practise.

FINANCING

The site is owned by a City Government Office and received a substantial amount of core funding invested into developing the Development Framework, placing critical services and infrastructure and marketing the overall site. Individual plots are a matter of commercial offer and negotiation.

CONNECTION TO C2C

The aim is to create a development model which others can follow, establishing a benchmark for eco-effective and resource-effective technology business parks in the UK and beyond. Investment and infrastructure will enable business to quickly embrace the three C2C inspired principles and showcase that the step-change toward C2C is the a valid business solution.

The demonstrator will help businesses work together to understand how synergies between their production processes can result in creating additional value from their waste or by-products that would otherwise be down-cycled, sent to landfill or discharged back into the environment, usually for a negative value, but importantly to re-introduce nutrients into the use chain again.

C2C-INTENTIONS AND GOALS

Intentions:

The long-term vision for the LSIP is to have an integrated area where a symbiotic hub is created which has C2C at its heart and the development can boast an array of quality buildings, industrial processes, connected infrastructure and integrated diversity.

LISP will provide eco-effective and environmentally diverse business space. Buildings on the Park will be required to achieve high bench-

marks for energy efficiency, continuous loop and energy resource effectiveness and the environmental infrastructure that supports them will be exemplary in design and be self-sustainable, as much as possible. Synergies between businesses will be exploited to ensure that opportunities to minimize the production of, and maximize the reuse of, waste are taken.

Goals:

Quantifying C2C Goals formulated within the LSIP are currently limited. Due to the small number of tenants currently on site, plots on the LSIP are being marketed and some still remain vacant. As industries begin to occupy these plots continuous loop goals for the LSIP will be decided by the collaboration of the participating industries. However, some of the overall goals for the site are as follows:

1. At the moment, since there are no specified C2C accreditations for buildings, in the interim period, the LSIP is encouraging the current market accreditations (such as BREEAM Excellent and LEEDS) for all buildings on the LSIP.
2. Using collaborative agreement, to reduce waste products leaving the LSIP by 5% per annum.
3. In 20 years (by 2025), to have influenced initial production design to assure that ALL waste leaving every individual plot on the LSIP becomes a resource for the other industrial/commercial businesses on the site.
4. Planned works on site to be completed:
 - ◆ Site wide infrastructure for heating and waste management, utilizing on-site renewable energy sources; the site wide sustainable drainage system will serve each development plot, taking surface water from hard standing and attenuating it over the next 15 year period.
 - ◆ Movement and transport networks, which do not discriminate between users and are safe for people to move through.
 - ◆ Integration of existing transport network extensions to include local bus routes and light rail.

- ◆ Strong links with neighbouring and associated building and public realm projects, to create a connected urban environment, which is also encouraged by activity carried out by the Green Technology Centre.
- ◆ Managed urban woodland in specific zones.

PARTIAL PROJECTS AND ACTUAL STAGE OF WORK

The C2C-related projects on LSIP are mostly in the planning stage. The planning permission for the demonstrator was awarded in August 2013. The London SIP demonstrator plant will take by-products emanating from three existing and future London SIP tenants (a plastic recycling business, a gasification plant and an anaerobic digestion plant) and process them into aggregate material that can be used for drainage on green roofs or on pathways in place of gravel.

A draft for a Development framework of the LSIP has been worked out by the IfS. After discussion and drawing up the final redaction, this document connected with a Memorandum of Understanding could be the base for the co-operation of companies and developers, as well as the assessment and acceptance of new tenants on the site.

FUTURE PERFORMANCE

The scale Demonstrator will open in October and trialling of C2C inspired industrial symbiosis will commence. This will show how the variety of waste products arising from the newly developing LSIP can work together to create value from nil value waste.

The development of a fully operational C2C business site can take a long time to establish. There are the initial adopters and those that will follow over a longer period of time, once a core nucleus has formed.



5.1.2 IRISPHERE, BELGIUM

SHORT DESCRIPTION

The project partner citydev.brussels (*Brussels Regional Development Agency*) together with its subpartner EcoRes contributes to the continuous loops and energy theme by preparing and executing feasibility studies at site level by addressing material and energy flows at company level. citydev.brussels has significant site management expertise and will contribute to a research methodology for the material flow feasibility study at the start of the Project. citydev.brussels will in a later stage (after the Project) make use of the knowledge and expertise in the network to redevelop business sites with regional partners.



