Floriade 2012
The greenest office in the Netherlands
Introduction:

Venlo is the first region in the world to implement the principles of ultra durability. Trade and industry and the Chamber of Commerce Limburg Noord want to present themselves according to the so-called “Cradle to Cradle” principle: LIVING WITHOUT WASTE, a new industrial revolution.

Floriade 2012 “Once every 10 years the Floriade is a platform of Dutch horticulture. It is here that the world-leading greenhouse horticulture shows the innovation ability, the creativity and the vigor within the new preconditions of durable cultivation without making use of fossile energy. The location is Greenport Venlo, the green natural setting at the junction of the national highway N 73 and A67 to Germany. The sparring partners are project business areas greenhouse horticulture with ZON Fresh Park and Flora Holland, across the road. The Floriade buildings have a permanent character as a “place to be” marked by the spectacular innovation tower.
### Number of inhabitants with Venlo as center (year 2001)

<table>
<thead>
<tr>
<th>Radius</th>
<th>Netherlands</th>
<th>Germany</th>
<th>Belgium and Luxemburg</th>
<th>Total number of inhabitants</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 km</td>
<td>368,000</td>
<td>668,000</td>
<td>-</td>
<td>1,036,000</td>
</tr>
<tr>
<td>50 km</td>
<td>1,136,000</td>
<td>3,799,000</td>
<td>93,000</td>
<td>5,028,000</td>
</tr>
<tr>
<td>100 km</td>
<td>5,256,000</td>
<td>12,510,000</td>
<td>2,045,000</td>
<td>19,811,000</td>
</tr>
<tr>
<td>150 km</td>
<td>13,022,000</td>
<td>16,780,000</td>
<td>6,427,000</td>
<td>36,229,000</td>
</tr>
</tbody>
</table>
The greenhouse/ landscape offices Floriade 2012 (2) will be built in a natural setting in an existing forest according to the “Zonneterp concept”* In the Zonneterp 2 ha of closed greenhouse horticulture can heat and cool 8 ha houses of the Edible City. This is a fully selfsupporting building with among other things the new low temperature technology of the energy-producing greenhouse.
In most respects, the “Zonneterp concept” is a parallel design next to the “Cradle to Cradle” concept that makes compost out of waste. However, by using the Dutch Fiwihex fine-wire heat exchanger it is possible for the first time to utilize or store very low waste temperatures in season heat storage in the aquifer. All organic waste is collected, anaerobically fermented into biogas and by means of a micro turbine, the building provides itself with electricity.

An important, little known aspect of the greenhouse/landscape office is the healthy work environment. It appears from research that houseplants have a surprisingly wholesome effect. We know the process of purifying the air of CO₂ and producing O₂ from the biology lessons, but reducing stress, skin irritations and headache are a little known contribution of plants to the improvement of the living environment.

Does the greenhouse/landscape office have any weak points then? Certainly, the metabolism of the sedentary human being and that of the plant is very different. So how do we make pleasant green workplaces in various climates? That is what this book is about.
The Design:

Building with Green and Glass is durable but also a visually dominant building with a recognizable form and skyline. Building for brief visual contact along the highway is a special challenge. The forest is reflected in the glass by the forward tilted glass north façade and thus camouflaging the height of the building.

The assignment is to make a high-profile exposition for greenhouse horticulture on 10,550 m² floor area with office/workplaces in the green.

During the designing process it turned out that it would be better to build an adjoining multifunctional office building that was to be built at a later period, simultaneously, for various reasons; Floriade 2012 will be put on the map nationwide. Thus an integrally designed building arises of 42,500 m².

Finding users is relatively favorable. One disadvantage: the building market is tense.

The integration of greenhouse with other functions has a large excess value with respect to separate buildings. The floor height from floor to floor of 5 m by using double floors, developed by Adviesbureau Bartels, with a free span of 18 m with reachable wiring space between top floor and bottom floor. This space offers the possibility for the very low temperature “concrete core” heating and cooling is optimally functional for a flexible planning.
Indoor climate:
The Floriade 2012 greenhouse/office requires the absolute condition of the sustainable control of the indoor climate in all seasons and also irrespective to the number of visitors. It goes without saying that the metabolism of the sedentary human being, working at a table is different from a randomly chosen plant that wishes to sunbathe often. We here define inside climate as air temperature and radiant temperature, daylight and artificial light, air velocity (draft), humidity and acoustic climate such as echo time and ventilation. The smell of flowers, pollen and possibly insects comes up later. Each one at his turn.

Visitors of the Floriade visit “from all over the world”. The greenhouse/office climate during the Floriade responds to this. The greenhouse with workplaces in the greenhouse has four climates and spheres. A large subtropical office with Mediterranean lavender smell, olive trees and palm trees (ev. 30 mm water for hydro culture). The Middle Eastern office in the sand with loam work with cedar shutters, tents and date palms. The Amazon office, a warm and humid climate with birds and butterflies under a thick roof of foliage and flowing water. A cool, round Polar circle vegetation greenhouse, shadow free high lighting with specially adapted workplaces. The 650 covered parking places, open all round, under the building receive daylight by glass shafts around trees in the open air that stick through the floor.
Installations:

The typical feature of sustainable installations is that they are based on the physics of the open country rather than on mechanical engineering. The sun is the source of heating. The radiation at night towards the clear sky supplemented with cool air at night is the natural cooling. The heat and the cooling are stored in sand layers underground in the aquifer. According to the stratification principle, the heat stays on top in a tank with fluids and the cold at the bottom, as is done here. This season heat storage of energy excess is supplemented effectively with a short-term storage heat and cooling by storing excess in the thermal mass of the double concrete floors as concrete core activation. Charging a seasonal storage takes one season for before occupation of the building. For the personal choice of office staff or small temperature corrections use is made of decentralized fine-wire heat exchangers and radiation panels.

