Manual and Guidelines for Sustainable Housing Projects

EGCN Training Tools – Recommendations & Guidelines

European Green Cities Network
www.europeangreencities.com

Green City Denmark
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Contents

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European Green Cities Network

EGCN is a thematic network funded by the EU with the aim of marketing applied technologies in sustainable housing projects and advancing new solutions within this field.

EGCN derives from the European Green Cities, Green Housing Block and the Green Solar Region projects. Demo projects can be seen on: www.europeangreencities.com

The partners are:

Austria: GSWB, Salzburg. SIR, Salzburg, Salzburg City.
Belgium: Provincie Antwerpen. VITO, Mol. Zonnige Kempen, Westerlo.
Chech Republic: Ventos, Rumburk, Decin City.
Denmark: Cenergia Energy Consultants. City of Copenhagen. Fællesbo (Housing Association). Green City Denmark A/S. Municipality of Herning. Municipality of Glostrup. Municipality of Roskilde. Rambøll. SBS Byfornyelse. Solar Vent.
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Poland: National Energy Conservation Agency, Piaseczno Municipality.
Spain: Ajuntament de Vilanova i la Geltrú. Institut Cerdá, Barcelona. Qualitat Promocions SCCL, Vilanova i la Geltrú.
UK: Merz Orchard, London. Portsmouth City Council.

Green City Denmark

Green City Denmark is Denmark's national and international showcase for energy and environmental solutions. Green City Denmark is organized as a limited liability company with more than 250 shareholders - companies, municipalities, counties, and institutions etc. from all over Denmark, along with an international network of public and private sector partners.

The main purpose is to market Danish expertise within the field of environmentally sound production and sustainable solutions.

Our environmental forum includes:

- Technical visits to interesting Danish best practice facilities, companies, central and local authorities, etc.
- Export missions to selected markets with the aim of promoting Danish technology and know-how.
- Training activities – transfer of know-how and technology.
- International project co-operation and financing.
- Contribution to environmental seminars, conferences, and workshops.
- Task forces.
- Joint ventures.

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Introduction

The purpose of this manual

Green City Denmark would like to offer our partners in EGCN a useful tool, suitable for environmental management in housing projects.

The object is clear. All over the world the environment is under intense pressure. One of the reasons being that the built environment, both during construction and when being maintained, consumes an enormous amount of resources causing significant effects on the environment.

During the project design phase, it is possible to act with greater or less wisdom in relation to the environment. The decisions made here are crucial to the results. However, to reach the best result it is necessary to work systematically and to develop a sound working knowledge of the requirements.

This manual is intended to serve as a basic tool in this process. The manual is equally relevant to clients, architects, engineers and authorities.

How to use this manual

The manual and guidelines provide a checklist for use when dealing with sustainable housing projects and related works.

First, you will find a couple of general sections on the issues, explaining the environmental impact from housing projects, and explaining the suggested method of environmental management in project design. Then you will find steps A, B and C for the design process. Finally you will find a section on labelling housing projects. An appendix provides relevant literature and web links.
The central parts of the manual – A, B and C - are formed as a set of questions and checklists divided into different sections about Site Conditions, Site Plan, and Buildings.

Each questionnaire has three columns: first a general question; second, alternative suggestions about what to do, if the general question is relevant. Lastly, there are some comments on the possible solutions or how to proceed etc.

During the process of planning and design of a project, one needs to consider the questions several times, as required by increasingly detailed solutions. You also have to give priority to certain issues at the expense of other issues. It is unlikely one can integrate all considerations simultaneously.

The manual is general. Because some of the themes and questions may not be relevant to your project, and other themes may be omitted, you should modify as required.

Environmental impacts of housing projects

Most countries have committed themselves to promote sustainable development (The UN Rio Charter) and to reduce their emissions of CO2 (The Kyoto Protocol). It is increasingly obvious, that protecting the environment is a global issue. At the regional and national levels this has resulted in more or less serious policies and action plans to reduce environmental impacts resulting from human activities.

More than half of our resource and energy consumption in the western world is due to construction, maintenance and demolition of our built environment. This might differ from region to region in the world, but the end result is that dramatic changes must take place to reduce the impact.

