Sustainable Building in the Netherlands

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ABSTRACT

The perception of the expression SB is traditionally mainly resources focussed, with latest years some more attention for indoor climate and health (due to air tightness and ventilation measures) Also lifestyle and social participation have had a minor role under the approach. After successful nineties, latest years, SB as expression has lost its impact and interest, partly due to a government change, partly due to the complexity of the total approach.
Focus is now more on detailed issues: (renewable) Energy (EU driven) , a indoor climate and Health campaign and programmes(government), and smart building/production (flexible etc) as a "movement" (market). Besides, there is renewed interest in spatial and Urban planning, for several reasons: due to climate change and the Dutch geographical position, liberalisation and maintenance of large grid systems, and land scarcity. Un-officially the Dutch government has changed its focus already to climate adaptive policies, in stead of prevention

Its symbolised by the magazine we have in NL: Duurzaam Bouwen (Sustainable Bulilding) It changed its name 3 years ago to Pure building (to connect to a ' feeling") . This did not work, and now its renamed as Building IQ (Bouw IQ) symbolising the 180 degree turn to industry and production solutions. (But criticised by in crowd))

The more broad approach and most interesting project , is now coming from market parties(!) : a stakeholder group initiated the Toolkit for SB for project developers: written from Proj.dev. point of view with costs as a central item: multiple choices lead to a housing concept, with all consequences and performances listed. Hundreds are available in the toolkit, for every niche and every SB aspect.
You could say this is " market driven" and up scaling to mainstream. However successful, still small. In general the interest and implementation of SB is less as 5 or more years ago, however a basic reasonable level is now incorporated in activities of municipalities and market parties.

The only really mainstream success is in recycling building and demolition waste: over 95 pct in NL. And work is going on to decrease the level of downcycling. Its even getting profitable now.
The main driving parties at the moment are municipalities and large organisations, that initiate new innovative projects. However Government drive still is a critical issue for further enhancement of SB, as well as climate change: which will cause a focus at larger systems, in stead of buildings. Where this works out all right is in the successful recycling market: recycling rate is high: 96 pct (so partly as road foundation) but improving, also the commercialisation.
And yes, we see limits of the system: more or less all simple and limited measures are taken(at building level, product level). in order to establish further major changes in our resource consumption, the political and economical systems should be adapted to support this. If not adapted, demolition (in stead of re-use), fossil fuels (instead of renewables and reduction), intensive land use and population growth will further worsening the situation.

Summarize:
Consciousness about environmental problems started in the seventies of last century. First about pollution, next about energy consumption, and noise hinder. In the nineties materials consumption,

land management and water management became important. Nowadays clean indoor and outdoor climate and air quality have become main topics.

Although we had many successes in pilotprojects, technologies, demonstration projects , financial schemes, and some urban approaches, when it comes to mainstream results, we did not succeed to reduce resource consumption absolutely: We did not succeed creating a more local and sustainable input from resources, we did however succeed controlling and managing the output of consumption to a certain extent.

With a new government this year, and the increased attention for climate change, the approach in the Netherlands might gain renewed interest.

Sustainable Building, the concept

Sustainable building has now been developed in the Netherlands for more than 15 years, with a first very visible milestone in 1993: the demonstration project Ecolonia. At that time the general approach to sustainable building was to implement measures that would improve the performance of (part of) a building, and this project provided an overview of many measures and technologies. Since then, greater understanding and experience has led to the view that a better approach would be to implement one of 'concepts', instead of an uncoordinated collection of separate measures. This has been applied in projects since then as well as in the way that other areas are approached, such as municipal management strategies and national policies.

What is the rationale for Sustainable Building?

Why has all this taken place? The number of reasons that have emerged over the years has only grown. To help secure the supply of fossil-fuel energy was one of the first reasons, immediately following the oil crises early 70's .

Air pollution, with its adverse impact on health, came next, followed by political uncertainty in the world (and the trend towards self-sufficiency), and concerns about limited global resources. In recent years, commercial opportunities (for renewable sources of energy and materials) are seen as another reason for promoting sustainable building practices. At the moment, reports about the serious and direct effects of climate change are responsible for renewed interest in sustainability.

