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***Sustainability in Urban Areas: how can sustainability become  
mainstream?***

Drs Bauke J. de Vries  
Saxion University of Applied Sciences  
the Netherlands  
[b.j.devries@saxion.nl](mailto:b.j.devries@saxion.nl)

**Sustainability in urban areas: how can sustainability become mainstream?**

The explicit attention to sustainability and related concepts within the context of housing and urban development dates back to the 70's of the last century. Since then, a lot of efforts have been done to define the concept and to bring it into practice. This involved efforts from national to local governments, to create the proper policy conditions, from commercial partners like developers, constructors, and housing corporations, to realise sustainable residential areas and houses, and from other partners like NGO's and research institutes. And of course it involved efforts from residents, who lived in the (more) sustainable houses, experienced some benefits but sometimes also were confronted with disadvantages of their (more) sustainable houses. Certain successes were achieved, but the complete housing sector at this moment is still far from 'sustainable'. The need for further improvement is getting bigger, both for environmental reasons and for reasons related to other dimensions of sustainable development, like for example social and economic quality.

The objective of this article is to find the conditions that are considered necessary for broad implementation of sustainability into urban development and management.

It starts with a description of prevailing definitions within the literature on sustainable housing. It is argued that a broad view on sustainable development in relation to housing and urban development is considered most appropriate to realise further improvements in the field of sustainable housing. This also implies that the key factor for broad implementation of sustainable urban development is the combination of direct personal benefits with global long term benefits in the design of houses and residential areas.

Observations in a few case study areas in the Netherlands are used to support the importance of a number of conditions for a successful customer oriented approach for sustainable urban development. These observations originate from small scale evaluation research projects dealing with sustainability in new residential areas and from involvement of the author as advisor in decision making processes for new residential areas.

The experiences in the projects involved stress the importance of the following four factors:

- Attention for personal needs of residents in the decision making process, in design and in communication.
- Communication, network management and leadership
- Monitoring, evaluation and dissemination of results
- Appropriate financial constructions for a fair distribution of investments in sustainability and benefits resulting from these investments

These four factors have the search for quality in common: new developments should contribute to quality in a broad perspective: quality here and elsewhere, quality now and in the future.

**Definitions of sustainability in relation to housing and urban development**

A lot of articles and policy documents dealing with sustainable building focus on the environmental dimension of sustainability. This focus can be found, among others, in Melchert (2007), Priemus (2005) and Klunder (2005). Melchert (2007) describes the evolution of sustainable building policy in the Netherlands between the 1970 and the 21<sup>st</sup> century, by distinguishing a period of self-sufficiency and a period of environmental efficiency. The period of self-sufficiency is described as a period with a focus on a broad ideology, dealing with the connection between man and nature and focusing on a decrease of

environmental impact of housing with the use of low tech 'green' measures like the use of grass roofs, compost toilets and natural types of paint. An example of an organisation promoting this view is De Kleine Aarde (the small earth), an environmental NGO in the Netherlands.

More sustainable building projects from the 70's and 80's have the characteristics of a niche approach. Sustainable is alternative, and requires offers from the residents, in terms of higher costs, lower comfort, more costs for maintenance or an 'alternative' look. Some of the first 'sustainable' window frames were made from soft wood (in stead of hardwood tropical timber) in combination with water based paint. Negative experiences, also partly based upon failures in the construction procedures, create a poor image for 'sustainable building'.

The second phase, starting in the early 1980's, is described as the 'ecological modernization phase', where energy efficient and environmentally friendly building principles are gradually integrated in modern architecture and become embedded, though not yet completely, in the daily construction activities of the mainstream building companies.

Priemus (2005) also prefers to define sustainable housing in a narrow sense, as housing with a minimum of negative impacts on the environment, although he mentions the importance of social and economic dimensions of sustainability. He uses the metaphor of the 'ecological footprint' as defined by Wackernagel and Rees, to describe the environmental impacts of housing. He defines sustainable housing as housing with a minimum of negative impacts in terms of climate change, quality of air, water and soil; noise; stench; the stock of non-renewable materials and biodiversity. He uses the life cycle approach and the 'ecodevice' model as tools to measure the environmental impact of a house in its complete life cycle and for all the energy and material flows.