ASSIGNMENT WITHIN C2C BIZZ

Demonstration of continuous loops and C2C energy principles on existing business sites.

MOTIVATION FOR STAKEHOLDERS

For several years, citydev.brussels follows a proactive approach to improve the environmental performance of the buildings and industrial sites in its responsibility. It evolved the initiative IRISPHERE, which aims at companies that want to improve their environmental performance and offers advice and assistance in realizing this.

PROJECT ORGANIZATION

citydev.brussels was founded in 1974 to facilitate the establishment of companies in the region and to

increase employment. Today, it manages some 200 ha of commercial and industrial sites, occupied by over 300 companies with more than 18,000 work locations. Citydev.brussels is a public institution. EcoRes is a private planning office specializing in sustainable development. EcoRes helps companies, organizations and public bodies to develop their activities in a sustainable and responsible way.

citydev.brussels and EcoRes develop and perform IRISPHERE, with the support of the Ministry of Economy of the Brussels Region.

FINANCING

IRISPHERE is publically financed. The consultancy service for companies is free of charge.

CONNECTION TO C2C

The main objective of IRISPHERE is to improve the ecological performance of businesses in industrial areas in the Brussels Region. An essential point, thereby, is the identification, use, enhancement and optimization of synergies between the different companies and economic sectors. The focus lies on the flow of materials and energy.

C2C-INTENTIONS AND GOALS

A set of intentions was established at the beginning of the Project, particularly with regard to park management.

Healthy air and climate:

The material park offers recycling and reuse solutions, instead of an incineration solution which emit huge amounts of CO₂.

Healthy water and nutrient recycling:

A more specific collection and segregation of materials for more optimized material recycling.

Healthy materials:

Control of the recycling process of materials to avoid cross contamination.

Cultural diversity enhancement:

Helps involve different types of companies to build the value chain (from collection to treatment) and support diversity.

Functional diversity enhancement:

Creation of a new type of activity with unskilled jobs on the business site.

Mobility enhancement:

Reduce the number of waste collection trucks.

A roadmap is attached which indicates the given timeframe.

*Related document
Irisphere Intentions and Goals.pdf*

PARTIAL PROJECTS AND ACTUAL STAGE OF WORK

The Project started in October 2011. All companies settled in the actual Project area were informed by several communication means (flyers, press-conferences, information sessions and seminars). Eight companies (about 15% of the contacted enterprises) consented to participate in the Project. They represent several economic sectors (including food industry, metal assembly, equipment manufacturing and the tertiary sector).

In the second half of 2012, the energy and material flows of the interested companies and potential synergies between them were analysed. Eighteen potential fields, where synergies could be used, were identified. From them five were retained in a first step and are currently being studied in detail. These can be quickly realized, with comparatively little effort.

Not every synergy that is selected to be used fully fits the C2C-criteria. Partly, they are only eco-efficient and still not eco-effective. That means that the prior strategy is to create a basis for trusting co-operation that demonstrates and shows the creation of added value by using syner-

gies for ecological improvement. Building on that foundation, genuine C2C-inspired business sites can gradually be developed.

FUTURE PERFORMANCE

After the implementation of easy and quickly realizable synergies (possible examples: sharing collection and treatment of secondary raw materials and hazardous waste, infrastructure to recover wastewater, accelerated composting of food waste on site, purchasing (renewable) energy and car sharing), other synergies will be subject to feasibility studies.

Based on the experiences gained, the companies will be coached on identification and implementation of C2C synergies.



5.1.3 BLUE GATE ANTWERP, BELGIUM

SHORT DESCRIPTION

Blue Gate Antwerp is a major site development project (103 ha) for the City of Antwerp, Belgium. It has set high sustainable ambitions. The brownfield, to the south of the City Centre, is being redeveloped, in collaboration with the Flemish Region, into an eco-effective business park. In the future, Blue Gate Antwerp will be home to sustainable logistics, production and research and development.

Blue Gate Antwerp is a Public Private Partnership (PPP). The aim of the partnership is to create a business site on which authorities and companies co-operate to improve economic and social development and to reduce their environmental impact.

ASSIGNMENT WITHIN C2C BIZZ

Development of a charter and implementing C2C solutions during planning, (re)construction and operating of the infrastructure and premises on a brown site.

