Venlo town hall design
increasing environmental awareness by showing C2C concepts

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Increasing Environmental awareness by showing C2C concepts.
Preface

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Summary

The report is divided in 4 chapters.

The introduction presents the fascination for Cradle to Cradle, explains the problem and resumes the overall strategy of the design process.

The first chapter is an exploration of the site by using maps.

The second chapter is where the research on C2C concept and theories are explained and developed.

In the third chapter are explained concepts about introducing CO₂ in its cycle, using Architecture as support for a message, and creating a public building as a new paradigm.

In the fourth chapter the concept is applied to the building and the design is finished.

At the end of the report a conclusion, bibliography and annexes are joint to the document to help any further research.
Introduction

Fascination

This project started all because of a sudden interest in Cradle to Cradle. After reading the book it seemed important to me to participate in this new design-attitude and try to integrate it in the design.

Venlo is a town situated in the southeastern of Netherlands. It is an important traffic connection of commercial exchanges between Rotterdam and the Ruhr. Nowadays the city is developing through a new masterplan and aims to be the first city Cradle to Cradle in the world.

C2C is a sustainable concept invented by William McDonough and Michael Braungart and published in their book Cradle to Cradle in 2002. According to their vision, human industry should change through ecological and intelligent design. Their concept is to identify two cycles, namely biological and technical, to introduce each existing product in a cycle and ‘erase the concept’ of waste.

In 2012 the town will host The Floriade, World Horticulture Fair, and uses this occasion to promote itself to the world as the first ‘Cradle to Cradle City in the World’.

The Problem

The project of The Floriade is to build a greenpark and an innovative and distinctive greenfield business park called Greenpark Venlo. The City is also working on its masterplan, which is divided into two projects, Maaswaard and Maasboulevaard. Those projects extend the city to the Maas and add functions as a town hall, housing, apartments offices and parkings, to the old masterplan.

Venlo has already an important status in commerce exchanges and the extension of it plus the development of Cradle to Cradle together with The Floriade will bring millions of visitors. The city will therefore be responsible of enhancing pollution by emitting more carbon dioxide in the air.

Nevertheless nowadays C2C is concentrated on processes and products and is only known by engineers, designers and architects. Therefore the spread of its message is for now mostly inexistent. How could it be possible to generate an Architecture that helps to provide Environmental Awareness to the public as well as give a solution to the raise of Carbon Dioxide emissions?

Definition of the Project

As a first answer the design is a City Hall as it is the first public building in the City. It is by definition the place where everything happens in front of everybody, citizens as well as strangers.

The aim of the project is to design a building which can increase environmental awareness by showing C2C concepts. As here the problem lies in CO₂ emissions, the C2C concept is directly linked with its surrounding and the aim of re-introducing CO₂ in a cycle.

The project develops the complete cycle from beginning to end and provides a solution on how to generate energy by using CO₂.

Research and Theory

The theory studies 3 main directions:

1/ Questioning C2C: What is waste.
2/ Communication - How to perceive a message in the city.
3/ Definition - What makes a building a public building.

Concept

1/ C2C - How to integrate carbon dioxide emissions into a biological cycle. ‘Algae system’ to clean air and provide energy to the building.
2/ How to address a message to citizens by using architecture. A building shaped by different geometries to answer numerous surrounding situations and integrate itself in its context.
3/ How can a public building such as a Town Hall express nowadays’ paradigm of environment awareness. A building where ‘green’ and public functions follow one shape.
The site chosen is located in Venlo, city located in the southeastern of Netherlands, in the province of Limburg. In 2012 Venlo will host The Floriade, a World Horticulture Fair which is one of the major international exhibitions that have taken place in various countries since 1851. The Floriade is only one of those exhibitions and has been held in Netherlands every 10 years since 1980. These exhibitions represent an opportunity for some countries to show the world an impression of their economic, social, cultural and technical development. For Venlo it is an opportunity for the city to promote itself as the first region in the world to embrace the principles of Cradle to Cradle* with the Floriade as its outstanding project: A greenpark and an innovative and distinctive greenfield business park called Greenpark Venlo.

*Floriade Venlo Principles:

Our mission is to use our Cradle to Cradle framework as an engine for innovation.

Our Cradle to Cradle framework means: We are native to our place
Our waste = food
Sun is our income
Our air, soil, and water are healthy
We design enjoyment for all generations.

Our goal is a delightfully diverse, safe, healthy and just world, with clean air, water, soil and power — economically, equitably, ecologically and elegantly enjoyed.

The site - A Town Hall for Venlo

The new masterplan is divided into two main projects: Maaswaard and Maasboulevard, and extents it by adding a Town Hall, housing, apartments, offices, and parkings. Because it is a public building, the project developed here focuses only on the Town Hall.
Nowadays Venlo is subject to a new masterplan. The municipality had an increasing demand among elderly for assisted or independent living combined with high-grade care and other facilities. Maaswaard develops the city towards the Maas and provides opportunities for ecology and sustainability. Maaswaard is sited along the river Maas and will offer a wide array of living arrangements.

