

Report on the status of sustainable building in Sweden

and

Report from the Sustainable Building Regional Conference “Sustainable City Development”, Malmö 2007

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PART A: REPORT ON THE STATUS OF SUSTAINABLE BUILDING IN SWEDEN

1. Legal requirements regarding energy consumption in buildings

The European Directive on Energy Performance of Buildings (EPBD) (Directive 2002/91/EC) requires the introduction of legislation in each member state that measures the energy consumption of buildings. In addition, it asks for

- a general framework for a methodology of calculation of the integrated energy performance of buildings;
- the application of minimum requirements on the energy performance of new buildings;
- the application of minimum requirements on the energy performance of large existing buildings that are subject to major renovation;
- energy performance certification of buildings;
- regular inspection of boilers and of air-conditioning systems in buildings and in addition an assessment of the heating installation in which the boilers are more than 15 years old;
- requirements for experts and inspectors for the certification of buildings, the drafting of the accompanying recommendations and the inspection of boilers and air-conditioning systems.

In Sweden, this law was introduced in 2006 (2006:1592). It requires that an energy certificate is issued stating the de facto energy consumption of the building on a practical basis (not based on a theoretical calculation as is the case in most other EU member states). In the case of apartment buildings, these should be certified at the end of 2008, other buildings will be started to be certified after that date. Individual house owners need to produce a certification at the point in time when the house is sold. As reference value, energy consumption for e.g. apartment buildings is set at between 130 kWh/m² and year and 110kWh/m² depending on geographical location of the building.

In July 2008, the following table shows which municipalities have reported the highest numbers of certificates:

Municipalities	Total number of buildings certified by 31-12-2008	Number certified buildings	Percent
Svedala	324	91	28
Timrå	462	128	28
Storfors	124	25	20
Bromölla	276	52	19
Växjö	2 370	413	17
Upplands-Väsby	877	128	15

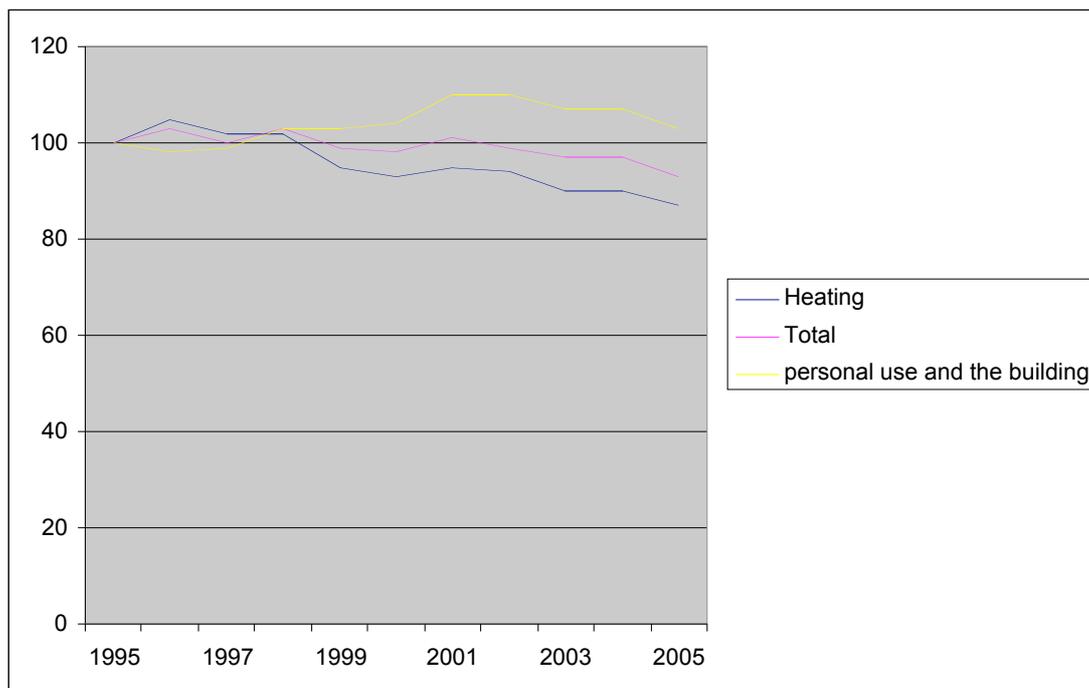
Bräcke	315	44	14
Lund	3 357	452	13
Orsa	212	24	11
Ragunda	284	28	10

Source: Swedish National Board of Housing, Building and Planning 2008

The table illustrates that especially smaller municipalities show a higher proportion of certified buildings, and this is the case for the whole country. Some medium sized towns (Vaxsjö and Lund) are represented as well.