Definitions

One of the problems in relation to sustainable development and more specifically, sustainable building, is how to define these terms: what is sustainable building (SB)? In many parts of the world, and even between experts, the concept is interpreted differently. In general, it may be said that balanced resource-use on a global scale is at the basis (e.g. energy, materials, water, land). These physical elements are the most tangible: availability is limited, negative environmental impacts are well-known and there are strategies to reduce resource use (although these have so far been only very partially implemented). Next come the human scale aspects: healthy living conditions, comfort, and social and cultural adjustment to people's perceptions of what life is, with its needs and desires. All this has to be established within the national political context, with the economy as a regulating system, research supporting solutions and sometimes religion as structuring framework. These three scales are sometimes summarised as 'ecology, sociology and economy', or as 'people, planet, profit'. This suggests the same level of importance for all three. However, the physically available resources (energy, materials, clean water, clean air, land, etc.) set the limit on the material framework within which people can create their welfare, while the economic system (with profit as a part of it) has to facilitate this, and is not a goal in itself.

Concepts

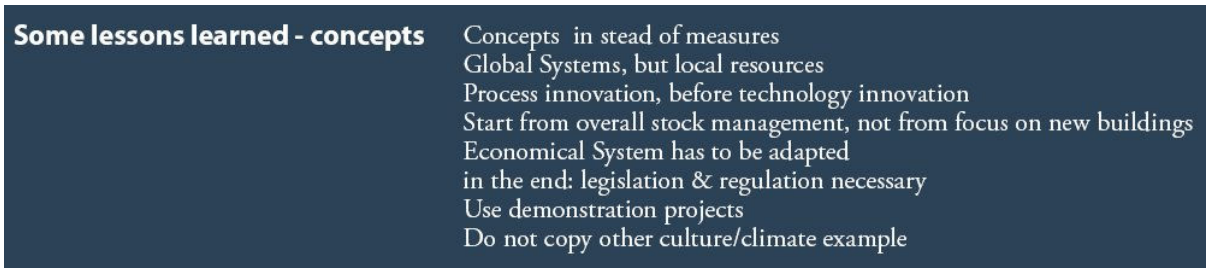
In implementing Sustainable Building, 'concepts' have been shown to be of the utmost importance, since individual or separate measures often lead to less than optimum solutions in the best case, and even to the reverse effect in the worst case, known as the 'rebound effect'. For example, the

introduction of energy-efficient light bulbs has led to reduced energy demand for lighting in living rooms, but also to more lights and more usage hours (and therefore more fossil-fuel energy use) in other parts of homes, like gardens.

This comparison does not stop at the building: the neighbourhood also needs to be included in developing a good concept,
Conceptual development sets an overall goal for a specific aspect and combines measures, technologies, design details, and management support to achieve a totality with optimum results in terms of the target to be met.

Trias Ecologica
The Trias Ecologica has proven to be a useful strategy in developing sustainable and environmental concepts. This principle states that the first step is to reduce the need for or use of anything.
The next step is to use renewable sources to meet the need. And if 1 and 2 are not sufficient to cover the activity, Step 3 can be applied: supply the remaining needs as efficiently as possible.
Applied to energy this leads to a major reduction in demand (through insulation, efficient ventilation, daylight optimisation, etc.), the introduction of renewable energy sources (e.g. solar collectors, passive solar gains by design, solar electricity, etc.) and highly efficient use of fossil fuels to meet the remaining need. These steps need to be applied in that order. The same approach can be used for materials, water consumption, and even for maintenance or installations. (See the relevant chapters).

Scales and responsibilities
Concepts affect decisions on different scales. For instance, to create a balanced materials use concept it is necessary to consider what impacts the materials consumption the most. The influences at the scale of a single building are limited. The decision to build has already been taken: a building cannot be built without materials and the builder can only choose from the materials available on the market. A combination of measures and responsibilities on different scales, involving more (i.e. different) stakeholders, will have more impact. For example, the Government Buildings Agency in the Netherlands is responsible for numerous offices, it does not build itself but decides on what and where to build. It has adopted a strategy which supports the balanced materials concept, that states: the first option is not to build (can the need for office space can be met in another way?) (Compare with the Chinese approach of 'Wu Wei'). The next option is to renovate a existing office or to extend it, and only if these two options are out-of-scope, new construction of offices is considered. The Trias approach is here, essentially, applied at the planning level.
Thus the concept is made up of elements that have to be implemented by different stakeholders and applied as well, but at the planning level. It also shows another important lesson learned from the recent history of SB development: the importance of organisation: many options require a high level of organisation. Well-organised sustainable building management can provide more environmental benefit than technology, for instance, and at different levels: in policy development, in management and in design.