The programmatic interpretation of the planning area consists of five parts, namely a downtown office, Nedinsco Weerd Tower (above all offices and residence), a residential (care) complex (mainly living in public and commercial spaces) and public space / de Weerd.

The construction of the complex began in April 2009 and will be finished for 2011.
1. General Informations
Venlo - Masterplan.

- Town Hall
  20 000m² (10 000m² town hall)
  apartments: 71 (100-120m² BVO)
  individual housing: 12
  parkings: 250 + 20 in street
  116 for houses with rear block

- Green Tower
  office: 4500 m²
  restauration: 500m²
  apartments: 61 (110-120m² BVO)

- Nedinsco
  apartments: 35 + 4 (chocolate factory) (100-120m² BVO)
  common space: 1000m²
  Individual housing: 19
  Nedinsco max: 7000m²
  parking: min. 1100m² + 24x (ground level housing)
  max. 5200m² + 24x (ground level housing)

- Wozoco
  apartments: 95 live care: 45
  parking: 4400m²

Program of the design
Here the choice is to focus on the Town Hall only. Apartments and individual housing will not be integrated in the design. The program then is about 10,000m².

MAASWAARD - PROGRAM.
Town hall, offices, apartments, individual housing and parkings.
1. General Informations

Historic map.

Venlo is built near the Maas in the northern Limburg. The old Venlo was open to the Maas because of the importance of trades.

In fact originally Venlo was a little trading town of no particular importance. Granted a municipal charter in 1343, it became a member of the Hanseatic League in 1481. Because of its situation in a frontier area it was strongly fortified, but in spite of this it was compelled to surrender on a number of occasions (- in 1543 to Charles V's forces, in 1543 to Alexander Farnese, in 1632 to Prince Frederick Henry and in 1702 to Marlborough. In 1713 it was incorporated in the United Netherlands.)

The demolition of the old fortifications in 1868 increased both the industrial activity and the population. Venlo suffered heavy destructions during the Second World War but has been rapidly rebuilt. Its situation near the Maas and its place in the centre of Europe made it an important traffic junction between Rotterdam and the Ruhr, and promotes the development of industry and the establishment of international commercial firms outside the city.

This picture shows how the Juliana park, the station and the railway which are built on the prints of the old great walls. The site is at the boundary of the old city centre, where industrialization started for Venlo.
From the 8th to 12th Century the town was concentrated in two parts and directed towards the Maas. It is only after the expansion of the 13th century, during the 14th, that the two cores met and filled the gap between them. The city expands itself as an industrial city on the 19th century.

**MORPHOLOGY - Full and Empty.**

The centre grew from two opposite sides.
MORPHOLOGY - Structure of Venlo.

The old center is a distorted grid working as a palimpsest. The south part follows a countryside structure.
In the city the green structure occupies the sides of the railway track and then takes the shape of the Juliana Park, giving a new life to the space left after the disappearance of the old great walls. Nowadays Venlo is much less turned on the Maas but tries on the contrary to extends through the countryside. The green structure seems disconnected from the public squares of the old centre.

**GREEN - Along the Maas.**
Structure Disconnected from the old center that finds its origins in the Maas and the old great walls.
The main branches of industry are engineering, production of optical apparatus, wire-drawing, electrical engineering, textiles, building materials and woodworking. They are mainly situated outside the city, on North-West and South-East.

1. **General Informations**

   **Functions map**

   The main branches of industry are engineering, production of optical apparatus, wire-drawing, electrical engineering, textiles, building materials and woodworking. They are mainly situated outside the city, on North-West and South-East.
**1. General Informations**

*Building heights map.*

The old centre's density is characterized by its thin windy streets mainly composed of G+3 houses. The south part of the city, structured around a main and large axis is built with lower density mainly constituted of 2 floors high houses.

**SITE**

**NORTH**

**MORPHOLOGY - Buildings heights.**

Two entities divided by the railway: the old centre and the south part of Venlo.
TRAFFIC - importance of the network in Venlo.
The communication between North and South meets traffic boundaries.

The South part of Venlo is isolated from the pedestrian streets and public squares of the old centre because of both the railway track and the car path.

1. General informations
Traffic map.

- highways
- bus line
- bus stops
- railway track
- parkings
- public squares
- pedestrian streets
- secondary car path
- provincial car path
C2C is a concept explained by William McDonough and Michael Braungart and published in 2002 in the book Cradle to Cradle. According to their vision, human industry should change through ecological and intelligent design. In fact an industrial system that “takes, makes and wastes” can become a creator of goods and services and generates ecological, social and economical value.