2. Energy consumption and trends in Sweden

Energy consumption for housing (single family and apartment) has been rather constant over the last ten years. The following tables shows the change in energy consumption over ten years with 1995 as the base line. On average, 220kWh/m² and year was used in 2005 (of which 143kWh were for heating and 77kWh for personal use and the building in general).



Source: Swedish Energy Agency 2007

The increase in energy consumption for personal use is due to the increase in electronic equipment (TVs, computers) but also partly due to the installation of heat pumps, which would also explain part of the reduction in energy used for heating. Another reason for the decrease in energy for heating is that the winters in the last five years have not been as cold.

The energy prices increased over the last ten years by ca. 40% (excl. taxes), which gives a strong incentive to reduce energy consumption, especially considering the fact that the prices are expected to continue rising.

As a result of these trends and the introduction of energy declarations, there is a trend to the construction of low-energy and passive houses. Until April 2008 there have been 183 passive housing units built in Sweden, mostly apartment buildings. At the same time 319 new apartments are under construction as passive houses, while 300 apartments are being renovated according to the Swedish definition of passive house standard.

Besides housing, a new nursery is under construction in Alingsås and a new school in the municipality of Storfors. In March 2008 the first passive house in Stockholm was finished. So far most of the developments in Sweden were in the southern part where it is easier to fulfil the criteria for passive houses, due to the milder climate compared to the north of Sweden. However in many cities both bigger and smaller ones, new initiatives are under way and many passive houses are in a planning phase. There is, however, a need to initiate and test passive house projects in the northern regions, where due to the climate it is a big challenge to fulfil the criteria in a cost efficient way.

In order to reach and implement energy saving and low/passive housing in Sweden, there are a number of different initiatives that provide information and training. These include the Swedish National Board of Housing, Building and Planning, but also from the side of Universities and/or a number of EU financed projects and industry initiatives. In addition, the Swedish government provides funds for investments in CO2 reduction measures.

3. Legal requirements regarding water

Water issues are administered on a municipal level in Sweden, based on the Law on Planning and Construction (PBL, 1987:10). Municipalities are required to include questions regarding and the management of natural resources, including water courses and ground water usage, in the Master Plan for the municipality. Fees for water supply and the management of wastewater are therefore determined by each municipality.

As a general rule, water supply is for the time being not a contentious issue in Sweden. Even in a number of analyses and scenarios for the future, drinking water supply is not seen as a limited commodity. On the other hand, quite a lot of focus has been put on pollution of drinking water. Therefore have five water agencies been established in 2004, which have the obligation to monitor and administer water quality measures.

A water-related problem which is more dominating the planning strategies in municipalities is the rise in sea level. A number of municipalities lie close to the coast, some even below sea level. This means that many municipalities introduced building requirements that oblige construction above a certain height above sea level. At the same time the necessity to strengthen or build protection from the rising sea level is implemented. On a general note, however, it can be said that the rise in sea level is not regarded as the biggest threat. This is not least due to the fact that, depending on the rate of sea level increase, rising land masses in Scandinavia compensate at least partly the increase in sea level.

A more relevant question regarding climate change in Sweden is the probably increase in precipitation, which will cause flooding and an increase in demand of water treatment facilities. A number of municipalities introduced therefore requirements and mechanisms to manage storm water directly on site through infiltration dams, channels or permeable surfaces.