There are no visible air ducts, no false ceilings, plants and division panels mostly regulate acoustics. The skylights and front windows provide a breathing indoor climate and humidity regulation. The conference rooms will be provided with decentralized “breathing windows” ventilation with CO² sensors and thermostat.

The light regulation will mainly take place through outside awning and inside awning on the high illuminating polycarbonate roof tiles and façade tiles. Panorama windows are HR++ clear glass. The Middle East does not have outside awning, only artificial fanned wind and windows that can be opened. The upper office floors have Nanogel translucent aerogel skylights. Horizontal reflection curtains are used against nightly drop in temperature and extreme sun irradiation. The parabolic skyline-defining roof plates form a solar collector that can generate boiling water, but this is in an experimental phase. The Floriade 2012 is CO2 neutral.

Waste in sustainable cycles:
The greenhouse/office Floriade 2012 is energetically self-supporting. How heating and cooling is done by means of very low temperatures with fine-wire technology and seasonal heat storage has already been explained. By collecting all organic waste and digesting it anaerobically, biogas fermator can drive a micro turbine and diesel motor that generates electricity. The CO² exhaust fumes that arise during combustion are fertilizer of the plants in the greenhouse up to 1,000 ppm with closed greenhouses. The “Zonneterp” principle*, for instance waste collection (website: www.zonneterp.nl ), can be used for all buildings on the Floriade grounds, supplemented with the organic waste of the Auction at the other side of the highway. In practice it will be noticed by users that vacuum toilets are used everywhere like on large ocean vessels. This has the advantage of needing little rinse water and that the faeces from the lavatories is concentrated. Condensation water from the greenhouse is suitable for drinking water in other parts of the world and water from the digester as irrigation water for the benefit of the greenhouse.
Rainwater can be buffered in the carp pond and the swamp landscape at the south side of the greenhouse. To experience excess of water a glass umbrella is installed under a leaking awning. The greenhouse/offices Floriade 2012 can convince some million of visitors that a sustainable future for the world population is possible.

Footnote:
* The development and structural design of the “Zonneterp” (Greenhouse village) came about with financial assistance of InnovatieNetwerk Agro 2006. While the current greenhouse horticulture nowadays often uses 50 m3 natural gas per m2 per year intensive culture. This is reduced to zero with one step and the surrounding dwellings can also thus receive an excess of low calorific heat. A few important Dutch inventions lie at the bottom of this. In the first place the very effective fine-wire heat exchanger for heating, cooling and heat recovery on ventilation air (Dr Noor van Andel, www.Fiwihex.nl)

In the second place the anaerobic digester, also a special innovation, for which Prof Gazte Lettinga (www.LeaF.nl) received the prestigious USA Taylor Award 2007. Dr Adriaan Mels of LeaF is the advisor for this division. In the third place the feasibility research for solar collectors is in its initial stage with Prof. Jón Kristinsson (www.kristinsson.nl), he had world patents in 1976 of seasonal heat storage in the ground, a bit ahead of his time. Due to the progress and not-certified – techniques in innovation, preparation, permits, building and start of user phase an experimental status seems indispensable.
Floor Plan: Ground floor (15,500 m²)
Section: Tropical Zone

Sustainable installations
Waste collection
Biogas digester
Micro turbine
Diesel engine or Electro turbine
CO₂ – manuring

Under foliage roof
Warm and humid
Tropical greenhouse with birds and butterflies
32 to 35°C 80 to 90 %

jungle office
glass working space “standalone airco’s”
with 4 m² PV cells
100 W heat pump
fiwihex technology
breathing window
ventilation

glass column
tree sticks through the floor in open air
Monumental covered entrance

Open parking basement 650 cars

parabolic solar collectors

North façadelight
Light reflecting glass

Main entrance

Seasonal heat and cold storage in sand layers 30 to 80 meters deep

Aquifer (earth surface)

Heat buffer (ground level 1.5 m)

Peil is 0 (level is 0)
650 car-parking places in a half open parking basement with a lot of daylight. Twelve glass columns, with trees in open air, create a transparent relaxed atmosphere. Bicycles can be parked under the forecourt.
652 parkeerplaatsen  (652 parking places)
Section: Mediterranean subtropical zone

Temporary pavilion
With polar circle climate

Parking space
open Dutch brick paving
Filtering rainwater parking hole

glass columns around
large trees in open air.
The trees stick through cutouts in the ground floor

Greenhouse
Ground floor, fields with 30mm water for hydro culture.
Large variety of trees, shrubs and plants.
Walkways on the floors separated by green and glass
Office islands in three different climate zones with corresponding spheres have to adduce proof that working in glass and green is healthy and relaxing. The offices in the Middle East and the Amazon climate will have “stand-alone” climate working places.
Temporary pavilion with "leaking awning". Visible moss and roots in a swamp of reed. The visitor experiences the excess of water under a low glass umbrella.

The trees that are planted in open air are thermally separated from the parking basement. In this zone there are dates, royal palms, olive trees and thorn-bushes.
Parabolic solar collectors
Section: 2nd floor (7,074 m²)
Section: 3d floor (4,860 m²)