

Cradle to cradle landscapes in the Netherlands

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Since the summer of 2007, a wave goes through the Netherlands. A documentary by VPRO's 'Tegenlicht' introduced the "Cradle to cradle" principle. Its aim is as follows: "to create a joyfully diverse, safe, healthy and just world, with clean air, water, soil and energy – where economy, equity and ecology can be enjoyed in harmony." The approach is based on cycles of nutrients and energy; waste equals food. It provides a positive and economically viable approach to re-invent our designs into regenerative life-cycles.

Meanwhile, the approach is well-known all over the world and the inventors, William McDonough and Michael Braungart, are famous. Special about the "Cradle to cradle" trend in the Netherlands, is that many people became inspired by it and immediately started working with it. Something that is also noted by the authors themselves. They are frequent visitors of the Netherlands and consult many initiatives that are undertaken. These are mostly on the level of chemistry and product development and on the scale of architecture. This is logical, because these areas are the profession of the authors. Fewer projects take place on the level of urban and regional design. A pity, because a lot can be gained especially in this field, where many functions and energy- and resource cycles can be combined. In the Netherlands, we already have a 'hands-on' approach to our environment and we are used to work in regional designs and to work with nature. Many "Cradle to cradle" concepts exist on smaller scale, but a way to apply the "Cradle to cradle" approach to the regional design, has not been developed yet. So, developing from the "Cradle to cradle" approach, from ecological design and from the landscape approach; here are a few first statements to think about:

"Cradle to cradle" regional design =

- 1 ecological; based on process and dynamics
- 2 integrative; everything is related, network
- 3 flexible; creates space for developments

1. As J. Koh states: "*Ecology* is relevant: it is holistic (integrative) and it is dynamic (regenerative)." (Koh, 2005) Ecological concepts can help us to organize the built environment. We are looking at a number of ecological concepts, among them: succession - dynamics, source-sink - material cycling, hierarchical organization, cooperation - symbiosis, carrying capacity – ecological footprint (Stremke, 2007). These concepts are just a few from ecological theory, but all of them are very relevant to the design objectives in the C2C approach to the landscape.

2. Everything is inter-related and every design needs to have an *integrative* approach. Especially on the scale of a landscape, one deals with a huge complexity. The visual appearance of the landscape is an expression of the network and interconnecting, dynamic forces behind it. To design is to find and to formalize the innate forms of a process. (Jantsch, 1975 cited in Lyle, 1985) A landscape approach needs an insight in the environmental sciences (hydrology, ecology, soil science, economy, sociology etc.). It combines two modes of thought: the analytic use of information and creative exploration. (Lyle, 1985)

3. In designing a future for the landscape, the anticipation for unforeseeable change is of great importance. For this reason, *flexibility* is a crucial design factor. The Casco concept (Sijmons, 1991) offers the possibility to design a framework in which changes can take place, while the designed quality is maintained. In addition to this, even the Casco itself has a flexibility; no design is ever-lasting; everything is part of the dynamic landscape. Current scenario studies interpret critical uncertainties on the global scale which then must be anticipated on at a regional scale.

The bio-based economy

Gerda Verburg, the Dutch minister of Agriculture, Nature and Food quality (Ministry of LNV), foresees a bio-based economy. The biobased economy uses renewable green resources to produce chemicals, materials, products and transport fuels as well as to generate energy. This contributes to a sustainable economic development and it relies on an effective collaboration between the agrofood sector, the chemical industry and logistics. (LNV, 2007) The bio-based economy is not something new; rather we are just experiencing a temporary fossil-based economy. With the bio-based economy defined, we would like to elaborate a bit further on the 'economy' part of the view of the Ministry of LNV. Economy can be described as the "scientific study of the efficient allocation of scarce resources (energy, material and information) among competing uses in human society" (Rees and Wackernagel, 1996). Compare this with ecology which is described as "the scientific analysis of the flows of energy, material and information through ecosystems and of the competitive and cooperative mechanisms that have evolved for the allocation of resources among different species" (Rees and Wackernagel, 1996). Actually, sharing the same semantic roots and having the same subjective focus, one could argue that economics is to some extent overlapping with human ecology. This points interestingly upon the differences between economy and ecology that we notice in reality. A first clue can already be found in the 'efficiency', described in the definition for economy. Nature is not efficient in monetary terms. It can produce many blossoms and 'spill' resources, but it still is effective: a subtle but basic distinction between economy and ecology. Also the roots in chemical and thermodynamics laws guiding the transformation of matter and energy in the organic world are ignored temporarily in economy due to the discovery of fossil fuels. This made it possible to start producing without the need to look for material cycles, natural processes and energy flows. The end of the fossil-fuel era approaches and a new direction towards a biobased economy is possibly emerging. With the presented definition of economy in mind, we hope to open the discussion for a new approach towards a "Cradle to cradle" design.