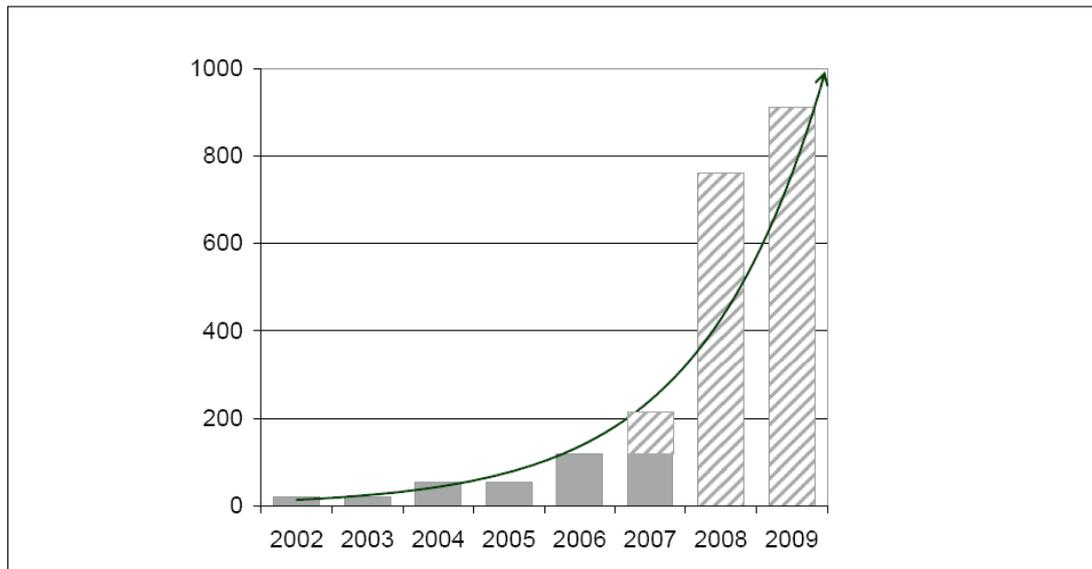
4. Legal requirements regarding construction material

One of Sweden's 16 environmental goals covers 'the well-built environment'. This includes also good indoor quality (i.e. air and construction material). One of the initiatives that were initiated was the BASTA concept, which builds on declaring the contents of different construction material and identifying those that are toxic or environmentally less favourable. The initiative was formed by a number of construction companies (NCC, Skanska, Peab, JM), the Swedish Environmental Research Institute and the umbrella organisation for construction companies in Sweden, Sveriges Bygginstitut. This initiative allows a voluntary approach to phase out environmentally damaging construction material. The BASTA list of materials is closely linked to the EU directive REACH (Registration, Evaluation Authorisation of Chemicals) which was introduced in Europe in 2007 and is introduced into Swedish legislation at the moment.

The BASTA scheme has been taken up in a wide range of projects and has proven to be both practical for the construction companies, the deliverers as well as it can be rather easily communicated to the end customer.

5. Situation of Sustainable Building in Sweden

A number of aspects of sustainable building and construction have been taken up in Sweden to a rather high extent. Low energy and passive housing is increasingly being built. Although numbers are still low compared to other European countries, the trend towards higher energy prices will most likely push for more passive housing. The following graph shows the development of apartments built according to the passive house standard.



Source: Forum för energieffektiva byggnader, 2007

As described above are construction projects with environmentally preferable construction material increasing as well. It was not possible to obtain numbers for how many projects are using the BASTA principle. This is also due to that it is not always possible and feasible to build entirely with BASTA listed materials and the list is only used partly. But again, the trend (and legislation) points towards the usage of less toxic and more environmental construction material.

One initiative that is pointing towards an increasing trend towards a more holistic planning and construction process is the 'Building and Living Dialogue', initiated by the Swedish National Board of Housing, Building and Planning. (www.byggabodialogen.se). This initiative is a cooperation between companies, municipalities and the government to facilitate a better and more sustainable planning and construction process by focussing of a number of key issues, such as indoor environment, energy use and resource management.

As part of the process, a number of construction companies and municipalities negotiate what environmental, social and economic targets can be achieved. This negotiation process leads inadvertently also to an informal learning process between the construction companies that share their experience and their different level of experiences with sustainable construction.

On a general level it can be said that the biggest growth in sustainable building is in the residential sector, here especially in apartment houses. In relation to the total construction mass, the sustainable construction is certainly rather low. The next big task is to find functional solutions for the refurbishment of buildings from the 60ies. Regarding single family owner-occupied housing, there are considerably more changes and refurbishment happening, especially on the energy supply side.

Public buildings are increasingly refurbished as well, again is the biggest focus on energy saving measures, i.e. lighting and ventilation. In addition, municipalities put more focus on a sustainable building than the private sector.