From a design point of view they identified two close cycles necessary to eliminate the concept of waste:
- The Biological Cycle is related with biological metabolism which biodegradability provides nutrients or “food” for nature and industry;
- The Technical Cycle deals with all kinds of high-tech synthetics and mineral resources as technical nutrients. They circulate in a perpetual cycle of production - recovery - remanufacture, and are ideally powered by renewable energy such as sunlight.

But this concept is mostly known by engineers, designers, architects and industrials because nowadays Cradle to Cradle is considered in terms of materials, consumable products and processes.

Cradle to Cradle is not yet widely known public. Architecture can help its promotion and communication through the use of architectural elements (scale, shape, structure, circulations, image and more).

In fact, the major reason why Architecture is such a big producer of CO₂ essentially lies within the transportation of materials through the planet. It is first extracted, then moves to be processed and then is placed on site. Instead of a product which materials can be totally controlled, Architecture is every time specific from a place and situation. This is why the concept of C2C - Waste is Food - is very relevant for designing products but not for sufficient for Architecture.
When it comes to Architecture it appears important to precise the definition of Waste. Architecture has a site with surroundings and works together with a specific program to help the leaving of humans. It is not controllable in the same way as a product.

While looking at Architecture and its influences it is possible to define 6 categories.

- **Geographical Waste** is food
  atmospheric conditions and seasons: sun, rainwater, geothermal heat, humidity, wind, pollution.
  (biological cycle)

- **Landscape Waste** is food
  ground layers and their qualities: permeability, solidity, flexibility, fertility, fauna and flora as well as their dissemination/migration, tectonic movements, presence of water, river, forest, trees.
  (biological cycle)

- **Urban Waste** is food
  circulations of pedestrians, bikes, cars, buses, sewerage, electricity, canals, noise, public squares and furniture.
  (technical cycle)

- **Architectural Waste** is food
  constructions, buildings, aesthetics, shapes, social role in the city.
  (technical cycle)

- **Human Waste** is food
  history, philosophy, spreading of a culture with its own meanings and created by a civilisation in a certain period of time.
  (time line)

- **Material Waste** is food
  types of materials growing and gravitating along the surface of the planet.
  Types: organic, inorganic, composite.
  Qualities: visual, performative recyclable, upcyclable.
  (time line)

In order to define which waste is relevant it is necessary to investigate all kind of informations collectable about Venlo. This is shown in Chapter 1 - general informations.
TRAFFIC - Importance of the pollution in Venlo.
Venlo between Rotterdam and the Ruhr. Pollution. View from Eindhovenseweg. 01 - 02.

TRAFFIC - Importance of the pollution in Venlo.
Roermondsestraat is integrated in the city and its important traffic is moved to a new boulevard. 03.

Venlo is in the middle of an important commercial traffic which starts from Rotterdam and goes through the Ruhr. In 2012 The Floriade and the expansion of the city as the first Cradle to Cradle in the world will lead to more traffic congestion and carbon dioxide emissions.

The new urban plan Maasboulevard solves the traffic congestion by improving the use of Roermondsestraat and by creating a new boulevard to pass through the city. The boulevard helps to integrate Roermondsestraat in the city and creates new opportunities for the hinterland.

We design enjoyment for all generations. Our goal is a delightfully diverse, safe, healthy and just world, with clean air.

In order to design enjoyment for all generations it appears more than important to build a new Town Hall that takes into account the pollution problem. It is here necessary to graft a new function to the building and give it the possibility of clean the air. By this the town of Venlo would be able to keep its intention intact and continue to provide clean and healthy air for next generations.

Carbon dioxide emissions as food for a building

Nowadays our planet is still getting hotter as the many global agreements signed over the last 20 years calling for action and funding to stop climate change haven’t been respected. Human activities through their energy consumption are considered to be responsible for releasing so called greenhouse gases into our atmosphere. The primary gas identified is carbon dioxide (CO₂).

Here the issue becomes to re-integrate the CO₂ emissions of the area together with the CO₂ from the parking as well as from the workers - in a biological cycle. The project can answer to this question by developing an architecture that emphasizes the relation with nature by cleaning the air around and inside the building.

The Institution of Mechanical Engineers has undertaken an initial assessment of a range of potential geo-engineering options available under its Cooling the Planet program. Out of many options reviewed, three most promising have been outlined.
The Building should spread the importance of C2C to the citizens. Therefore it should borrow its philosophy to the sociology of architectonic artifacts: The sociology of architectonic artifacts studies the interaction between architecture and subject and how a very specific architecture can suggest certain ways, movements and perceptions.