Many developing countries face political unrest due to rising food prices. In Egypt, Mexico, Haïti, many people can hardly afford bread anymore, since grain prices doubled over a few years. The lack of this very basic resource threatens to destabilize many countries and is a threat to the world economy.

There are several reasons for the rise of the



food price, however it is unsure in how far they have effect. In many countries, welfare has risen. This is very good, however there is a magical border at an income of 2\$ a day: people start buying meat. And now that many more people have the opportunity to eat meat, a lot more feed is needed for meat production. In general, the feed-meat ratio is about 4:1 in average (Centre for World Food Studies, 2001), meaning that 4 kilo of feedstock is needed to produce 1 kilo of meat. Another trend that might cause harm for the food supply, is the growing demand for energy crops. It is still unsure how much effect this demand has on world-market prices, but the production we see is only in a starting phase of a biobased economy and we can expect further drastic change in landuse and in prices of agriculture products.

Anticipating on these expectations, we might want to re-evaluate our ecological footprint, which, for the Dutch population, amounts approximately 14 times the size of the Netherlands (Rees and Wackernagel, 1994). Much of the agricultural products we use come from outside our country. And with increasing prices ahead, it might be wise for ethical, economical and security reasons to investigate how we can play our role in a common future. Because importing our resources at the expense of the life quality in developing countries is not a sustainable way to proceed. The question that lies ahead is then; to what extend will the biobased economy influence our landscape? And in addition; how can we design our landscape "Cradle to cradle"? We are facing fundamental changes and we need to prepare for the tasks at hand. We need to do this in a sustainable way. Rethinking our system can only work when we do it right; doing it less bad will just not be good enough.

The Dutch landscape

As Dutch landscape architect Eric Luiten says in his essay 'Designing with landscape antecedents': "Research into the history of the landscape is seldom used for any other purpose than active landscape conservancy. And up to now the reverse has also been true: the research is only made legitimate by the desire to conserve the landscape." It is an interesting situation that historic knowledge often leads to a conservative design. Luiten further states: "The attractive power of good regionalist [landscape] architecture is that it is reminiscent of something, without directly quoting, copying or restoring."

This is an important design consideration, in the field of landscape architecture, as well as in other design professions. In landscape architecture, the sense of the place is even more direct than in the architectural design. The processes behind the formation of a landscape derive from the very site. Therefore, in designing new landscapes, a balance has to be found between the changing land-uses and the genius regionis (Meeus, 1992).

The formal qualities of a landscape "..cannot be isolated from the functional and constructional dimensions. (...) On top of this, it is never finished." (Luiten) This points precisely to the processes in the landscape. "Landscape designers analyze their field of work in terms of dynamics and see the landscape as a result of systems and processes. Historical geographers tend to see patterns and objects with different degrees of intactness, age and rarity."

So as landscape architects, we can conclude, landscapes are ever-changing, formed by natural and human processes and dynamics that give form to the functions and the dimensions of the landscape. This does of course not mean that one cannot steer these functions and forms. On the contrary, landscape architecture plays a vital role in dealing with these processes. It is exactly the dynamic characteristic of the landscape that makes the profession of landscape architecture so challenging.

Nowadays, a lot of research is being conducted into historical landscape characteristics. And many times, remarkable nostalgic conclusions are being drawn. A very conservative approach guides many designs, because we want to keep the landscapes that we appreciate. The new governmental policy about "Nationale landschappen" is a very good example of this programme (Nota Ruimte, 2004). It is of course a very good development that we become aware of the scarcity of land and that we want to conserve the few cultural and natural landscapes we still have. It is however the question whether the protectionistic approach is the right choice in every case.