One of the bottle necks for the realisation of sustainable housing identified by Priemus (2005) is the gap between construction and use: many measures in sustainable housing require modification of user behaviour. He describes research where the residents failed to adapt their behaviour, or even showed a rebound effect: the behaviour reactions of the residents cancelled out the impact of sustainable housing measures (Hertz, 1996). He mentions evaluation and measurement of rebound effects as one of the key issues on the research agenda on sustainable housing.

The cases described below in this article show that also in recent times, examples of this rebound effect can be found and that responsible policy makers underestimate the negative impact of this effect.

Another bottle neck described by Priemus is the asymmetric distribution of (financial) pros and cons of sustainable building. This is also supported by the experiences discussed below. In addition to financial pros and cons of energy saving measures that can be quantified quite easily, sustainable housing can have other benefits that are more difficult to quantify or to prof. De Kam (2008) identifies opportunities to quantify the benefits and to solve problems with regard to mismatch between investments and benefits. He concludes that it is important to elaborate these concepts but that a lot of research needs to be done before this can be fully implemented into the practice with respect to building and area management.

Other authors use a broader definition of sustainability in relation to buildings and developments. De Bruijn (2004) uses 5 different quality criteria for sustainable development of the living environment: social, environmental, economic, spatial quality and process quality. All the qualities can be assessed at the local level (here and now) and the long term global level (later and elsewhere). Williams and Lindsey (2007) describe features from three different dimensions of sustainability: environmental, economic and social. The economic

issues described are local supply chains, decrease in running costs of buildings and the appropriate mix of functions in an area (e.g. housing and business). Social issues are accessibility of a residential area, affordability of the housing, issues related to quality of life and adaptivity of buildings. Winston and Eastaway (2008) promote the use of a broad set of indicators to quantify sustainable housing, and consider the model of the European System of Social Indicators (EUSI) as a useful framework for sustainable housing indicators. This system puts a strong focus on social dimensions. It covers the following issues: improvement of objective living conditions, enhancement of subjective well-being, reduction of disparities and social exclusion, strengthening social connections, preserving the natural capital and preserving the human capital.

Callaghan and Colton (2007) propose to use a broad definition of sustainability, when municipal decision makers want to support the development of sustainable communities: to overcome segmentation, communities should be described using a variety of types of community capital: environmental capital, human capital, social capital, cultural capital, public structural capital and commercial capital. Decision makers should pay attention to the interrelatedness of the different capitals and seek for an appropriate balance of the different capitals.

The cases described below support the statement that designers and decision makers need to use a broad definition of sustainable housing, to make the necessary steps forward in the effective implementation of sustainability in housing and area development.

### **Sustainable building in Hengelo: prejudices against sustainable building**

The first case is based on a series of depth interviews with 16 households in Hengelo, Zwolle and Enschede, three medium sized towns (80.000 – 150.000 inhabitants) in the province of Overijssel in the Eastern part of the Netherlands. Half of the households lived in ‘sustainable’ houses: a community based project in Zwolle, houses that were the result of a design contest for sustainable houses in Hengelo, and houses in a neighbourhood in Enschede with high ambitions with respect to sustainable building (Oikos). The other half of the households lived in houses that met the regular requirements of the moment of construction (2000 – 2005), but no more than that. The location, size and price of these houses and the socio-cultural position of the residents was comparable to that of the ‘sustainable’ houses.

The interviews present a fairly consistent image of opportunities and bottle necks for sustainable building. Many of the households who chose to live in a sustainable house, are rather positive about the result. They notice that their house offers more comfort and quality than the house they had before, and than other houses in the neighbourhood, in terms of energy use, in-house climate and ease of maintenance. They also noticed that the application of relatively modern technology in a house created more risks for miscommunication and failures during the construction period. Many of the construction and installation companies involved in the construction of the houses had very limited experience with the technologies applied, e.g. with low temperature heating and cooling systems.

Most of the interviewed residents of the regular houses showed little knowledge about sustainable building and have negative ideas about it. Most of them associated sustainable building with extreme and unattractive concepts like grass roofs, roofs covered with solar panels and ugly smelling compost heaps. They presented many examples of expensive and ineffective measures applied in sustainable buildings. In general, they saw lots of disadvantages connected to sustainable building and did not expect important benefits.