The philosopher Marx W. Wartofsky distinguished several types of artifacts:

- primary artifacts, which are used in production (e.g., a hammer, a fork, a lamp, a camera, etc.)
- secondary artifacts, which are representations of primary artifacts (e.g., a user manual for a camera) and tertiary artifacts, which are representations of secondary artifacts. *(01) definition from wikipedia.*

In our modern cities, we can distinguish two main types of consumables which are directly linked with a specific type of communication. *(02)*

*Culture is transmitted through MUSEUMS. Products are promoted with ADVERTISEMENTS on external surfaces and make use of the scale of the building to exert a relative influence on people to buy certain products.*

These principles are both made to attract people and because of it they can work well together - e.g., advertisement for a museum. Their difference exists within the fact that their communication principles work in opposite ways to attract people. It is possible to compare this to a simple push or pull movement: a person has the choice whether or not to go to an exhibition and if she goes she has probably looked for that information. The information is suggested to the person.

Instead with advertisements the information comes to the person and it is almost impossible to subtract itself from its message. The information is forced into the person (push). Museums and advertisements are in that sense respectively a primary, and a tertiary artifact. The secondary one would be this report if the building was built someday.

In order to communicate its intentions to connect with its surrounding context, the building should then use both of those communication strategies. It can use the big scale of the building to induce the movement and a primary questioning from the public as to give a global picture of the message. Then it can secondarily use its inside space to present details to answer the curiosity of the visitor.
DIFFERENT TYPES OF VOLUMES - two sizes and attitudes.

Industrial and modern - unified blocks directed outwards the Maas / individual housing and supermarkets - directed inwards.

The building can thus be integrated in terms of physical conditions, and by being related to human understanding communicate better its message about environmental awareness.

**HUMAN dimension**

Because of the complexity of what means to build a Town Hall - the first house of citizens - it seems important to choose the HUMAN concern as one of the guiding line, reference of the project.

Here the definition of human dimension represents all the spread of a culture with its own meanings and representations, created by a civilisation in its living time. In this perspective, structure, proportions and geometry are the primary tools created by our societies to help humans building the paradigm which answers in a specific way questions related to very specific living conditions. This paradigm has been industriality and is now renewed with Cradle to Cradle.

The Oxford English Dictionary defines paradigm as "a pattern or model, an exemplar."

Here we can easily identify the Industrial paradigm with Nedinsco and use it to place the new paradigm of C2C. Nowadays cities are palimpsests of different scales added together in time. The scale of a building is an issue to how people react and understand themselves in the environment. The existing proportions at the site's boundaries are used here as a starting point to place the building in its context. In order to do so two main directions have been taken into account.

*Horizontality* follows the low scale built by individual housing while *verticality* answers a large scale raised by towers and public buildings. The specific situation of the site in the middle of different volumes and paradigms gives the building the opportunity to be heterogeneous even though the building itself should express the integrity of a Town Hall and therefore appear as one building.

The Town Hall's concept uses its surroundings to create a new paradigm for the city. The old *industrial paradigm* faces the new C2C paradigm.
2. Theory - 3
Definition. What makes a building a public building.

In order to address the message, the building needs to be accessible to anybody from the city or stranger to it. There are several reasons why the choice of a public building becomes an issue:

- It concerns everybody.
- It is relative to the municipality which represents everybody.
- It is done for the use of everybody.
- It is known by everybody.
- It takes place in front of everybody.

As a resume the building should consider three important points:
- All wastes are food;
- A message (C2C) in its two dimensions far and near.
- Be public in a way.

**Metaphor of a tree**

During a conference in Venlo it has been possible to meet William Mac Donough. He talked about the development of the city as well as the construction of the new Town Hall. He said that in order to be an icon of C2C the Town Hall building had to be thought as a tree.

But if we take into account biological and technical cycles it appears easier to work with the metaphor of a graft. Indeed a building is grafted as a technical object to a biological and technological cycle and is then integrated as a new organ. The new organ works as an intermediate to fix a system, a cycle that has been disrupted.

The building designed here 'lives' in its environment and has a special role regarding human needs. It doesn't only shelters humans but its large surfaces can be used to collect energy humans can't reach in another way.

In that way the design builds a relation between humans and its living structure in a comparable way as trees do with birds.
Chapter 3. Concept - 1
How to deal with Global Warming in Architecture

3 options to reduce Global Warming

- Artificial trees (01)
Building machines which would act like trees and remove CO₂ from the air. When the air passes through the device the CO₂ sticks to a sorbent material - the leaves. Then it is removed and buried underground as for conventional carbon capture and storage (CCS). As each tree can absorb ten tonnes of CO₂ per day, the UK would need 100,000 trees - $20,000 each unit - to capture the entire nation's non stationary and dispersed emissions.

- Algae-coated buildings (02)
Strips of algae are fitted to the outside of the building. As algae naturally absorbs CO₂ by photosynthesis and grow fast, it can be periodically harvested from the building and used as biofuel in conjunction with a carbon sequestration solution. An advantage is that it doesn't require additional land which can be used for food production.