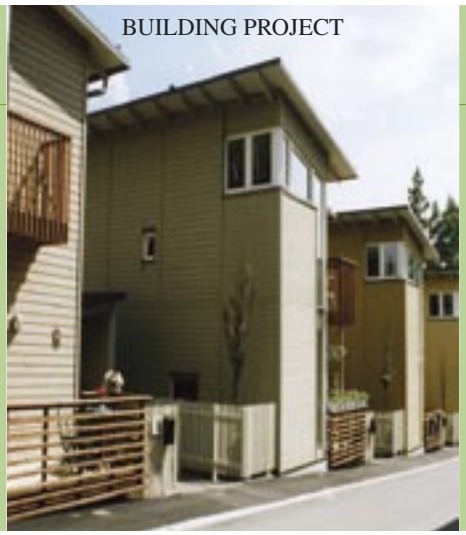
It is also important to note, that the major impact (typically 80-90%) originates from maintenance and operation of the buildings, mainly from energy consumption for heating, cooling, ventilation and electrical devices. This means that reductions in energy demand will have a huge effect, and renewable energy sources should be given a high priority.

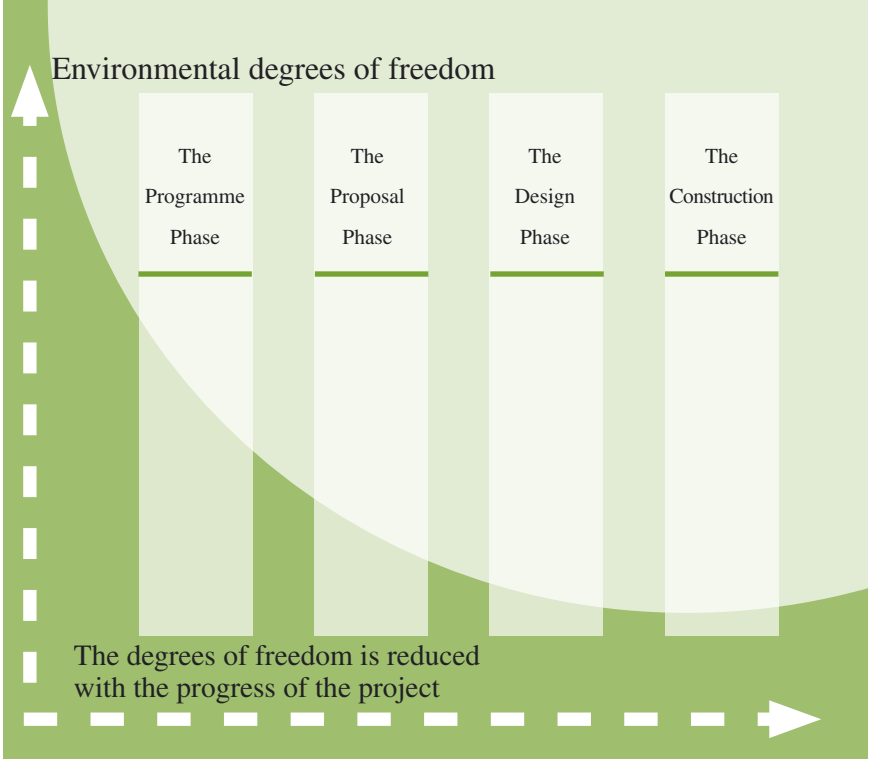
In addition, the consumption of raw materials, water, and the physical surroundings are important. The figure illustrates the inputs and outputs of a building project. A reduction in the inputs means a significant reduction to the outputs.

Many options are available to reduce the inputs and the outputs. In many cases regional knowledge about traditional planning and construction principles, and local building materials, may be key. This knowledge must be combined with modern environmental technology – including energy technology.

Finally, it is important to state that sustainable housing and environmental management in housing projects are wise investments. In the future housing market, buildings with low consumption of energy and water for example, will be more attractive to own and occupy and will be more durable.

Overview of environmental impacts of a building project:

INPUT (consumption)	BUILDING PROJECT	OUTPUT (external and internal factors)
Energy		Emissions to the atmosphere (CO2 etc.)
Raw material		Noise
Water		Vibrations
Physical surroundings		Change to the physical surroundings
		Solid waste
		Waste water
		Emissions to soil



Environmental management in project design

The easiest way to reduce environmental impacts in building and construction projects is to take the environmental issues into account early in the planning and design phase. Environmental management in project design introduces new aspects to both the building project and the basis for decision-making during the project. It is essential that the environmental issues be integrated into the work typically associated with defining the project and achieving the most appropriate solutions.