MOTIVATION FOR STAKEHOLDERS

According to the Flemish governing accord (2009-2014), land is simply too scarce in Flanders to let dilapidated and contaminated former industrial terrain lay empty and unused. Because of this, Flanders wants to 'kick-start' the development of these 'brownfields'. In the consciousness of the fact that the conventional way of economic activity and management is, due to multiple negative and partly unknown or not yet foreseeable consequences, not future-proof, the institutions and companies developing Blue Gate want to create an eco-effective business site on the basis of C2C principles.



PROJECT ORGANIZATION

The development of Blue Gate is led by four public administrations of Antwerp and Flanders in a participative public-private partnership with the private sector (Blue Gate Antwerp NV: legal form public limited company).

FINANCING

The development of Blue Gate Antwerp is financed by the partners with the support of the EU.

CONNECTION TO C2C

Blue Gate Antwerp aims to be a leading international eco-business park. Candidate companies will be selected based on a sustainability and innovation charter. Companies will have to comply with several ambitious standards in order to be allowed to establish themselves at the site. The aim is to turn Blue Gate Antwerp into a label for the economy of the future. The production and use of renewable energy, the establishment of continuing cycles and biodiversity as an element in the development of green space are only some liaisons with C2C.

C2C-INTENTIONS AND GOALS

Related document
Bluegate Intentions and Goals.pdf

PARTIAL PROJECTS AND ACTUAL STAGE OF WORK

- ◆ The environmental impact assessment (EIA) for the Blue Gate-site started late 2011 and is, after public announcement, consultation, consideration and comment of the EIA Unit of the Flemish Administration, about to be completed.
- ◆ Work on the new quay wall for the logistics area have started; the building permit has been obtained and the site is being prepared. In a first phase (from 2015) the quay will be used for in- and out-bound flows of building materials for the development of Blue Gate Antwerp and surrounding projects. A call for a PPP partnership to attract a private partner for the first phase of the logistics zone of Blue Gate Antwerp (after finishing the new quay) has been made.
- ◆ A charter with the eco-effective ambitions of the City of Antwerp and Flanders for Blue Gate Antwerp is in preparation and was made available from late 2013.
- ◆ A call for a PPP partnership to attract a private partner to start the decontamination and re-development of the site has been made.
- ◆ A study that examines whether an incubator/accelerator for a sustainable chemical industry is technically and economically viable, and whether Blue Gate Antwerp is an appropriate location for it, started in September 2012.
- ◆ A three year test-project for the municipal distribution centre, which will be the hub for city-regional distribution and is located in the logistics zone of Blue Gate, was launched by the City of Antwerp in the first half of 2013.

FUTURE PERFORMANCE

Currently, Blue Gate Antwerp is still in the planning stage. After finishing the Environmental Impact Assessment (November 2013) and the call for the PPP concerning decontaminating and infrastructural redevelopment (April 2014), the constructional development of the site will begin. According to expectations, the first companies will be able to settle at Blue Gate Antwerp in 2015.



5.2 PROJECTS WITH FOCUS ON RENEWABLE ENERGY

5.2.1 ECOPARC WINDHOF, LUXEMBOURG

SHORT DESCRIPTION

Ecoparc Windhof is a Public Private Partnership (PPP). The aim of the partnership is to create a business site on which authorities and companies co-operate to improve economic and social development and to reduce their environmental impact. On the site willingness to apply innovative ways of making business already existed. Different companies work together on a voluntary basis to go beyond sustainability by applying C2C principles. The partners will create value by synergies. Moreover, an office building (called Solarwind), that applies certain C2C criteria, has been constructed on the site.

ASSIGNMENT WITHIN C2C BIZZ

Insertion and demonstration of C2C-solutions in an existing business area.

MOTIVATION FOR STAKEHOLDERS

Companies in the inter-municipal industrial zone Windhof have made it their task to work together for the positive development of the area in the interests of local actors.

PROJECT ORGANIZATION

The involved companies and the administration of the Municipality of Koerich (i.e. the community on whose terrain the business site Windhof is situated) founded GIE Ecoparc Windhof (an economic interest grouping) in May 2010. The members represent most of the office buildings in the zone and several storage buildings.

FINANCING

Parent activities (e.g. basic data acquisition and concept development) are financed by membership dues of the GIE. Costs for specific joint projects (e.g. solar filling station) are shared on a pro-rata basis.

Construction and operation of other facilities (e.g. a kindergarten) take place in a dedicated and self-sustaining business model.