Sustainable building, the Netherlands
From 1975 on, a great deal was invested in energy-saving measures in the Netherlands. Up until 1995 municipalities could set their own requirements for the energy performance of a building based on their local model building ordinance or bylaw.
During the 1990s National Packages were introduced for dwellings. These included a coherent set of measures which could be used individually or in combination (for energy as well as for materials and water management). The use of these measures provided credit points which, based on an agreement with the financial sector, could provide access to better financing schemes (e.g. lower mortgage interest rates).
After 1995 the legislation and standardisation increased dramatically. It was realised that rules should not simply dictate requirements for materials, but prescribe the desired performance. It should be left to the market parties to decide how to fill in these requirements or meet these performance standards.

Energy
In 1995 the (new) National Building Regulations were introduced. This code sets the performance requirements for the whole building. For energy this performance requirement is expressed as an Energy Performance Coefficient. In 1995 the EPC for dwellings was 1.4 (unitless). At the time it represented an improvement of about 10% in energy quality. The method for calculating the EPC is laid down in the Dutch standards: NEN 5128 (dwellings) and NEN 2916 (non-residential buildings). (An English version of these standards is available.) It took about ten years to develop them. These standards have been revised a few times (further to new techniques) and the required performance level has also been changed twice in the building regulations. In 1998 the EPC changed to 1.2 and in 2000 to 1.0. In 2006 the EPC has been lowered again, this time to 0.8.

Energy performance of the location (EPL)
Based on the growing understanding that an integrated approach is required to improve the energy performance of a building, it became clear that many energy-efficiency measures needed to be applied at the neighbourhood level, because many technical installations are more efficient when they deal with larger volumes. For this reason an energy indicator for a site or whole location was developed and introduced: the EPL (Energy Performance Location indicator) which, for the time being, is a voluntary performance indicator. This EPL means that energy aspects can be introduced which are outside the scope of the house building and construction sectors, but which have a positive impact on the energy consumption of a building (e.g. energy-efficient heat and electricity generation, collective facilities, heat delivery, etc.). Usually it is the municipality that sets a target for EPL to support the improved performance of individual buildings.

Covenants
In the past (1998-2002) the government tried to conclude voluntary agreements with industry and housing associations. The aim was to implement energy saving measures in buildings to provide a better energy performance standard for the building than the minimum performance laid down in the building regulations, but these agreements have not been successful.

Energy and legislation goals
The energy consumption of a newly-built dwelling decreased from 3000 m^3 gas to 800 m^3 (for heating and hot water) , but this was offset by an increase in electricity consumption, caused mainly by household appliances. Step-by-step new building directives, standards and guidelines are being set up to establish new minimum standards. But these are still minimum levels and, for the time being, only for new buildings. A whole new set of standards and regulations is needed to steer the building sector towards a real shift and an absolute reduction in resource consumption and environmental impacts.
The ultimate goal is to build homes which are affordable, energy neutral (no use of fossil fuels), made of renewable and recycled materials, with local management of water, in a inspiring and people-oriented neighbourhood. That is the target for the coming decades . Demonstration projects already have shown the possibilities . Mainstreaming these developments is the next barrier tot take.

Existing residential buildings and dwellings
Of course the existing stock is the largest consumer of energy, and the performance has to be improved. This is a complicated approach and so far the approach has been voluntary and supported by subsidies. There is/was a tool to guide this, the EPA (Energy Performance Assessment). Using a computer model an expert can make recommendations on how to improve the construction and installations of a building to reduce its energy consumption.

EU Energy Performance Directive (EPBD)
Now the EU has taken over part of the approach to energy conservation. The 2006 introduced Energy Performance for Buildings directive stipulates that each country has to have minimum requirements for the energy consumption of buildings. Existing buildings must have a label for the energy efficiency of the building. Heating and ventilation installations must
be regularly checked. The CEN (the European Standardisation organisation) has developed several standards which can be used by member states. From this year on it is mandatory for each member state to have this EU legislation implemented.

Energy efficient commuting
The VPL (traffic performance on location)
Parallel to the energy performance of a location, a traffic performance indicator for a location has also been developed, known as TPF. (There is also an English version available.) This tool provides guidance on how to plan and design part of or even a whole town in such a way that transport connections are efficient and energy consumption by traffic is reduced as much as possible.