It is important to implement the environmental management from the early stages of the process, since the "freedom" to make decisions, of importance for the environment, decreases with the progress of the project.

The Life Cycle Assessment (LCA)

Proceeding systematically produces the best result. Conducting a life cycle assessment (LCA) ensures that all environmental impacts and effects are listed. Later it is possible to assess whether they are relevant. The intention here is to provide an overview in order to make better decisions.

In doing environmental management in project design, one is concerned with five phases of the life cycle:
1. Extraction and processing of raw materials
2. Production of building materials and components
3. Construction and modifications
4. Operation and maintenance
5. Demolition and disposal

From A to B to C

Step A: Which impacts are relevant?
Each of the five phases results in multiple environmental impacts. Listing the possible environmental impacts that are relevant in the specific project, across the five life cycle phases, produces an overall survey of the impacts.

Step B: Which ones are important?
The next step is to determine which are the most important impacts to deal with. It is impossible to deal with everything. Focus on 5-10 significant issues. Impacts caused by energy consumption will almost always be significant, but many other impacts may be relevant.

Step C: Which solutions?
The final step is to identify which of the preventative measures are relevant. By listing possible preventative and remedial measures, you get an overall survey of the possible solutions. This enables you to make the right decisions.

Preventative and remedial measures can vary greatly. One measure may be in relation to the form, for example, orientating the building so it is possible to use passive solar heat, or to provide shade so it is unnecessary to use cooling. The preventative measure may also be of a functional character, where the measure influences the use of the building. Finally, the measure may be technical in character, for instance, installation of solar cells or the selection of other materials.

When going through the lists (see next pages) some of the questions might seem very simple and basic. Nevertheless the experience shows, that these simple questions are important and often forgotten even in high profile projects.

Manual and guidelines

How to use the manual?

A. First go through the lists on possible environmental impacts. Which are the possible impacts from your project? Record your notes where it is relevant.

B. Then estimate the importance of the impact. The first question is whether or not the impact is relevant? Answer yes or no. If in doubt, then answer yes. If you answered yes, you must estimate whether the impact is small, medium or large. Now you are able to give priority to, for example, the 5-10 most important themes to be handled in step C.

At the beginning it will probably be a bit difficult to make this estimate. Try to take into consideration for example, the amount of building materials etc. Ask yourself whether the impacts are negligible, reversible or irreversible.

C. Finally, go through the list of possible solutions. The important ones are the 5-10 themes to which you've given priority. Add notes about your intentions in the project.

1. Site conditions

A. Possible environmental impacts		B. Importance					
Possible impacts	Notes	Y	N	S	M	L	Priority
1.1 Conflicts with existing buildings which are of value?							
1.2 Impact on valuable existing natural elements?							
1.3 Impact on valuable existing cultural elements?							
1.4 Good or bad road access?							

C. Possible solutions

	Possible solutions	Notes
	• Utilise existing buildings or parts of the buildings. • Use recycled building materials.	
	• Avoid disturbing valuable views, habitats, trees, paths, streams etc. • If disturbing then compensate.	
	• Avoid influencing or disturbing valuable cultural and/or historic ele ments.	
	• Priority to different types of traffic. • Traffic plan for the entire area.	

1. Site conditions

A. Possible environmental impacts		B. Importance					
Possible impacts	Notes	Y	N	S	M	L	Priority
1.5 Good or bad public transportation? (Traffic is the main source of pollution in our European urban environment).							
1.6 What is the local electrical energy supply and how does the new project cause problems or benefits in this regard?							
1.7 What is the local heating supply and how does the new project cause problems or benefits in this regard?							
1.8 What is the local fresh water supply, and how does the new project cause problems or benefits in this regard?							
1.9 What is the local sewage system, and how does the new project cause problems or benefits in this regard?							
1.10 How is the local rain water system, and does the new project cause problems or benefits in this regard?							
1.11 What is the local waste system, and how does the new project cause problems or benefits in this regard?							
1.12 Is there any polluted soil and/or ground water on site. How does the new project cause problems or benefits in this regard?							
1.13 What is the local air pollution, and does the new project cause problems or benefits in this regard?							