The municipality of Hengelo used the results of this research to develop a strategy to promote sustainable building by private commissioners in a new residential area in Hengelo. They decided to focus on quality for the resident in a broad perspective, without stressing too much on the concept of sustainable building. Quality implies: low energy costs, high quality of in-house climate, low maintenance costs. The municipality also provided individual support and guidance to all the commissioners. A building supervisor provides up to date information about high quality technology and design principles that the residents can use to realise the desired quality. In addition to communication tools, also regulatory tools are used to guarantee a minimum level of quality with respect to sustainable building: every house owner must have at least a score of 7 within the GPR framework for sustainable building (Shabou, 2006; Municipality of Hengelo, 2006).

Evaluation of solar boilers in Deventer: consumers satisfaction and energy use

The second case is an evaluation research in the new residential area 'Vijfhoek' (Pentagon) in the town of Deventer. It shows the importance of evaluation research, and illustrates the lack of attention to evaluation research within municipalities that put a lot of effort in the realisation of residential areas.

Between 1994 and 2000, around 1,000 of the 3,000 new houses were provided with a solar boiler. Throughout the year, the solar boiler can deliver half of the warm water needed in the house for purposes like showering, bathing and dish washing. The expected energy saving of a solar boiler is 150 - 200 m<sup>3</sup> gas, compared to the same type of house with completely gas heated warm water provision.

Based on the size and the energy efficiency of the houses, the municipality of Deventer expected an average gas consumption of 750 m<sup>3</sup> in the houses in charge (most single family dwellings in rows, or semi-detached houses, with a volume between 300 – 400 m<sup>3</sup>). The solar boilers played an important role to support the environmental friendly image of the residential area. In the year 1999, Deventer was awarded as the 'Solar Boiler Town of the Year', by a popular radio programme on environmental issues ('Vroege Vogels' – Early Birds).

In spite of this extensive attention to sustainable building in general and specially energy saving, the municipality did not execute any systematic evaluation research. In 2005, the local Advisory Board of Nature and Environment, a commission with members from local environmental NGOs who give advice to the local government about issues related to nature and environment, advised to execute an evaluation research to measure the effectiveness of the energy saving measures and the satisfaction of the residents. This research is executed in 2006, by students and staff of Saxion, the local University of Applied Science.

In a representative part of the area, 110 houses were selected for the evaluation research. A letter with a request to participate to the evaluation research was given personally to the residents, during a visit by the students. The evaluation form itself was accessible on an internet site. Residents without access to internet could fill in a paper form. In total, 45 forms were filled in using the internet site. The results show that most of the residents have no complaints about the functioning of the solar boiler. In most cases, only the regular maintenance, in combination with the heating system of the house, was done and no extra maintenance or repair for the solar boiler was necessary until now (around 10 years after the delivery of the houses and the solar boilers). Most of the residents appreciate the presence of the solar boiler and report a positive attitude towards saving of energy.

In contrast with this positive attitude, the reported use of gas is much higher than the expected 750 m<sup>3</sup> per year. The total gas use reported by the respondents varies from 500 to 2500 m<sup>3</sup> per year, with an average of 1250 to 1500 m<sup>3</sup>. The details of the warm water use in these households were not investigated in this research, because of the difficulty of getting reliable data about this.

A possible explanation for this much higher use of gas is the room temperature in the houses. More than 40% of the respondents report a room temperature higher than 20 °C. The highest room temperature reported by one respondent was 25 degrees C. These high heating temperatures lead to a serious increase in the gas consumption. These experiences are consistent with the research by Bartiaux (2007) about domestic consumer behaviour in Belgium. She found in a sample of 962 respondents, that almost 60% had a room temperature of 21 degrees or higher, 27% had 20 degrees, and 15% had 19 degrees or lower. Bartiaux could not find a significant relationship between knowledge of energy and climate and behaviour.

An important issue for the effectiveness of the solar boiler on the long term is maintenance. Installation companies interviewed suggest that after 15 year of usage, some essential parts of the solar boiler need to be replaced, to guarantee proper functioning on a longer term. Many of the solar boilers in the area are more than 10 years in use. This implies that the moment for large scale maintenance is approaching. It was suggested by the researchers that the Municipality of Deventer could stimulate the long term use of the solar boiler by organising a communication campaign for the house owners, or by arranging or facilitating a collective contract for maintenance of the solar boilers. At the moment of the research (2006), the department of the municipality that was supporting this research, did not have the intention to organise this communication campaign or facilitate the collective contract (Flim et al, 2006).