CONNECTION TO C2C

Ecoparc Windhof developed, in co-operation with public authorities, joint initiatives in the interest of its members. It is the objective to exploit possible synergies and develop and implement sustainable solutions. Economic, environmental and social intentions of the stake-



holders are to be implemented in co-operation and without complicated management structures.

C2C is seen as an approach to tackle and meet the self-appointed tasks in a systematic and innovative way. In early 2011, the C2C concept was integrated into the work of Ecoparc Windhof.

C2C-INTENTIONS AND GOALS

A project charter has been signed by all members. The following intentions of the Charter correspond with C2C-intentions:

- ◆ The business site is to be developed sustainably, with the objective to increase economic gains and improve environmental quality and the social environment.
- ◆ The energy concept envisages high performance energy systems. For new buildings, this will result in an energy performance that should be much better than legal requirements.
- ◆ Induce a dynamic of civic behaviour through working on collective changes.

The partners in Ecoparc Windhof want to use the potential of the site (natural local and regional conditions; the mix and diversity of enterprises on the site; the common interests and visions of the occupants) to develop the site in a sustainable way, by enhancing and assuring good economic, environmental and social features.

As C2C-ideas were seized after the construction of the business site, during the operational phase. ECOPARC is not a project 'starting from scratch.'

Instead, many fields of activity and elements have been identified where C2C could and should be applied.

Thus, the following goals were set:

- ◆ Optimize recycling and avoid losses, waste and pollution.
- ◆ High performance renewable and effective energy systems.
- ◆ Enhance the supply of mobility (including e-mobility).
- ◆ Practise sustainable purchase.

A comprehensive description of intentions and goals at Ecoparc Windhof and a roadmap are attached.

*Related document
140605 Ecoparc Windhof C2C intentions goals.pdf*

PARTIAL PROJECTS AND ACTUAL STAGE OF WORK

Material flow:

An inventory of waste type and streams has been carried out.

Energy:

Common purchase of green electricity is implemented.

Study on potential roof surfaces and possible electricity-production by photovoltaics has been conducted.

Basic data acquisition on business site level is prepared (monitoring the chronology of electricity consumption).

Diversity:

A kindergarten is realized and a second is planned to support workers on and near the site by making child care more convenient.

FUTURE PERFORMANCE

Ecoparc Windhof will permanently promote the business site by regarding charter intentions and C2C principles. The results of research and monitoring on site level and feedback assessments, as well as technical and conceptual progress and practise in C2C, will be integrated.

5.3 PROJECTS WITH FOCUS ON DIVERSITY

5.3.1 LA LAINIÈRE, FRANCE

SHORT DESCRIPTION

Lille Métropole's area is marked by a very long and complex industrial past. This means Lille Métropole has to deal with regeneration of numerous former industrial sites with major environmental issues. The area also needs to find new ways of developing attractiveness. Therefore, Lille Métropole led a study on 21st century business sites to see how to develop intense and eco-friendly economic sites in a C2C perspective. Lille Métropole is also engaged in a policy for promoting



and structuring eco-enterprises in two sectors: eco-building and eco-innovations and sustainable development.

The site La Lainière (30 ha) is one of the most important brownfield sites in Lille Métropole's territory. This former wool company closed in 2000 and the site will be redeveloped for business companies (logistics) and housing.

Lille Métropole chose to redevelop it in an intense, sustainable and C2C diversity perspective, as the first pilot-site (prototype)

of the so-called '21st century business parks charter' and of the C2C BIZZ Project.

It will implement measures for an eco-positive (eco-effective) site, embedding it in existing economic, social and ecological structures. It has to become a dynamic site, that has longevity and which can be reused for other purposes when the current production processes will move. Thus, diversity is a very important issue for La Lainière site.

ASSIGNMENT WITHIN C2C BIZZ

Development of a general charter for evolving business parks on brownfields and translation of this paramount document in specific charters for certain defined areas.

MOTIVATION FOR STAKEHOLDERS

In 2011 Lille Métropole triggered a process to create business sites of the 21st Century. The objective is to evolve the metropolitan area as an important economic centre in Europe, a so called 'Eurométropole'. The intended Eurométropole must be dynamic, sustainable and innovative. The brownfield La Lainière was identified as one of three prototypes in the framework of the 21st Century Business Parks Charter and the C2C BIZZ Project. The following guidelines have been set out for the redevelopment of the site:

- ◆ Diverse residential and commercial zone with production activities and logistic services.
- ◆ Investigation of the overlap of industrial and commercial activities with residential function, aiming at the optimization of 'cohabitation' in terms of reasonable density and eco-positive functions of the area.