Office buildings are usually not very advanced. There are a number of very good examples and each year some new ones are being built, however in relation to total construction this is only a small fraction.

On a city level has the concept of sustainable city development been endorsed on a wide scale, in most municipalities for example has sustainability been included in the Master Plan of the city. In practice however, there are a number of municipalities that are very active in implementing and working on putting the principles into practice. There some examples for projects that try to implement a wide range of different sustainability aspects (energy consumption and supply, waste management, water management, social aspects, traffic), however these are still quite rare.

On the other hand, experiences from those projects are increasingly being used on a wider scale in the rest of the city as well as spread to other municipalities. This concerns though usually only some of the sustainability aspects of the pilot projects, i.e. the waste management.

There are a number of funding possibilities for research and investment in sustainable city development. One example is a fund provided by the Swedish government with the purpose to facilitate a sustainable urbanisation that contributes to a long-term development and a reduction of poverty. The state provides a proportion of the additional investment necessary for a more sustainable city district. Another example is the establishment of a research centre for sustainable city development at Chalmers University in Gothenburg. The objective of the centre is to coordinate research and find long term solutions for cities and city development.

PART B: REPORT FROM THE REGIONAL SUSTAINABLE BUILDING CONFERENCE, MALMÖ

1 General introduction

In September 2007 the city of Malmö, Sweden, arranged a regional conference within the Sustainable Building Initiative with the theme Sustainable City Development – Making Sustainability Attractive. The development of the programme, the evaluation of contributions, lectures and workshops and the actual organisation of the conference was monitored by a scientific committee staffed by researchers within Sustainable City Development from the Baltic and North Sea regions. This scientific committee also took the main responsibility for the content of this report.

The conference reflected the situation in the North Sea and Baltic regions and through this report we now want to make a contribution to global efforts for sustainable development in conjunction with the conference in Melbourne in September, 2008. The report summarises the most important issues within sustainable city development and sustainable building as we see them from the North Sea and Baltic regional perspectives. We begin with the issues we believe we can resolve within regional work and which are mainly of regional interest. We then highlight the most important of these issues that are of concern in the global arena and where the work is of global interest. Finally, we identify some issues that we regard as important for us in our region but that we cannot resolve on a regional basis and are dependent on global actions.

One development in our region is that the perspective has altered from the work primarily being focused on sustainable building to increasingly seeing the more complex issues where the individual buildings are grouped in their urban context. We took the theme Sustainable City Development for our regional conference as an expression of this development and shift in focus. The effect of individual buildings on the environmental situation is smaller by far than the combined effect that can be attributed to the building in its context and the city as a whole.

Our region consists mainly of countries that do not have major problems with megacities or with large and steeply increasing populations. The region lies on the boundary between a warm temperate and cold temperate, but damp climate and therefore issues concerning indoor heating are of great interest. We have a region with great access to forestry and timber. We return to the question of wood as a renewable and carbon dioxide-neutral building material later in the document. Furthermore, in the region, we have great differences between the countries that were part of the former Eastern Bloc, where industrial, social, economic, and sustainability conditions differ greatly from the other countries, which have experienced more stable industrial development and greater economic stability but which have also advanced further in their basic sustainability work. Those former Eastern Bloc countries are nowadays experiencing fast development looking into experiences and developing models of the western countries. This is supported by the cooperation work in many European projects that connect the actors in the region.

2 Issues from the region for the region

Many of the countries in the region have made great progress in their democratic development and have a decentralised control system where local influence and scope for action are great. State influence is gradually decreasing, to be replaced by local government. In the region, we regard the development of the local authorities as an essential condition for stable sustainability work. Understanding the domestic contribution to lack of sustainability is the basis for increasing engagement and concrete work for change. A range of examples show how people in our region are being influenced to change their lifestyle and alter their contribution to the greenhouse effect through local actions, a change that could have been achieved only with difficulty through national bans or general regulations. However, general and joint regulations and actions are important in resolving those problems that have their solution at that level.

Many of the countries in our region have a balanced distribution of power as regards planning, where societal interests are balanced against commercial. This creates the potential to develop new forms of planning, and indeed some of the world's most prominent examples of concerted sustainable urban development and town planning can be found here. At the same time, legislation, economic conditions, culture and relationships between societal interests and other interests are linked to local and regional traditions and development. Our cases provide good examples, but the ways to develop planning must be on a local basis in the respective country. The appendix, which shows the results of our competition for the region's best sustainability project, includes some of the prominent examples referred to here.