- Reflective buildings (03)
By making building surfaces more reflective it is possible to lower the heating effect of the sun and thus reduce the amount of solar radiation absorbed by the Earth's climate. This option has the benefit of reducing temperatures in urban heat islands such as city centres which are often few degrees hotter than the surrounding environment.

Conclusion
From these informations it seems more interesting to develop a building that integrates CO₂ in a cycle instead of storing it somewhere. The option choosed then is to design a building using algae to clean CO₂ emissions and integrate it into a cycle. In that way algae are also used to provide energy to the building and the cycle is closed.
Algae culture leads to the production of different energies such as biogas, biofuel as well as electricity and heating. It can be harvested either by using an open or a closed system.

By using algae that collect CO₂ and convert it into energy the building achieves the C2C concept of closing the cycle.

**Open or Closed system**

There exist two types of Algae systems with their own pro and cons.

**Open system, Pond (01)**
- invasive
- surface growth
- evaporation
- difficult to harvest
- daily/seasonal temperature cycles
- difficult to control
  + inexpensive

**Closed system, Algae tubes (02):**
+ non invasive
+ cylindrical shape,
  equal distribution of light
+ close system, no evaporation
+ simple to harvest
+ controlled environment
  - expensive

Algae-photobioreactors enhance the speed of grow of algae by making easier the control of their environment. The building is designed by using algae-photobioreactors in order to control the system easily. Moreover algae tubes are designed to efficiently collect solar radiation and occupy minimal area.
LANDMARKS IN VENLO.
Witnesses of the palimpsest's paradigms. Industrial / Religious / Cultural / Political.
A building shaped by different geometries to answer numerous surrounding situations and integrate itself in its context.

The previous study of landmarks lead to the comprehension of different geometries. Those geometries are related to the program of each building. The Church is tall to be seen from far and for the ringing of the bells. The Town Hall is a cube installed in an important square. The museum works on complex edges and creates an entrance made like a cross to invite people to enter. The main geometry used is the type A, visible from far. The other geometries of the building are applied to the edges of the ground floor and create perspectives in order to direct people through the site and entrance.

The building is divided in different geometries. In that way it can answer in a both horizontal (individual housing) and vertical way (tower).

Each Geometry developed has a specific given name:

**Different geometries answering diverse surrounding situations**

- **TOWERS**: dialogue with the large scale offered by the boulevard.
- **the LOFT**: a flat space to dialogue with the small scale / individual housing.
- **the BASE**: crossing from the small scale to the large scale / boulevard.

Loft and Base volumes have together the same height of individual housing - 10 m height and introduce the volume as the citizen’s house. The Base is defined at 6m high in order to gain a high ceiling with 3 m high division and removable floors. The Loft is 4 m high and develops a continuous view over the roofing surfaces of its surroundings. Towers are scaled regarding the sun orientation. Higher towards the North and smaller towards the South.

HUMAN PERCEPTION - three volumes for two scales.

01 Base, Loft and Towers.
02 Sketch Volumes.
The program follows the three different geometries of the building. Each type of geometry has a different program definition.

Tower. REPEATED FUNCTIONS: discussion rooms, offices. 1487 m². View over the city.

Loft. PUBLIC: exhibition room, restaurant PRIVATE: security, mail rooms, archives. 1295 m². View over the surroundings.

Base. PUBLIC FUNCTIONS: administrative functions, secretariat, storage. 7209 m². Possibility to change doors / windows in order to change the use of the building.

PROGRAM m² - division follows the different types of floors.

01 base / 02 loft / 03 tower.
Project: Sizing the project’s volume. Study by footprints.

Total surface town hall 10,050m² / parking underground not include 200 cars 5,000m².
Chapter 4. Design - 1
Building the volumes.

01 - Building aligned with its industrial context - Nedinsco.

02 - Passages created to cross the scales. Interior quality with a garden.

03 - Loft directed on the industrial decor to isolate the longest side on the small scale.

04 - Visual connection to the bridge.
4. Design - 1
Building the volumes.

01 - The industrial decor Nedinsco.

02 - The diagonal is based on the surrounding to integrate the public space in its context.

03 - Visual connection to the industrial decor.
4. Design - 1

Building the volumes.

01 - Development of a branch to dialogue with the small scale of the individual housing.

02 - View from the building - dialogue with the small scale.

03 - Opening a dialogue with the green square.

04 - View from the train - dialogue with the small scale.

Viewer's position
4. Design - 1

Building the volumes.

01 - Open a relation with the garden.

02 - Open the blocks to relate different heights to their respective surroundings and follow the Maas’s as well as Maaswaard’s direction.

03 - View from the train - Urban Gate beginning the Maasboulevard.

04 - Overview.