PROJECT ORGANIZATION

Lille Métropole is the local authority gathering 85 communities (Lille and surroundings) and representing 1.1 million people.

FINANCING

Public, local and European funding.

CONNECTION TO C2C

In 2010, the site was identified as a place for economic revival in the framework of a study on economic land. In 2011, while studies on the Charter for 21st Century Business Parks and C2C BIZZ Project started, the site was chosen as the first pilot (prototype) for the implementation of this Charter and to put into practise 'diversity' as one of the C2C principles.

C2C-INTENTIONS AND GOALS

The business sites of the 21st Century are:

- ◆ Ecologically, economically and socially enduring.
- ◆ Attractive for all kinds of business, primarily for manufacturing industries and logistics companies.
- ◆ Innovative in conception, construction, operation and governance.
- ◆ Ambitious in architectural and spatial design and concerning deconstruction and reuse after their different 'use and life cycles.'

Amongst others, these intentions are realized by:

- ◆ Recycling of the brownfield infrastructure (waste = food): reintegrating the brownfield in the town.
- ◆ Economic diversity: offices, production activities, artisan activities and small scale logistics.
- ◆ Social diversity through diverse functions (economy and housing).
- ◆ Thinking and designing the Park as a reversible site, with reversible buildings (goal = no wasteland in this area).
- ◆ Creating and developing biodiversity on the site (= ecological diversity).

PARTIAL PROJECTS AND ACTUAL STAGE OF WORK

Lille Métropole launched a specific procedure called 'competitive dialogue' to help it to define the physical planning of the site and the future project. This procedure is an innovative way to define an urban project and it is the first time that Lille Métropole used this procedure for plan-



House of Project © Simon Clause.

ning. Lille Métropole chose the contractor at the end of 2013, after this specific tendering procedure. This allowed site co-design and co-creation, according to C2C concepts. This co-creation was reinforced through workshops with citizens, in order to have a direct dialogue about the site and its future.

The tangible development of La Lainière and its different partial projects, as well as the implementation of companies on site, are managed and controlled by a Charter, which contains guidelines for activity on the site.

The Charter for 21st century business sites was adopted in April 2013 by Lille Métropole Executive Board. It gives guidance to planners and companies acting in the selected pilot business parks. It considers density, diversity, mobility, ecology and governance.

'A C2C-inspired House of Project' will be built, according to the diversity principle of C2C. This will be the symbol of the redevelopment of the site. Building use and operation will be flexible, to evolve during the site's lifetime.

FUTURE PERFORMANCE

The Charter for 21st Century business sites is not a general template to be applied in all business areas. It contains frameworks which need to be 'translated' specifically for every single site.

The resulting site charter constitutes a Memorandum of Understanding. In it, the concerned parties define realistic conditions for developing the site.

Based on the experiences gained in La Lainière, the more general charter for 21st century business sites and the project specific charter will be evaluated and continuously revised.



5.3.2 STRIJP T, THE NETHERLANDS

SHORT DESCRIPTION

Strijp T is a brownfield site in Eindhoven. It is a former Philips site and it also contains an old and used energy generation plant. Heavy industry is allowed on the business site. In practice, heavy industry is mixed with other activities, like designers. In the south, Strijp T is adjacent to Strijp S, an upcoming cultural area, also a former Philips site. In the east and west there is housing around Strijp T. In the north there is a large green area. Because of uncertainty about the future of the business site, companies did not invest for some years. At the beginning of 2014

the Municipality of Eindhoven decided Strijp T will stay a business site with heavy industry and this will be facilitated. Only the small part at the border with Strijp S can also be used for more cultural activities. The old energy plant will also be used for cultural purpose and next to it a new biomass plant will be built.

ASSIGNMENT WITHIN C2C BIZZ

Within C2C BIZZ a diversity design has been made for Strijp T. The Project started just after the announcement of the decision that heavy industry on the business site would still be allowed in the future and even facilitated. The expectation was that companies and entrepreneurs would start investing in the business site again. The aim of the diversity design was to show them the possibilities of developing the site further in a C2C way.