A claim from our conference is that the super-powers must cut their loads on the environmental situation and develop their countries in a different direction. At the same time, poor countries must be given the freedom to develop to the same sustainable level as countries in the West.

Decentralised government is seen as one essential factor to implement and move to a more efficient sustainable development, since the local authorities can better take account of local conditions and requirements.

3 Issues and experiences as the region's contribution to the global community

There are a range of issues from our region that we consider important to bring to global sustainability work. We regard the local conditions for change as a central starting point for all work towards sustainable development, but there are still a number of aspects on which our experiences and insights can contribute to the global effort.

Focus more on sustainable cities

Sustainable design of buildings is an important matter. However, in our region it is increasingly being complemented with aspects of sustainable design of cities. Buildings have the greatest implications on ecological sustainability, whereas changes in cities also affect social and economic sustainability. A number of aspects of ecological sustainability are not linked to individual buildings and their design, but to the city and its organisation and content.

The climate impact of our daily life in cities is not negligible; in fact it is one of the major contributors to the greenhouse effect by our daily demand for energy in buildings and in transports. The climate impact could be reduced if cities were built more densely than today and if buildings were designed to be more energy efficient. The dense cities could make it more attractive to use public transport and allow for new innovative concepts of mixing buildings for service and residential practice. On the other hand, accessibility to nature is an important aspect for human health and well being. The question is, however, how to design dense cities in a sustainable way – how dense could a city be, how could we integrate services, residential areas, and open spaces for recreation in a sustainable way, how do we guarantee social sustainability and how do we guarantee that public transport will be an attractive option? These are questions that need to be studied and further discussed in order to be able to design the sustainable city of the future. Moreover, we need to find concepts for energy efficient houses that fit into these dense cities. How do such houses look like and how do they integrate systems of renewable energy supply in a sufficient and efficient way? A benchmark study on best building practices in the region has shown that in recent years, passive house concept is being more used for new buildings. It assures significantly lower energy demand of buildings. The constructed buildings are closely monitored by researchers to ensure the sustainability and efficiency of the concept, looking for ways for its mainstreaming. In some studies, experiences from inhabitants are closely analysed. The initiative for constructing passive house and low energy buildings comes both from developers and the local communities. New buildings are those that get most attention regarding low energy solutions, but increasingly the topic is brought up when renovating existing buildings.

Sustainable transport systems

The possibility to decrease travel and to change to more sustainable methods of travel is a central question, as is the possibility to decrease transport of goods and other items in cities. However, leisure travel is a substantial contributing factor and here the range of recreational and leisure places offered by cities have an impact on the interest in, and the need for, travel. In many projects in our region we have focused on mobility management in order to support the transition of residents to more sustainable methods of travel and transport. A number of these projects have been very successful and have shown good potential to alter travel habits and coordinate transport. Furthermore, if pleasant living environments are designed to offer local recreational spaces, the need for travelling to distant nature areas decreases.

We need to give higher status to sustainable transport modes when planning the city - by giving priority to walking, cycling and public transportation and by making the related function and infrastructure more attractive than that for cars. We also need to increase public transportation options, by that decreasing the need for car use.

Working from the bottom up – demands strong local actors

Another lesson in shifting the perspective from the building to the city is that cities are unique and based on their own culture, history and development and that is it more difficult to see general trends in how their problems could be resolved compared with those of buildings. However, there is no general recipe for sustainable building, although there are many examples showing good performance as regards energy and resources. Every project needs to be planned according to the local conditions, not just by copying in full good examples from elsewhere.

The local situation must form the starting point for a first phase consisting of understanding the sustainability problems that exist and their local background in order to identify potential solutions. This means that it is difficult to drive sustainability work from the top down, from the national and the general down to the community, town and the specific. The work must therefore be driven with a high degree of local influence and with local involvement. This requires the local authorities to have the power, resources and interest to act. The local actors are normally considerably weaker in terms of expertise than the central actors and can find it difficult to themselves carry out analyses and syntheses of the complexity and creativity required. Methods must therefore be developed and resources provided to support the local actors in interpreting and understanding their local situation and clarifying how local actions should be organised and resources used to lead to sustainable development.