Viewer's position
4. Design - 2
A building where ‘green’ and public functions follow one shape

**CO₂ collection**

Before starting with the design of the algaes it was necessary to investigate the ways of collecting its most important incomes such as CO₂ and sun.

CO₂ can be find in different pi aces and it is possible to introduce it into the algae “reactor” by using a simple pump.

It is possible to distinguish 3 important sources of CO₂:

01 - Atmospheric Air - Vehicular exhaust
02 - Air in parking’s place.
03 - Humans expelling it in the building.

In order to feed the algaes it is possible to enrich the CO₂ fraction by scrubbing the air outside the building, in the parking and inside from the workers expelling it all day long. This can be done by common scrubbing technology.

The design of the system uses the ventilation system to collect CO₂ and channels it to the algaes.

The increase of CO₂ concentration results in increasing the rate growth if nutrients are abundant. In fact the only difficulty lies in catching the sun.

The CO₂ content introduced to the algae should not exceed 15% of the total air flowrate. Also air plus CO₂ should be introduced at a total flowrate of 0.1 v/v/min (volume gas per volume water per minute).

The collection of biomass has to be done every 2-3 days as the approximate lifespan of algaes are about 2-3 days.

**Algae needs**

The algae introduction in a built environment, with its growth of biomass and extraction means the use of vertical or horizontal surfaces as support for photobioreactors.

The rate of algae growth together with CO₂ removal from the atmosphere is influenced by several factors that are taken into account in the design of the building:

- temperature
- light levels
- nutrients availability

The major input required is solar therefore the way of implanting the tubes is carefully studied in the design.

**Algae design**

Humans need sun as well as algaes do. For humans Architecture Design lies in how to organize space and functions according to the rhythm of life of an inhabitant together with the course of the sun.

As a living system it is therefore a natural attitude to integrate it in the human scheme.

The project works with an ‘architectural promenade’ according to the Algae system. As each level of the building has its own architectural shape and program, each part of it participates to the Algae process in a different way and creates a promenade that invites the public to be aware about environmental issue such as global warming.

Each Floor has its own role to play in the system.

In perimeter of the towers is where Algaes grows. There they can circulate in a close loop and benefit from the sun at any time of the day.

In the loft Algaes are collected from the towers and arrive in the exhibition room.

In the base and specifically entrances algaes are channelled to the end of the process until the public space where are disposed the necessary machines to convert oil or biomass into biofuel and biogas.

In that way Algaes grow from top to bottam and create a ‘green promenade’ for the visitors which then discover the process from the end to the beginning.

‘ALGAE'S PROMENADE’ IN EACH TYPE OF FLOOR.
This part of the design has been studied in different steps with the help of Benjamin J. Taylor, PhD from the Department of Chemical Engineering and Biotechnology of the University of Cambridge. Him and his team have been awarded first prize in the 3rd CIB International Conference on Smart and Sustainable Built Environments for their AlgaeHouse concept, a design for an energy and carbon-neutral house powered entirely by algae.

General Conditions

The structure and environment of the algae is made of tubes to allow the control of what is coming in or out of the system. Their disposition on the building respects temperature, light level and offers the possibility to control any dysfunction at any time: by being inside and along the perimeter of each tower-building they can grow homogeneously by having a good distribution of sunlight.

The tubes are placed inside the building in such a way that a person can stand and enjoy the view beneath them.

scheme

1) Sun energy, CO₂ and nutrients feed the culture of Algae. Introduction of air plus CO₂ at a total flowrate of 0.1 v/v/min (volume gas per volume water per minute)
2) The water is working in close loop and dry filtered only for bacteria to clean it. (0.2 micron filter is sufficient). Because the waste water from toilets is filtered, the water which comes out is nutrient-rich. By using two different filtering systems Algae never contact bacteria and the system can last a long time with little maintenance.
3) The biomass is stored and then sent to the first floor of the building, in order to be processed.
4) By making the biomass go through an electric field, it is possible to collect biomass and lipids. This technology is called the Quantum Fracturing: it breaks down water, carbon dioxide and other nutrients into micron-sized bubbles. In less than an hour biomass water and oil separate by gravity alone. This technology does not require chemicals. It separates the components in one step only and does not need a significant capital expenditure for heavy machinery. If needed this system can also be used with lower pressure during the growth phase.
5) Once Straight vegetable oil is extracted it is possible to convert it into biodiesel by using the esterification tank. By making biomass going through an anaerobic digester it is possible to convert it into biogas.
02 CONNECTING TUBE
Algae are channeled from each tower to the Exhibition Room through a tube fixed on the ceiling of the circulation path. The tube links Restaurant and Exhibition room. There algae are collected in extractor tanks and then sent to two gravity filters.

03 ENTRANCE
The transformation of algae into Biomass and Oil is shown at each entrance. Each of the two Gravity Filter - 8m high - is placed near one of the two waiting areas to invite any visitor to discover about algae.