MOTIVATION FOR STAKEHOLDERS

The diversity design was made in close collaboration with stakeholders. The Municipality of Eindhoven wants to facilitate the development of the business site, but not by investing in it. The companies and entrepreneurs are the stakeholders that should do the investments. Therefore, these stakeholders are the ones to decide about intentions and goals for the business sites. The only criterion for the outcome of the diversity design was the usefulness for the companies of Strijp T.

PROJECT ORGANIZATION

A project leader for the diversity design was hired, 12N Stedenbouw. The Project started with interviews with the most important stakeholders, followed by a workshop with these stakeholders, to define intentions and goals for Strijp T. During the workshop several C2C experts were present. In the meantime several C2C BIZZ tools were used. The outcomes of this first stage were used to define the diversity design that should be the outcome of the second stage.

FINANCING

The diversity design of Strijp T is financed completely by the C2C BIZZ Project. The investments that are necessary to realize the intentions and goals in the diversity design should be done by the companies and entrepreneurs on Strijp T.

CONNECTION TO C2C

Because the development of the diversity design for Strijp T started only in 2014, most C2C BIZZ tools were available, at least as a draft, during the design process. The description of the process towards a C2C business site was also already available. Therefore, Strijp T offered a perfect opportunity to apply and test the process and tools in practice.

C2C-INTENTIONS AND GOALS

On Strijp T the following intentions apply:

- ◆ The area (rooftops) is (are) used to generate renewable (solar) energy.
- ◆ Excess heat that is available on the business site is used to facilitate the sole use of renewable energy.
- ◆ The business sites profile is aligned with Eindhoven's core qualities: 'high-tech' and design.
- ◆ Co-operation between the different types of companies is enhanced.
- ◆ The area is open and inviting (i.e. no more fences).
- ◆ The traffic flows (trucks, cars, bikes and pedestrians) are smooth.
- ◆ Joint facilities (meetings rooms, canteens, parking spaces) are available.

At the moment of writing this Guide, no goals are yet determined.

PARTIAL PROJECTS AND ACTUAL STAGE OF WORK

The aim of the Project was to deliver a diversity design and that is exactly what has been done. The work that should be done within C2C BIZZ is ready and the next steps are up to the companies and entrepreneurs on the business site.

FUTURE PERFORMANCE

Further developments on Strijp T depend completely of the companies and entrepreneurs on the site. Because the intentions and goals of the diversity design are determined by these stakeholders, they will support them and if the added (financial) value is clear, investments will be made.



5.3.3 STRAWBERRY FIELD, GERMANY

SHORT DESCRIPTION

The Project partner City of Bielefeld and WEGE mbH built a local C2C-BIZZ project team with three companies from Bielefeld: Schüco International KG, Goldbeck GmbH and Stadtwerke Bielefeld. Together they work on a guideline for planning a business site with high quality of diversity and optimized continuous loops with respect to water, waste and materials. The project work in Bielefeld is study-based and has a theoretical approach. Based on an existing greenfield ‘Strawberry Field’ Bielefeld wants to find out the differences between the development on C2C-principles (continuous loops, renewable energies, diversity) and the ‘traditional’ way.

ASSIGNMENT WITHIN C2C BIZZ

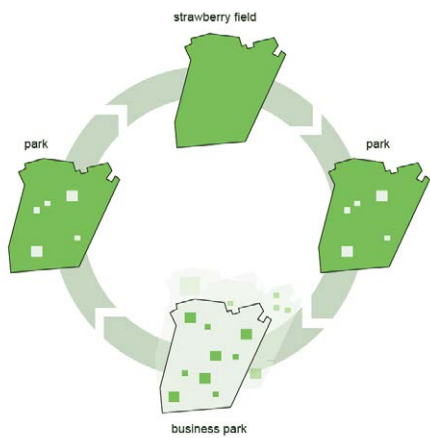
For the design of diversity on business sites exemplary planning should be developed, which correspond to C2C philosophy from the onset (i.e. ideas of flexible design regarding buildings and space, respect of nature, diverse use and renewable energy).

MOTIVATION FOR STAKEHOLDERS

The City of Bielefeld and WEGE mbH wish to increase the attractiveness of Bielefeld as a location for business and industry. Public discussions, consultancy and planning of a C2C business site should raise the awareness of companies and citizens on matters such as ‘acting and economizing in continuous loops.’