High density green areas instead of high-rise buildings

Dense cities are necessary for a high degree of resource utilisation. In Northern Europe we have been working with dense green cities as an alternative to high-rise buildings. This provides a better living environment and unifies several of the goals of sustainable development. Our dense green cities are an extension of the garden city tradition. In combination with the demands for sustainability, this can be categorised as Nordic Green Urbanism.

Renovation of post-war buildings a huge challenge

A large proportion of the housing stock in the West emerged during the 1950s-1970s. These houses will be in great need of maintenance in coming decades as they were not built to the same energy requirements as newer houses and are considerably less energy-efficient. Many of these areas also have great social and economic problems. Ecological conversion of these areas will be one of the great challenges for the immediate future and we need to develop good models whereby economic and social sustainability can be improved when ecological and energy-related renovations are

being carried out. A number of local initiatives have already started developing comprehensive strategies for redevelopment of those areas.

Wood a new renewable building material

Wood is one of the few renewable and carbon dioxide-neutral building materials. Timber-frame construction has a long tradition in the North Sea and Baltic regions but is primarily used for single-family houses. In recent years, technology for multi-storey timber buildings has been developed and there are now technically and commercially viable solutions that have been used in a number of projects. Production of timber as a raw material for building can be regarded as competing for available land with other crops, e.g. energy forest. In most countries in our region there are large areas that are suitable for production of timber for construction purposes, while in other regions the situation is different. International cooperation on development of timber building technology and international deliberations on the best use of arable land are interesting challenges.

Management issues central

A large proportion of the environmental and climate impact of a building is dependent on its operating time. At the same time, the existing building stock is an enormous capital resource which requires good forms of management in order to be developed in an appropriate way. Increased or altered use of existing buildings is also a way of decreasing resource-demanding new investment. Existing buildings are the capital that we can work with, they are the stock we need to manage.

For residential housing the energy consumption is determined primarily by the requirement for heating, but in many climate regions also for cooling. For offices and other commercial premises the air conditioning requirement is often the factor leading to the greatest energy impact. Management can affect the use of the premises and it is possible to influence staff requirements as regards comfort temperature, use of machines and other factors that are of great importance for the air conditioning requirement and energy use. Expertise and interest need to be developed within the management organisation in order to exploit the potential that exists for decreasing resource consumption in the home and in offices and other premises. One of the emerging options is individual metering and possibility to follow energy, water and waste consumption. On an individual basis this helps bring up the awareness of consumers and keep the consumption and costs down.

Summarising, it is therefore important to keep in mind a wider scope for sustainable construction, i.e. the focus on sustainable cities instead of buildings, since this includes aspects such as mobility, density of the city, green areas, and takes account of the existing building stock that we need to manage.

4 Issues for which the region requires global input

For some issues, we in the region need support and assistance from the rest of the world. Such issues may perhaps be of a regional character and interest in the first

instance, but cannot be resolved solely through efforts within the region and global action is required to support and create the possibilities to solve the problems.

Lack of definitions

There are a number of initiatives in the region to establish climate-neutral cities and energy-neutral cities. One problem in this context is that there is a lack of definitions that can be used to steer towards this goal. The concept climate-neutral has had great uptake and is very attractive and applicable. It is a simple concept on which it is easy to gather opinion. It can be used at various levels from the individual climate-neutral individual, through the family to the company, etc. and on to the city, the country and then the world. For individuals and families a number of projects have been carried out in which people try to cut their carbon dioxide debt but for cities there are no well-defined and accepted definitions that can be used. The concept climate-neutral can become very important as a driving force for many cities and it is important that we at a global level develop definitions and key parameters that make it possible to identify the most important measures and ways of measuring success so that comparisons can be made.

Transcend barriers

The will for change is greatest in areas other than the political and bureaucratic. Many are trying to implement a change in development. However the authorities and administrators we have appointed to improve our society and lead it towards good development are often a hindrance in the work towards a sustainable society. There are many political and bureaucratic barriers and these must be broken down in order to increase the scope for action and to alter the path of development. Implementing measures that make sustainable development attractive and obvious increases the potential to create interest for change in opposing groups.