### **Province of Flevoland and municipality of Rijssen (Overijssel): combining personal benefits with environmental benefits**

The third case deals with the development of an indicator set for sustainable building that uses the direct benefits for the residents as the starting point. Not the expected benefit for the global environment is the central issue in the communication, but the benefit for the residents, in terms of comfort and quality and financial benefits. Even some issues mainly dealing with external environmental benefits are presented as personal benefits, because they create a good feeling. Examples: protection of biodiversity, waste prevention in construction materials, water saving.

The model is developed in the province of Flevoland, in close cooperation with representatives of the building sector, residents and municipalities. This was part of a broad campaign called 'Goed bouwen, prettig wonen' (good building, comfortable living). Quality is the central issue in the communication and design, and a broad set of 'sustainable' measures are included in this framework.

Aker et al (2008) came up with quantitative indicators for a set of 21 criteria within this framework, and distinguished different quality levels scored from 6 (minimum legal requirements) to 9 or 10 (maximum ambition).

The focus on direct benefits for the residents decreases the risk of negative prejudices against 'sustainable' building and helps designers and constructors to seek for the combination of personal benefits and long term environmental benefits. This strongly customer oriented approach also could decrease the risk of wrong use of the facilities: the demands and the behaviour of the residents are considered as the starting point for design and construction, and not the environmental performance of a technology in an in vitro laboratory situation.

This approach was used by the author in the municipality of Rijssen (Overijssel, the Netherlands), where the decision making process about the ambitions regarding sustainable building was in an early stage. The residents in this municipality can be described as 'traditional', and this could also be seen in results of inventories of ideas regarding the design of the new residential area. Moreover, this municipality hosts several major construction companies and other business related to housing. The people who were interviewed about their preferences for this new residential area showed a strong preference for traditional design of the houses. The concept of sustainable housing was connected to a couple of negative associations, like 'experimental' (with a risk of failure) and 'not well looking' (a sun oriented design of the houses was expected to lead to a monotonous, unattractive living area) (Municipality of Rijssen, 2008).

Also the project team that is preparing the structure plan and the ambition level regarding sustainable housing had to a large extent negative expectations and low ambitions with respect to sustainability. The presentation of the main features from the model from the Province of Flevoland, created a positive change in the attitude towards sustainable building, because people saw that sustainability is not contrary to quality and benefits for residents, but can be combined. Between March and June 2009, the process of decision making with regard to the sustainability ambitions in the new residential area will be completed.

### **Conclusion: opportunities and limitations of the four factors mentioned**

After the description of these cases, we will return to the question posed in the title of the article: how can sustainability in urban areas become mainstream?

The opportunities and the limitations of the four factors mentioned at the beginning will be discussed, with reference to the case studies described and other experiences from literature. At the end, some important research questions for the future are mentioned.

#### *Attention for personal needs of residents*

The first case shows that the owners of sustainable houses experienced personal benefits, in terms of comfort, quality and low maintenance costs. On the other hand, the owners of the regular houses who were interviewed, had negative prejudices about the concept of sustainable building. The third case shows that technological improvements have increased the possibilities to combine personal needs and environmental benefits, and that this way of thinking stimulates designers, constructors and policy makers to strive for the combination of personal benefits and environmental benefits.

On the other hand, it can be argued that a growing need for luxury and comfort still goes hand in hand with a growth in the use of resources, and that the present level of use of resources is far from sustainable. The World Wildlife Fund (2008) estimates that the total Ecological Footprint of all people on the world in 2005 was already 25% more than the world's biocapacity (WWF, 2008), and the consumption of resources and space is growing each year. The challenge for designers, constructors and policy makers has two dimensions: on the one hand the environmental impact of building and living should be decreased by technological innovations. On the other hand it is important to make clear to citizens that we are still (and even more) facing 'Limits to growth', and that not all personal needs can be fulfilled. Communication is crucial in this respect. Apart from that, policy changes like the greening of tax regimes can play a role in influencing behavior of residents in this respect.

The explicit attention for personal needs also helps decision makers to look for synergy between different dimensions of sustainability.

*Communication, network management and leadership*

With respect to communication, two more or less opposing conclusions can be drawn. On the one hand, policy makers underestimate the importance of communication as an instrument for behaviour change. A lot of money is used to introduce sustainable technologies in houses, but very little attention is paid to explanation and motivation (why is this technology introduced, what are the benefits) or instruction (how does it work, what is needed for maintenance). Also constructors and installation companies are not always well trained in sustainable building or installation technologies. This creates the risks of waste of money, because the effectiveness of the new technology decreases by improper use.