The environment and legislation
The first legislation clearly focusing on environmental issues (other then energy) was the act that limited the use of asbestos in building materials. It was during a period when there was a growing belief and concern that production and consumption should change and become more controlled. Prompted by events like Rio '92 and the Kyoto Agreement, a whole set of rules and regulations was introduced on production emissions, product performance during use and disposal – all intended to avoid damage to the environment.
At the same time, regulations were introduced to clean up already polluted areas, like rivers and soil. The health aspect is now also seen as more important, partly as a result of incorrectly insulated buildings (built too air-tight or with poor or incorrect ventilation and/or heating installations).
A key concept in modern environmental policy is total chain management. It is a technique that involves assessing and managing the environmental effects of products throughout their lifecycle, from extraction of raw materials through to the disposal of waste. To make total chain management work in practice information is needed about the overall environmental impact of a product. Various tools have been developed to assess such information. These include the Life Cycle Analyses (LCA) and the eco-indicator.
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Eco-indicator
An eco-indicator reduces the results of an LCA to a single figure. This figure expresses the environmental impact caused by a product or material 'from cradle to grave'. Ecoquantum, Greencalc and Dubocalc are three well-known methods/computer programs used to calculate the eco-indicator in the Netherlands. However, These have no legal status .

Standard for Radon radiation
This standard was set up from a health and safety point of view. The standard has been completed but has not been implemented in legislation also because of opposition from the building industry.

MRPI
Further to LCAs and the eco-indicator, the building industry developed a system known as MRPI, the Dutch abbreviation for 'Environmentally-Relevant Product Information'. This system provides

standardised and validated information about the environmental impact of building materials. MRPI enables suppliers in the building industry to provide other parties in the industry with reliable and comparable environmental information about their products.

Waste legislation
For a long time the Netherlands was a frontrunner in the legislation and regulation of environmental matters. As part of a package of mandatory measures the government introduced the Building Materials Decree (Bouwstoffenbesluit). This means that manufacturers are obliged to provide relevant environmental information on their products and materials (see also MRPI). A label can be awarded on the basis of this decree. Precise rules are given on how to deal with building and other waste products.
This has been accompanied by tax measures on dumping of waste, and a gradually introduced ban on dumping. One of the successes of this combination of measures is that about 95% of building waste is now recycled. Though this is on a low quality level (aggregates for road foundation for instance) policies are under development to upgrade recycling to a higher level (re-use of products in stead of recycling of materials)

Noise
Noise and Noise hinder were among the first issues tackled in the Netherlands. Already back in 1982 the Law on Noise hinder was introduced, defining maximum levels of noise indoor and outdoor, leading to many mandatory improvements of facades along roads.

Air
Air pollution has not been a serious issue in the Netherlands, until the EU legislation on air quality defined maximum levels for fine particles of dust of different kinds in air. The Netherlands, in the midst of several industrial areas in the European region, exceeds these levels in may p[laces. New construction is now withhold in these areas, until measures have taken effect to reduce these levels.

Renewable energy
As in all countries, renewable energy is available in abundance, only to capture it requires a shift in energy policies. The Netherlands has much experimented with all kinds of technologies, and technically the country can produce more then enough, with integrated concepts. It's a matter of mindset, and shifting economical incentives, to make it really happen. At this moment, the country has no specific renewable energy targets anymore, its all shifted to CO2 reduction targets, Which partly lead to new coal fired plants, but with CO2 stored in old and empty gas fields. From former policy remains the construction of two offshore wind parks, out in the North Sea, one being completed.
For the building sector it seems that there is now growing support for creating more 0-energy buildings and areas, The new government, now in place for three months, has mentioned some plans in that direction. Technically no problem, it has all been demonstrated already, at a commercial level.

Water
For centuries the Dutch have battled the water and tried to control it. Most of the old windmills for which the country is famous, were built to pump water out of the built environment. There are several circumstances which have contributed to a change in this approach. First of all, it has been accepted that living with water is a better approach than fighting it. Several river floods over the last decade have influenced this line of thinking. A second reason is the fact that climate change is causing sea levels to rise – while much of the land is sinking due to oxidation of drained peaty soils - and controlling surface and groundwater at today's levels in the Netherlands (for a large part below sea level) would require huge investments. A third reason is that people are starting to appreciate water as part of their living environment.

<u>Sustainable local water management</u>

Traditionally, water was not a building issue. Surplus water (groundwater, rain water) is drained and transported out of the urban environment. Domestic water is supplied by a central grid system, used in the building, and collected for transport by sewerage systems to a distant wastewater treatment installation. The first attempts to integrate water into sustainable building projects were by reducing the volume used in the building or house. Further improvements were made by rainwater harvesting for domestic water use.
Nowadays, new insights and technologies are aimed at a local approach to the water cycle, including local storm water infiltration and decentralised wastewater treatment, as well as facilitating groundwater recharge and urban landscaping. In this way a local water concept is developed which is directly related to the urban and building design. Sustainable local water management follows good practice principles: keep water local, minimise water use, do not mix clean and polluted water flows and facilitate local reuse of water.