Many of the threats to sustainable development lie in the free choice of consumers. It is a hot topic politically to call for restrictions. However, it is unlikely that the commercial forces will themselves call for restrictions, which are a threat to the free market.

The political and bureaucratic levels have the powers to introduce regulations, taxes and other absolute measures that have direct and powerful effects on sustainable development. One example is to ban non-sustainable energy solutions. At the same time there are strong pressures for good relations with the authorities that are pulling in the opposite direction. This conclusion has brought to the global community (for many years and probably by other regions as well), and demands joint action to open up the political debate and show the leadership possibilities. In Europe, a number of Directives and Resolutions are supporting low energy buildings, which puts a pressure on the politicians to introduce new regulations and laws. This top down approach in conjunction to the bottom-up approach mentioned earlier is a good way to foster faster change

Zero-carbon target for new homes

An example of political action where the political barriers have been broken down is the English decision that all newly built houses must be carbon dioxide-neutral by 2016. England thereby became the first on the global arena with such a demand. This gives the market time to adapt while also requiring political agreement to achieve the targets, and it will place demands on the bureaucratic organisation to ensure that the decision is implemented.

From past benchmarks to future targets

Building projects are long-term developments, and thus goals and targets need to be set accordingly, with the possibility to adjust them to new needs and demands that arise over time. The trend seems to be to changing from improving past benchmarks towards meeting future targets. The global community could lead this process by providing definitions, target analyses, solutions and tools. On the other hand the sustainability aspects of buildings need to be made *visible*, for example by presenting sustainability indicators for the building as kWh/m², CO₂/m², user/m², kg house/m², heat loss factor, daylight factor, sound insulation class. This has been done for example for buildings in the Bo01 area of Malmo, Sweden, and is of great significance for international interest and for the potential for comparisons on a national and international level.

Shared business for more sustainability

Office buildings are a growing part of the urban landscape. They are generally low occupancy and are empty most of the time, e.g. normally occupied for less than one-third of the hours in the week. They are also equipped with resource-consuming facilities that could equally well be shared. An important resource-saving issue would be to increase the shared use of buildings and office facilities. There are examples from businesses that locate their main offices in a shared building instead of building their own. Through that, they can share facilities and be more sustainable. This also can be regarded as an example of shared architecture.

Dependent media

The media are supposed to be objective or close to objective (which of course is not always the case). At our regional conference, some of the participants from countries other than Sweden talked about how their media are owned by large companies, which are not willing to admit the problems with climate change. As a result, the media do not want to write about it. It is not easy to communicate the issue in such cases. This lack of independent reporting, objective architecture analyses, etc. seems to be a global issue. This requires a joint global approach to independent architectural analyses, assessment of sustainable city approaches and more. The establishment of an independent leading magazine could perhaps be a goal for the sustainability frontrunners. Internet is becoming increasingly used as a resource for collecting,

presenting and storing information about new examples and case studies. Credibility is there if crucial importance in order to be able to guarantee the truthfulness of data.

Information about tools not available

There are a number of environmental assessment tools for buildings, for instance Ecoeffect from Sweden, Sustainable Homes from the UK and LEED from the USA. Also in some cases, the ecological criteria for steering the construction projects that have been developed for smaller areas are after initial success being developed to guide future city or regional development. However, all those tools and criteria have been developed for different reasons and basic conditions, which makes them hard to compare. Some are intended for analytical and research purposes, whereas others are market-orientated with the main focus on making it easier for businesses to achieve a higher degree of sustainability. The purposes at the tools were created for influences the construction and thus the results obtained from the tools. This calls for transparency in the tools to enable critical analysis and interpretation of the results. The creators and users of the tools are not always interested in transparency and it is sometimes difficult to get information about how the tools are constructed. This requires an open platform by an international organisation (UNEP, CIB, OECD/IEA, iiSBE) to obtain standard information and to discuss needs and other issues regarding tools.

Climate neutrality in tender for SB 10/SB 11

The SB07 conference in Malmo was climate-neutral, proving that this is a possible appropriate demand for coming conferences within SB. As a start, this should be a condition for the SB10/SB11 tender.

The region would thus benefit from a clearer definition of terms and indicators to be able to benchmark and set references for future development projects. In addition, a common marketing is necessary, spreading knowledge and experiences with sustainability projects and tools and mechanisms available to carry out these projects.