Especially in our densely populated country, the landscape is a product of culture: it is made into a production landscape, as indicated in the graphic below. This production landscape underwent changes when the demands or production methods changed in time. The introduction of fertilizers and the "ruilverkaveling" are examples that changed our landscape drastically. Most of these changes are being regarded as a loss of cultural diversity and landscape quality. Many programs are running to restore the loss we experience: for example the restoration of 'houtwallen' and of 'veedrinkputten'.

Agricultural history of the Netherlands



We want to discuss however, whether this is the only way to proceed. This restoration is a way of constructing a new landscape, although in this case based on copying historic landscape elements and traditions. Another way of evolving our landscapes - since we are obviously not happy with many of our production landscapes- is to look into options that are not only beautiful but also functioning well under the current challenges of climate change and resource depletion. The Dutch landscape has always been one of production for energy and of food. Moreover, combining sustainable productivity with improvement of the landscape qualities might give a new direction for future developments. With a proper balance of the 'genius regionis' and new landscape composition, we might succeed in going with the dynamics of our landscape.

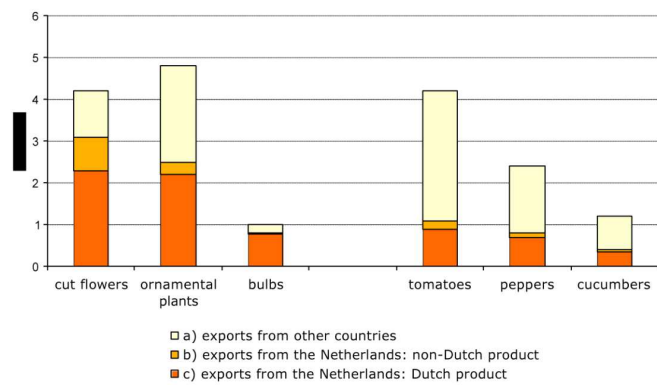
In the past, goals were set for the agricultural production of our landscape. Engineers would then drain the polders and set the right condition to meet the demands. Scale-enlargement created a uniform landscape of which human scale and enclosedness was banned. This was all necessary to meet the demands set by the government, in response to the food shortage in the second world war and later with an increasing population.

Having entered the 21st century, we can look back and analyze what the consequences of this paradigm are. The Netherlands succeeded in creating a very strong agriculture economy with a massive production. 8 of 10 internationally most traded products are agricultural products, in which the Netherlands has a big share; it

is one of the largest producers of agricultural products in the world.

A downside of this achievement is the loss of landscape quality. Not only in an aesthetical way, but also environmentally. The regulation of water levels dried out nature areas, the overproduction of manure inserted lots of methane and phosphor in the environment, resulting among others in over-enrichment of nutrients in nature.

Figure 1: The Dutch Share of World Trade in Selected Horticulture Products, \$ billion, 2003



Source: www.gtis.com
Note: Some products may be counted in both columns A and B

Towards a Cradle to Cradle landscape approach

Investigating the agricultural processes, we can conclude that the technical approach in the landscape was totally insensitive to ecological principles. Nature has a way of sustaining itself. Nutrients cycle in a balance so that the outcome of one process feeds another one. Before the industrial revolution, people also had their role in the ecological cycle. This balanced approach made it possible to live on our planet without extracting too many resources. The industrial revolution changed this. For the first time, man was not limited anymore to renewable resources. We could use stored resources, making energy and materials out of it. As a result, the human population grew, products were developed that generated waste. Besides the biological system, a technical system was created, the technosphere.



This nowadays poses a lot of trouble: we extract resources from the biological system, we make products of it and we then leave waste. This is not sustainable, because the resources will in this way have an end one day (and for many resources, this end is not far away).