This is currently recognized and several new issues can now be explored to add to the conceptual development:
• Local storm water infiltration for groundwater recharge and city landscaping;
• Minimizing external water supply;
• Wastewater separation at source and local treatment and reuse of domestic wastewater.
Since water itself is a continuous resource (and therefore renewable) a closed cycle approach to water consists mainly of treating the polluting elements in the cycle at local level and for re-use as much as possible. Water can be seen as an in and outgoing stream in the neighbourhood, and in between it is used. The polluting elements added to the water should be removed before releasing it again to the mainstream. This way a continuous loop is possible.

Some examples of water-saving equipment are:
• Water-saving toilets (6 l / 3 l per flush);
• Water-saving washing machines and dishwashers;
• Showers instead of baths;
• Water-saving showers;
• Low-flush vacuum toilet systems (1-2 l per flush).

Domestic wastewater is an important local source of water that can be used for groundwater recharge, landscaping and various other purposes (e.g. car washing). More than 130 m3 of wastewater is released per household per year.
The grey water of households (up to 75% of the total water use) is relatively clean and therefore easy to treat on a local scale. The treated effluent can be used for groundwater recharge or landscaping. There are various examples both in the Netherlands and in Europe where grey water is treated in reed bed systems. The treatment results of these systems are very good and can comply with strict European discharge standards. There are also successful examples of compact methods for grey water purification, such as biofilters and membrane bio-filters. The treated grey water from reed bed filters is often discharged into local water systems that have a function in urban design. Landscape architects who have been involved with grey water projects state that reed bed filters are considered as design elements in urban landscaping and that viewed in this way the extra cost of local grey water treatment is low.

Materials
In the Netherlands, about 150 million tonnes of building materials a year are used to build houses, offices and infrastructure, with only about 10 million tonnes being used for new housing. About 60,000 new houses (1% of stock) are built every year, with about 16,000 being demolished. On average a Dutch house consumes about 1 ton of materials to construct 1 m2 living area. This is based on a brick structure with concrete flooring. There is an official policy to raise the share of timber frame housing, to reduce the materials input and shift towards more renewable materials. This has

only relative success for the moment, and is far behind the practice in for instance Scandinavian countries.
However, the solid brick based way of building is among the most materials efficient in Europe. Dutch industry has invested a lot in reducing materials and optimise building detailing. Concrete floors are usually made of hollow elements. And the Policy support for industry has resulted in many new technologies and products to help reduce the materials consumption. A very successful development was the replacement of solid masonry for the external façade, by a hollow ceramic tile cladding system, maintaining the "ceramic architectural look " while reducing mass and increasing flexibility and dismantling/re-use option.

This is partly related to the focus the government in the nineties had on the products industry: these were challenged by incentives and "long term agreements" to come up with innovative solutions, to reduce embodied energy, change for less harmful materials, and provide new products for use in "easy to dismantle buildings".

At this moment most pressure to improve on materials consumption, is coming from the EU. Though the EU has no mandate to directly aim at building and construction (excluded from the treaty) it can bring up directives on products and resource consumption and waste management. The EU is preparing advanced legislation for this.

In the materialisation of office building only marginal improvements have been established, and is mainly depending the wishes of the client . However one interesting development has growing interest: to reduce the constructed volume by a flex-working concept: Based on the idea that most of the time only part of the employees is in house, the employees have no fixed working space anymore, but acquire a desk when entering. This way up to 50 pct of space reduction has been achieved. The municipal office in Den Bosch for instance has 1500 employees, but can manage with 750 "desk spaces" .