PROJECT ORGANIZATION

The City of Bielefeld is a public body. With respect to the C2C BIZZ Project, Departments of Urban Planning, Construction, Traffic, and Environment are involved. WEGE mbH is a customer-oriented service provider and the central contact for all businesses in Bielefeld. As location manager and helping hand with respect to administrative processes, WEGE is dealing with office accommodation and trade area



development and marketing, planning consent management, real estate services, company incorporation, promotion consultancy and location marketing.

FINANCING

50% funding by the INTERREG IV B Programme.

CONNECTION TO C2C

For Bielefeld there is a chance to give an additional contribution to the climate protection goals of the City of Bielefeld by developing business sites on C2C principles. C2C seems to be an important vehicle for

bringing environment, economy and nature into better balance, make cities more attractive and more pleasant for the present and future generations. But of course Bielefeld cannot do it on its own, because Bielefeld does not have experience in C2C and its implementation. Thus, Bielefeld wants to learn from the Project partners and co-operate by transnational working with the aim of developing a C2C concept for the business-site greenfield 'Strawberry Field,' which could be an example for other greenfield sites in Europe.

C2C-INTENTIONS AND GOALS

The following intentions are important:

- ◆ Requirements for C2C-inspired legal binding land use plan.
- ◆ Private-law contracts regarding requirements of C2C.
- ◆ Voluntary commitments.
- ◆ Structure of a C2C inspired business site regarding material loops, energy and diversity.
- ◆ Criteria for a C2C inspired business sites regarding energy, water, waste, construction materials, social aspects and mobility.
- ◆ Concepts for realization of continuous loops on the business sites.
- ◆ Concepts for C2C inspired materials regarding site infrastructure.
- ◆ Concepts for C2C inspired buildings (materials), also including storage and parking places.
- ◆ Definition of site-relevant factors for the creation of optimized loops.
- ◆ To find out what kind of businesses are interested in co-operation with respect to waste, water, energy and material loops.
- ◆ To find out and describe economic advantages and benefits of C2C for businesses.
- ◆ To develop recommendations for companies and local authorities if they want to invest on a C2C inspired business site.

The goal of Bielefeld is a feasibility study about the planning and development of a greenfield into a C2C-inspired business site. The study will contain recommendations and guidance for local authorities and business.

PARTIAL PROJECTS AND ACTUAL STAGE OF WORK

During 2011 the Project started with a local public workshop. Furthermore, companies, citizens and politicians were informed by leaflets and a website about the Project. Since 2012, Bielefeld started a series of events, such as 'Planning the Future' about various C2C topics with moderated discussions for the public. In the second half of 2012, Bielefeld started co-operation with Bielefeld University of Applied Science. At the same time, Bielefeld C2C-BIZZ Project team developed and published a brochure for companies, with information on the advantages of sustainable buildings and C2C. Based on it, an intensive dialogue with companies has commenced.

FUTURE PERFORMANCE

The Project work was study based and had a theoretical approach. The results were integrated in the transnational exchange with Project partners and will help to make planning of a C2C inspired business site much easier, both in Bielefeld and beyond!

GLOSSARY

C2C	<i>Cradle to Cradle</i> [®]
C2C-inspired elements	Measurably add value to a building or business site by implementing C2C at a substantive level. An element usually consists of a system in a building or business site.
C2C-inspired features	Elements are broad categories with several innovative features to be integrated to achieve holistic quality.
Intentions	Break down the C2C principles (waste equals food, use of current solar income, celebrate diversity) to the level of qualitative guidelines.
Goals	Provide the network to let users break down intentions into time-tables and specific operational plans. They have a quantitative dimension and are measurable in economic, technical, productivity-related or ecological terms.
Showcases	Describe processes and modules that have been applied to the C2C BIZZ pilot sites.
Best-practice cases	Description of projects that have not been part of C2C BIZZ.

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STORAGE MEDIA (ENCLOSED)

- ◆ Development Framework & Memorandum of Understanding
- ◆ Operational Framework
- ◆ Inventory
- ◆ Communication strategy tool
- ◆ Valuation tool
- ◆ Guided choices towards a circular business model
- ◆ Guideline for C2C inspired materials management on business sites
- ◆ Guideline for energy assessment of building sites
- ◆ Guideline for diversity
- ◆ Continuous loops tool
- ◆ Film
- ◆ Executive summary
- ◆ Intentions and Goals Exoparc Windhof
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- ◆ Brochure C2C Centre
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