C. Possible solutions

	Possible solutions	Notes
	• Good conditions for bus transportation. • Good conditions for train transportation. • Good conditions for cyclists and pedestrians.	
	• From the public grid? • What kind of energy source? • Alternative energy sources? Wind energy, photovoltaic energy, combined heat/power based on natural gas.	
	• District heating? • Local system? • What kind of energy source? • Alternative energy sources? Wind energy, solar energy, geothermal energy, bio energy, waste energy from industries, combined heat/power based on natural gas etc.	
	• From the public supply? • Local system? • What quality?	
	• To the public system? • Separate sewage and rain water? • Maybe a local system? Local treatment could be based on reed beds, aqua culture, small bio systems.	
	• To the public system? • Separate sewage and rain water? • Is a local system possible? A local system could mean recycling rain water for toilet flush, laundry, cleaning. Local filtration should also be considered.	
	• Separate at source? • Recycling? • Which future fractions?	
	• No risks. • Soil excavation and treatment. • Isolate/seal polluted areas. • Immobilising additives required. • In situ bio-remediation. • In situ ventilation. • In situ extraction. Depends on results from investigation in the following steps: 1. Historic description 2. Field investigation and sampling 3. Survey of pollution 4. Risk assessment related to future land use 5. Cost benefit analysis	
	• Reduce at source. • Remove source.	

1. Site conditions

A. Possible environmental impacts		B. Importance					
Possible impacts	Notes	Y	N	S	M	L	Priority
1.14 What is the local noise pollution, and does the new project cause problems or benefits in this regard?							
1.15 What is the local climate, and does the new project cause problems or benefits in this regard?							
1.16 What is the local telecommunication, and does the new project cause problems or benefits in this regard? (A secure project depends on good telecommunications).							

2. Development plan

A. Possible enviromental impacts		B. Importance					
Possible impacts	Notes	Y	N	S	M	L	Priority
2.1 Can the energy consumption be reduced by a good orientation of buildings?							
2.2 Can the energy and resource consumption be reduced by a compact shape?							
2.3 Can the impacts on the neighbourhood be reduced by good adaptation to existing buildings?							
2.4 Can the development plan be improved through flexibility? (durability)							

C. Possible solutions

	Possible solutions	Notes
	• Reduce at source. • Remove source. • Noise attenuation. • Special construction.	
	• Wind conditions. • Solar exposure. • Temperature conditions. • Variations over the year.	
	• Telephone. • Radio/television. • Computer network.	

C. Possible solutions

	Possible solutions	Notes
	• Orientation +/-450 towards south for exploitation of the free energy from the sun. • Other special building shapes. • Reduce shadows from other buildings, trees and landscape.	
	• Compact shape to reduce area consumption, energy consumption and consumption of building materials for houses, technical infrastructure and traffic system. • Number of storeys. • Row houses. • Compact shape of every apartment.	
	• Architecture, proportions, building materials, shadows, valuable views etc.	
	• Flexibility increases the qualities: More possibilities, higher utility value. More stable population. Lower costs when changing things in the future. • Different types of apartments in the neighbourhood. • Apartments that can be remodelled. • Units to be added to the houses. • Flexible shape of every apartment.	

2. Development plan

A. Possible enviromental impacts		B. Importance					
Possible impacts	Notes	Y	N	S	M	L	Priority
2.5 Can the quality of the development plan be improved by integrating different urban functions? (Multi- rather than mono-functional).							
2.6 Can the social qualities of the development plan be improved through the project? (Or maybe reduced?).							
2.7 Does the development plan reduce or improve security and confidence? (For residents and users).							
2.8 Does the development plan reduce or increase wind speed and turbulence?							
2.9 Does the development plan reduce or increase the areas of sealed surfaces?							
2.10 Does the development plan protect or destroy existing valuable natural elements?							
2.11 Does the development plan protect or destroy existing valuable cultural and/or historical elements?							
2.12 Does the development plan improve or reduce the quality of outdoor areas?							
2.13 Is the development plan suitable for public transportation, pedestrians, the handicapped and cyclists?							
2.14 Are there any areas reserved for waste handling, composting systems, filtration of rainwater, renewable energy systems, and for the future.							