The solution lies in the ecological cycle that nature gives us as an example. When a cherry tree blossoms, only a few seeds make new trees. Still, we do not say: "what a

spill of resources, those flowers." They are nature's production and when they fall, they become nutrients for the soil. This example of how nature can produce and recycle gives us the direction for our future landscape system. (McDonough and Braungart, 2006) We have to investigate the potential of any site for a production cycle. Instead of organizing our landscape solely for the production to meet our present-day demands, we will have to organize it in such a way that we can produce our products in a sustainable way, creating an appealing landscape in the same time. As Einstein said: "The world will not evolve past its current state of crisis by using the same thinking that created the situation" (in: McDonough and Braungart, 2002). The conventional approach to our landscape will not help us to organize it for a sustainable future. We can only discuss a truly sustainable landscape when we can integrate our design with ecological material cycles, described in the "Cradle to cradle" approach. This way, the potentials of the site are used in production, we can produce energy and we can use our water effectively. Doing this, we can create a regenerative and appealing landscape for ourselves and for future generations.

Designing cradle to cradle landscapes

In rendering C2C design for a building, McDonough describes the building in terms of a tree: it creates oxygen, fixes carbon, makes energy out of the sun, changes with seasons, provides shadow and shelter. Taking this comparison one step further, we can describe city as a forest. But, as we all know, a forest is more than just a collection of trees. It is a complex community of trees and all other kinds of organisms, all having their own niche in the system and sharing a complex cycle of nutrients.



Complex as it may be, this might be a very good metaphor for the city. We see the city, a concentration of human use and occupation, as an integral part of the landscape. Let's first have a look at the life cycle of a forest. Succession starts with pioneer species that grow fast, aiming at a fast production of biomass and reproduction into offspring. The forest develops over decades into a mature ecosystem near

equilibrium. In this mature state, there is a certain balance in the cycles of nutrients and water and energy flows to maintain this state. The city might follow a comparable succession, when we look at the industrial city as the pioneer stage, in which a lot of resources are used for growth. A mature city would then need to be a sustainable city.

(Newman, 1975)

This metaphor can also offer strategies for the spatial organization of our cities: the forest has a vertical layering, a stratification. A very effective use of the space in all directions. It also knows a horizontal zoning of territory that changes with periods and in which different species have their own niches. We might describe this as a multi-functional landuse in time and space, or in ecological terms, in periodicity and biorhythm.

Applying ecological concepts to the city in this way, does not only change our view on

the spatial form of the city but also on the processes that work in a developing city. Ecology has, over time, developed a very effective way of regeneration and of adaptation to disturbances. Only by creatively developing the most effective ways of dealing with problems, has nature received its present and meanwhile ever-changing form. The difference between the natural and the human world is that we have less time to develop smart solutions and that failure is collateral.

Using these principles as a model for city growth might ideally also mean that the city is able to produce some material and energy for growth or for maintenance. It would however also mean, that growth is limited by the carrying capacity of the land. This is a critique on the present oversized ecological footprint that mankind has on his environment. It is obvious that this is not a way to achieve an equal distribution of sustainable welfare, on a global scale. By effectively closing the cycles of the many materials we use, we will have to eliminate the concept of waste. In this way, according to the "Cradle to cradle" approach, we can create a positive ecological footprint.

The previously discussed biobased economy increases the demand for agricultural products. The future landscape will have a challenging task, having to provide room for energy production, materials and agricultural crops for biorefinery and food. All of this has to take place in a "Cradle to cradle" landscape; in a sustainable landscape that integrates ecological principles.

Our landscape has evolved in the past from marshland to the landscape we see right now. It is dynamic and simply a phase in time. With future challenges in resource availability and climate, a new task lies ahead: to design regions "Cradle to cradle". This means an open attitude and an assessment of the present use of our landscape. The design task for landscape architects and planners is to develop attractive, sustainable landscapes that offer quality for living, that produce food, energy and other resources, landscapes which protect us and at the same time sustain biodiversity and a viable economic system.

To be able to do this, we can learn from history how mankind dealt with nature over the course of time. Investments will have to be made in technological innovations to be able to guarantee a sustainable bio based society. From ecology, we can learn how effectiveness in stead of efficiency can guide us in being a part of cycles of water, nutrients, materials and energy.

To make proper plans for the future, "Cradle to cradle" regional design strategies need to be ecological, integrative and flexible. Processes and dynamics of the landscape are leading for future developments. Everything is related in a complex and fluctuating network. To plan for this requires another way of thinking and we can start with it now. Research at the faculty of Landscape Architecture, Wageningen University is focusing on this. The 1st author of this essay is working on his thesis about "Cradle to cradle in regional design", with a case-study design for the Greenport Venlo.

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