04 PUBLIC SPACE
The last port of the process occurs in front of everybody and outside for security matters. Anaerobic Digester (biomass > biogas) and Esterification Tank (oil > biofuel) are supplied by tubes installed on the walking path of the ground. Any pedestrian is visually confronted to one of the tanks or tube. Each tube comes from each Gravity Filter and helps the visitor to find his way to enter in the building.

OVERVIEW OF THE DESIGN
An 'Algae promenade' flowing in the opposite way of the Architectural Promenade

The process is designed to create an 'alga promenade' and guide the public through the different steps of the process.

Precision on the drawing
While Algae get mature they are channelled into the extraction tanks in the exhibition room. The maturation process takes place from the higher floor to the lower one.
In order to achieve a C2C design the building uses new and green technologies. Each of them is visible and not integrated in floors or ceilings in order to be removable. Each technology is ‘green’ and use less energy than its traditional reference.

**FIREPROOF - HI·FOG 1000 sprinkler**

This technology uses 90% less water then usual sprinklers. The high pressure enables water droplets (mist) to penetrate into the fire and absorb heat very efficiently. It removes heat and oxygen.

As water mist expands 17,600 times it displaces oxygen at the seat of the fire. In that way it blocks the radiant heat, preventing the fire from spreading or reigniting. The smoke particles are blind with the droplets, preventing the smoke from spreading.

The system is very small compared to traditional sprinklers; in fact the system pipes is a very discrete installation. Their installation is fast as tubes - made in stainless steel and rated for high pressure - can be bent.

**HEATING - Infrared radiant heating panels**

This technology is interesting for several reasons. The heating is targeted where it is needed. After 4 - 5 minutes the panels allow the room to be comfortable.

It costs less: 33% savings over heat pumps and 52% savings over baseboard heating.

It is maintenance free and easy to install and there is no need to rip out a floor to replace a furnace.

It is eco-friendly as it reduces the energy consumption and the environmental impact.

The product is made from pre and post consumer materials.

**VENTILATION - Artica eco - friendly air coolers**

This new technology is just going to be out in October 2010. It acts as natural cooling, ventilation and heat recovery system.

It uses less than 10 % of energy compared to a conventional air conditioning system.

It reduces carbon dioxide emissions by 90% and it is made up of industrial bioproducts which would otherwise be used in landfills.
01 Public space and perspective leading to the entrance and the bridge crossing the Maas.

02 View from the boulevard, near Nedinsco.

03 & 04 Views of the main entrance with the Gravity Filter.
01 View from the terrace.

02 View from the restaurant.

03 & 04 Views of the algae going from the exhibition room to the restaurant.
01 View of the algae photobioreactors in a meeting room.

02 Night view with lighted algae.

03 & 04 Views of the building from the train and a truck coming from Eindhovenseweg.
VENLO IS A TOWN IN EXPANSION. ITS NEW MASTERPLAN OF 2005 IS GOING TO OFFER NEW SPACES TO LIVE AND PROMOTE THE TOWN AS THE FIRST CITY CRADLE TO CRADLE IN THE WORLD.

THE CITY ASKED TO DIFFERENT STUDIOS TO DRAW PROPOSITIONS FOR ITS NEW TOWN HALL, AND ASKED THE HELP OF MICHAEL BRAUNGAERT, ONE OF THE WRITER OF CRADLE TO CRADLE, TO EXPLAIN THEM THE DIFFERENT ISSUES INVOLVED.


THE DESIGN PROPOSES TO CLEAN INSIDE AND OUTSIDE AIR FROM CO₂ AND GENERATE ELECTRICITY AS WELL AS HEATING FOR THE BUILDING.

THE CO₂, 'WASTE' IS RE-INTEGRATED IN A COMPLETE CYCLE TO SERVE THE ENERGY NEEDS OF THE BUILDING. BECAUSE IT IS A TOWN HALL AND THEREFORE A PUBLIC BUILDING IT IS POSSIBLE TO VISIT THE COMPLETE INSTALLATION OF THE PROCESS. THE PROCESS IS CREATED TO BE SEEN FROM FAR AND BY NIGHT TO ASSURE THE ICONIC ROLE OF INCREASING ENVIRONMENTAL AWARENESS.
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Thesis


VENLO TOWN HALL DESIGN
INCREASING ENVIRONMENTAL AWARENESS BY SHOWING C2C CONCEPTS
FASCINATION

CRADLE TO CRADLE
“Waste is Food”

BIOLOGICAL AND TECHNICAL CYCLES

CRADLE TO CRADLE
“Waste is Food”

WASTE IN VENLO

PROBLEM

VENLO BETWEEN ROTTERDAM AND THE RUHR
Pollution in Eindhovenseweg

VENLO TRAFFIC CONNECTIONS
International Network

IMPORTANT TRAFFIC IN EINDHOVENSEWEG
Pollution brought with the expansion of the City