Building to urban scale
Much has been focussed on the building level during the past 15 years or so, and as well on product manufacturing and technology development. Nowadays its becoming clear that by a 1 by 1 building approach the overall result will be marginal. The interest for overarching approaches is fast growing, since the very dense populated country of The Netherlands is facing its limits: Traffic jams all over, air quality below European standard levels, climate change threats, and a still rising resource consumption require a more stringent approach.
This leads to more attention for spatial planning and municipal overall approaches. However Spatial Planning has always been a major issue in the Netherlands(and in some way we are famous for this) , the environmental elements in Spatial planning are new.
Several cities have developed a CO2 neutral or Energy Neutral policy, and taking initiatives to steer from a stock management perspective in stead of a building management perspective. Re-development of older areas is a growing activity (to maintain social structures, and improve quality and environmental performance) , and local production of renewable energy, from solar cells and wind turbines is planned (partly roof based). On the other hand, the national government is still on the line of economical growth and mobility as a prerequisite, constructing new roads.
Technology should bring solutions, however many believe that smart organisation and management can bring more relief.
(The urban harvest approach I developed in Wageningen university is addressing this, see other documents- Urban Harvest)

Land
As many know, the Netherlands is a small country, and land is scarce. Not a single m2 is un-used or un-planned. After 50 years of re-organising the land in an efficient way, latest years the country is under study again, to reform the land to better meet needs and adapt to environmental and climate

change requirements. Water is pushing from two sides: sea level rise, and increasing water flows from European rivers to the Dutch delta. With 1/3 of land under sealevel, this requires major adaptations. Parts of the land will be given back to the water, to create storage for peak flows, and the first dyke has already been stabbed…
It also leads to an adaptation in architecture: in some areas its only allowed to construct "floating houses" .

High rises.
High rise construction is not a real issue in the Netherlands. Only recently a few buildings above 100 metres have been constructed. This is related to the Dutch socio cultural approach, where people prefer to live and work at ground level, having a little garden, and easy access to facilities to walk during lunchtime. Another reason is that we have a weak soil, which is not directly suitable for high rises, and requires large investments in foundations. A recent study for the environmental performance of high rises shows that above ~36 floors the environmental performance per m2 drops dramatically due to increased need for systems and structures to support the building. This may set a limit as well to future developments in this direction.

"stacking"
In stead of reducing land needs by high rises, the latest trend is more directing towards "stacking functions" . For instance, combining agricultural production, with offices and houses: the base level can be used for mushroom growing and parking, in between levels for housing and offices, and roof levels for greenhouses, everything combined in a optimal energy concept.
One "mono'" stacking concept is to construct a tower , to house 20 pig farms, 1 on each floor, topped by a energy plant based on pig manure, and two or three ground levels to use as slaughter house. The surrounding are to use for food production for Pigs. This "Pig tower" is an efficient combination in terms of reducing energy and transport needs, while improving living circumstances for pigs. Amsterdam is seriously studying to construct one, to fulfil the cities needs for pig meat.

CONCLUSION

Over the years, the Netherlands has developed a lot of experience in Sustainable Building, in all fields. Technologies have been developed, concepts demonstrated.

One should keep in mind, however, that government support for sustainable building in the Netherlands has been minimised in recent years, and the Dutch body of knowledge – whilst firmly grounded in years of experience and many great successes – is currently not being applied in the Netherlands to the fullest extend possible. It is expected that the governments support will increase again, due to environmental pressures on society, raising oil prices, land scarcity, increasing air pollution and more. Furthermore, there is a growing interference in national environmental policies by European rules and regulations, issues by the European Union. The Union is developing and mandating many new regulations and policies, that will force member countries to improve on their environmental performance.
Although the knowledge on sustainable building is now widely available in the Netherlands, still only a small part of new developments are designed and built in a true sustainable way. The basic environmental performance level has risen, but is still far away from the desired improvement of a factor 4 to 10 in environmental performance, as will be needed to bring the Dutch building stock within long-term sustainability limits. Assessments of realised projects indicate that (the best) projects have an environmental performance of approximately a factor 2 better than 10-15 years ago.
(The new office-headquarters for the WWF organisation is reported to be the first factor 4 building in NL)
It can only be expected that the main focus for the future will be existing buildings. The Dutch building stock, which is expected to be the main component of housing until after 2050, has to be

maintain, upgraded, extended and/or re-developed to make the existing homes fit for a sustainable future (with significantly lower fossil energy consumption, strongly reduced materials consumption and waste production etc etc). Step 1 of the Trias, to reduce the need for an environmentally impacting activity, on a macro-economic level also applies to the whole building stock: to reduce need for new building activity, by limiting the need for buildings or by re-using old buildings (with renovations, if needed).
However, to have all knowledge implemented in mainstream construction and building management, a change of mindset is needed, in all levels and with all stakeholders.

To change from a linear way of thinking in construction (from ores to waste) , to a closed cycle way of thinking (from buildings to buildings). Maybe the recent attention for climate change and other environmental threats may help speeding up this process. There is a new government in the Netherlands, so there is hope.