On the other hand, policy makers are sometimes too optimistic about the impact of communication campaigns on knowledge, attitudes and behaviour of citizens. More evidence for the weak relationship between knowledge about environmental issues and environmentally friendly behaviour can be found in Bartiaux (2008). She shows that this link is very weak, and many people with a lot of knowledge about environment and energy do not bring this into practice in their daily life. Even very specific advice on opportunities for saving energy were seldom followed by action: 'precise, professional and customised information does not often bring about many changes in energy consumption: one year after the assessment, these households have actually implemented some 11% of all the proposed measures'. She identifies the following factors of crucial importance for more effective communication: consistency between different sources of information, social support for environmentally friendly practices by the family and the social network and more support from policies, both regarding supporting policy instruments and a stronger feeling of 'perceived obligation'.

For effective communication in relation to sustainable housing, it is important that the communication activities are clearly and explicitly linked to the physical conditions (the technology in the houses, the spatial planning in a neighbourhood) and the policy conditions. Communication about sustainability issues should be fully integrated into the existing communication channels and networks. With regard to residential areas, the existing channels from the municipality and all other stakeholders like real estate developers, installation services, energy delivering companies, social facilities in the neighbourhood should be linked. The information provided will be more effective if it is more consistent, as also is stated by Bartiaux (2008). This idea of consistency and cooperation is elaborated in a few large new residential areas in the Netherlands, like Leidsche Rijn (see De Vries, 2006).

More and more attention is paid to interactive policy making in area development projects. This can be seen as a very important tool to take the demands of stakeholders into account while developing or restructuring residential areas. On the other hand, there is a risk that interactive policy making results in overemphasizing traditional concepts. Most people prefer to have what they know and prejudices or misconceptions about innovative technology are quite common. Therefore, these interactive policy processes also need leadership: experts with up to date knowledge need to be involved, and politicians should not only 'do what they think that their voters want', but also stimulate innovation by explaining the benefits of sustainable building and motivating the reasons why this is important. Also here, a broad perspective on sustainable development needs to be used, linking environmental, social, economic and spatial qualities.



*Monitoring, evaluation and dissemination of results*

The first two cases illustrate that evaluation is not automatically included in policy development. In terms of the Deming cycle: Plan and Do are executed, Check and Act are often forgotten. In both cases, evaluation was not included in the original policy plans. In Hengelo, the evaluation was the result of the initiative of an individual civil servant of the municipality. In Deventer, it was suggested by representatives from environmental NGOs.

More attention for evaluation can result in more insight in costs and benefits of policy instruments and physical conditions for sustainable building. It requires a long term focus within the departments of the local government, and an attitude with attention to self reflection.

*Arrangements for fair distribution of investments in sustainability and benefits*

Many researches show the benefits of sustainable building, both in terms of financial benefits that can be easily quantified (energy costs, maintenance costs etc) and in terms of benefits that are more difficult to proof (improved health, improved consumer satisfaction etc). See for example Fowler and Rauch (2008) and Kats (2003). Nevertheless, finances are still a bottle neck in decision making about sustainable residential areas. In many cases, an unfair distribution of investments and benefits (or the perception of unfair distribution) seems to be a bottle neck.

With respect to energy, more and more examples can be found where combinations of local governments, housing corporations, energy companies and real estate developers try to create local energy services that provide electricity, heat, (bio)gas and / or cooling capacity. These institutions can help in improving the distribution of investments and benefits. Also financial constructions with banks, and changes in legislation, can help in this respect.

With respect to benefits that cannot easily be expressed in financial benefits, it will be much harder to create a reliable insight in costs and benefits and a proper distribution.

**Research agenda**

Knowledge about planning, realisation and management of sustainable and healthy cities is growing, and the implementation of practices in this respect is slowly improving. However, the gap between the innovators and the main stream is still large. Inconsistency in information and a focus on negative experiences seems to slow down the speed of improvement. What can be done to improve this process and what are the roles of different stakeholders like local and national authorities, and commercial partners like real estate developers and construction companies?

How can 'weak' and 'vague' benefits of sustainable area development, like improved satisfaction of residents, improved health and reduction of maintenance costs be quantified and used in decision making processes? What are effective constructions for fair distribution of costs and benefits and what are the implications in legislation, contract making and communication?

How can learning cycles in area development projects be improved (more attention for evaluation and feedback), to extract the lessons from these development projects for the future of these areas and for other areas? This involves improvement in the process of knowledge dissemination.

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