C. Possible solutions

	Possible solutions	Notes
	• Integration of urban function provides a more coherent life. Less transportation. • Living, working and recreation within the same area. • Functions can be changed responding to new demands.	
	• Different types of apartments in the neighbourhood. • Common facilities in the area. • Spaces for play, sitting, meeting etc. • More options, also when demands are changing. A more coherent life. Possible to have more generations living together. Improve quality of life conditions.	
	• Zoning/defining “ownership” of the areas. • Easy to overview. • Good lighting conditions. • Good relations between neighbours. • A more stable neighbourhood. Reduces the amount of vandalism etc. Positive social control.	
	• Create shelter through varied development plan and plenty of trees/plants. • Avoid wind tunnels and tall buildings. • Reduce energy consumption and increase outdoor comfort.	
	• Reduce areas of streets, parking areas etc. • Reduce consumption of building materials. Increase filtration of rainwater.	
	• Avoid - as much as possible - affecting them. • Recreate/replace. Many of these elements are irreplaceable and should be carefully protected.	
	• Avoid - as much as possible - affecting them.	
	• Provide areas to benefit people animals and plants. • Provide flexible multipurpose-areas. • Important to learn about and understand ecology/nature to achieve higher quality.	
	• Streets, bus stops, cycle paths, bicycle racks etc. suitable for these purposes. • Low priority to private cars inside the development area. • Reduce the demand for individual transportation. • Reduced dimensions of road construction. • Housing for all, including the handicapped and challenged.	
	• Each function has special demands. • Reservations for purposes not known today (e.g. new energy systems). Since it is extremely difficult to find areas for such environmentally oriented purposes later on, these must be planned for from the beginning.	

3. Planning the building etc.

A. possible enviromental impacts		B. Importance					
Possible impacts	Notes	Y	N	S	M	L	Priority
3.1 Is the building of a high or poor quality? (High quality helps the environment. Lasts longer).							
3.2 Are the possible impacts reduced through sustainable design?							
3.3 Are the possible impacts reduced through environmental control on building site?							
3.4 Are the possible impacts reduced through environmentally sound operation of building?							
3.5 Is it possible to carry through environmentally sound maintenance?							
3.6 Are the possible impacts reduced through user manuals for staff/professionals?							
3.7 Are the possible impacts reduced through education for staff?							
3.8 Are the possible impacts reduced through a user manual for the residents?							
3.9 Are the possible impacts reduced through instructions to the residents?							

	C. Possible solutions	
	Possible solutions	Notes
	• Provide good architecture with: • Functional, quality apartments. • Good craftsmanship.	
	• Use the methods of sustainable design. Methods are being developed right now in different ways. This manual is one of the methods. Other methods are far more complex (e.g. the Danish system for environmentally appropriate design, released 1998).	
	• The contractors must follow a manual for environmental control (Less pollution from the process. Less waste. Fewer mistakes etc.)	
	• Information technology (CTS-system, automatic controls). • Supervision / control. • User friendly installations etc.	
	• Surface treatment (poison free). • Easy maintenance and cleaning. • Maintenance free materials.	
	• Manual with special focus on the ecological questions. • To be produced by the consultants.	
	• Staff to become familiar with the different parts of the project and must accept conditions. • Education must be repeated from time to time.	
	• Residents have to become familiar with the different parts of the project and must accept conditions. The results of the project are highly dependent on the residents' behaviours.	
	• Manual provided to all the residents. The result of the project depends on the behaviour of the residents. • Special education offered to residents. • Especially interested residents can be assigned special duties.	

4. General design of the building

A. Possible enviromental impacts		B. Importance					
Possible impacts	Notes	Y	N	S	M	L	Priority
4.1 Are the possible impacts from constructions reduced? Are the benefits utilised?							
4.2 Are the possible impacts from external walls reduced? Are the benefits utilised?							
4.3 Are the possible impacts from roof construction reduced? Are the benefits utilised?							
4.4 Are the possible impacts from windows reduced? Are the benefits utilised?							
4.5 Good flexibility through room division?							
4.6 Any benefits from climate zone division?							
4.7 Any benefits from installations (electricity, pipes etc.)?							