VENLO MASTERPLAN

MAASBOULEVAARD
decongest Roermondsplein

MAASWAARD AND MAASBOULEVAARD
Venlo Urban Masterplan 2004

MAASWAARD - PROGRAM
Venlo Urban Masterplan 2004
VENLO TOWN HALL DESIGN
INCREASING ENVIRONMENTAL AWARENESS BY SHOWING C2C CONCEPTS
THEORY

LANDMARKS GEOMETRIES INFLUENCES THE PERCEPTION IN THE CITY
Study of landmarks for the composition of the City hall

IMPORTANCE OF THE DISTANCE OF PERCEPTION IN COMMUNICATION
exemplar of advertisements & culture.

The old Town Hall
The Meas
Location of the project
The old Centre
Railway

VENLO Boundaries

2 TYPES OF VOLUMES
Industrial towards the Meas - Individual housing inwards
INCREASING ENVIRONMENTAL AWARENESS BY SHOWING C2C CONCEPTS

CONCEPT

EACH TYPE OF FLOOR ANSWER TO A PARTICULAR CONTEXT LEVEL
construction lines of each floor

DIFFERENT PERCEPTIONS LINKED TO DIRECT SURROUNDINGS / SURROUNDINGS / CITY
2 different volumes: Base, Loft, Towers

ACCESSIBILITY - PERSPECTIVES INSIDE / OUT - INSIDE / IN
INTEGRATION IN THE DIRECT SURROUNDINGS
A BUILDING VISIBLE FROM FAR

OPEN OR CLOSED SYSTEM

ENERGY DIAGRAM OF AN ALGAE PHOTOBIOREACTOR

DESIGN OF THE ALGAE SYSTEM - Two phases.
1 production of biomass 2 processing biomass
VENLO TOWN HALL DESIGN
INCREASING ENVIRONMENTAL AWARENESS BY SHOWING C2C CONCEPTS

ENTRANCES INTEGRATE A GRAVITY FILTER IN EACH WAITING ROOM

ALGAE TUBES GOING FROM THE EXHIBITION ROOM TO THE RESTAURANT

ALGAE CATCHING THE SUN AROUND EACH TOWER

OVERVIEW OF THE DESIGN

OVERVIEW OF THE PROCESS
"Algae promenade"
VENLO TOWN HALL DESIGN
INCREASING ENVIRONMENTAL AWARENESS BY SHOWING C2C CONCEPTS
WHY WOULD VENLO NEED THIS BUILDING

VENLO IS A TOWN IN EXPANSION. ITS NEW MASTERPLAN OF 2005 IS GOING TO OFFER NEW SPACES TO LIVE AND PROMOTE THE TOWN AS THE FIRST CITY CRADLE TO CRADLE IN THE WORLD.

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THE PROCESS IS CREATED TO BE SEEN FROM FAR AND BY NIGHT TO ASSURE THE ICONIC ROLE OF INCREASING ENVIRONMENTAL AWARENESS.
VENLO TOWN HALL DESIGN
INCREASING ENVIRONMENTAL AWARENESS BY SHOWING C2C CONCEPTS

PLAN GROUND FLOOR (1) 1:200

Visitors path
Workers path
Viewer's position

Boulevard
From Eindhovenseweg
From the train
Public space
Night view
Entrance Hall
VENLO TOWN HALL DESIGN
INCREASING ENVIRONMENTAL AWARENESS BY SHOWING C2C CONCEPTS

PLAN LEVEL (1) 1:200

Restaurant

Cafeteria

Terrace

Night view

Night view
TERENCE COTON - MASTER DEGREE 2010 - Tutor: prof J.M. Post - Teachers: Arch AVB J.Timmers, dr.ir. Peter A. Erkelens

VENLO TOWN HALL DESIGN
INCREASING ENVIRONMENTAL AWARENESS BY SHOWING C2C CONCEPTS
FAÇADE NORTH 1:200

FAÇADE EAST 1:200

FAÇADE SOUTH 1:200

FAÇADE WEST 1:200
VENLO TOWN HALL DESIGN
INCREASING ENVIRONMENTAL AWARENESS BY SHOWING C2C CONCEPTS

SECTION [AA'] 1:200

SECTION [BB'] 1:200
VENLO TOWN HALL DESIGN
INCREASING ENVIRONMENTAL AWARENESS BY SHOWING C2C CONCEPTS

DETAILS

In boundary wall and floor slab with glass panel and supporting beam

Adjustment between door and floor slab

Adjustment between door and floor slab

Adjustment between door and floor slab

Adjustment between door and floor slab

Adjustment between door and floor slab

Detail of glass panel and supporting beam

Detail of glass panel and supporting beam