C. Possible solutions

	Possible solutions	Notes
	• Heavy construction in south zones. • Light construction in north zones. • Storing of surplus heat. • Heat regulation.	
	• Resource consumption etc. (See 5. Building materials). • Climate adaptation. Wind, sun, rain etc. • Materials. Environmental impacts, solar energy storage, durability, maintenance, insulation ability. • Solar walls. Glazed wall with thermal mass or Trombe wall. • Glass extensions. Towards south, southeast or southwest. Passive solar heat. Good indoor climate. Well-being. • Balconies/balcony coverage. Better living environment, insulating element. Possible to integrate photovoltaic panels. • Front planting. Insulation element. Wall protection. Air purifying. Humidity. Habitat.	
	• Materials. Environmental impacts. Maintenance. • Water drainage. Collection for reuse in toilets, laundry, gardening watering. • Possibility of solar collectors and photovoltaic panels. 30-700 roof gradient. Roofs oriented towards the sun. • Exploitation of passive solar heat. Roof greenhouses. Glazing.	
	• Passive solar heat. Large south oriented windows. • Exploitation of daylight. Electricity savings. Better indoor climate. • Reduced heat loss. Low energy windows. Night shutters. Insulation curtains etc. • Sun shades. Built-in venetian blinds. Canopies.	
	• Flexible rooms. Demand fewer changes.	
	• Glass extensions. Protects against draft. Passive solar heat. • Living rooms face south. Sun through the windows. • Sleeping rooms and bathrooms face north. Coolness.	
	• Situation in building. In relation to resource consumption and heat loss. • Separation of waste water. • Access. Easy maintenance.	

5. Building materials

A. Possible envorimental impacts		B. Importance					
Possible impacts	Notes	Y	N	S	M	L	
5.1 Reduction of possible impacts through life cycle analysis? (The impacts differ a great deal, depending on the specific materials and the main constructions).							
5.2 Resource and raw material consumption? (Limited or unlimited amounts of resources. Amounts of resources consumed. Water consumption.).							
5.3 Energy consumption? (Impacts from energy consumption related to extraction and processing of raw materials, related to production of building materials and components, and related to transportation of materials).							
5.4 Environmental impact? Landscape, health, dust, noise, accidents etc. (Impacts from extraction and processing of raw materials, impacts from production of building materials and components).							
5.5 Materials suitable for reuse/recycling? (Consider both the products and the waste from the process).							
5.6 Life time (durable materials and constructions are of higher value for the environment).							

C. Possible solutions

	Possible solutions	Notes
	• Both the specific materials and the main constructions should be chosen on the basis of Life Cycle Analysis (LCA). The know-how in this field is still very underdeveloped. More international databases are being developed.	
	• Simple solutions, few products. • Raw materials (limited or unlimited amounts of resources?). • Water consumption. • High priority to local building materials. Wood, stone, clay etc. from the region should be given priority. Regional architecture/design should be given priority. Less energy consumption. Better regional economy.	
	• Extraction of raw materials. • Production of building materials. • Transportation.	
	• Labelling. Life cycle analysis. Declarations. • Recognised/approved materials. • Avoid degassing, health damaging substances. • Biodegradability. • Surface treatment. • Noise reducing ability.	
	• Repair possibilities. Replacement of single parts. • Reusability. Separation of single parts. Simple materials and constructions. • Recycled materials. • Avoid directing to landfill.	
	• Long term durability. • Maintenance. • Weathering, ageing, patination.	

6. Indoor climate

A. Possible enviromental impacts		B. Importance					
Possible impacts	Notes	Y	N	S	M	L	Priority
6.1 Risk of poor air quality due to insufficient ventilation?							
6.2 Risk of poor air quality due to impacts from materials?							
6.3 Risk of insufficient or poor lighting?							
6.4 Risk of insufficient or poor cooling/heating?							
6.5 Risk of noise from installations?							
6.6 Risk of lacking air tightness of the building?							
6.7 Risk of solar overheating?							

C. Possible solutions

	Possible solutions	Notes
	• Minimum air exchange rate of 30 m^3/h pr person • Permanent ventilation. Vent holes in external walls, roofs or windows. • Natural ventilation. Inlet from dry places and out through wet rooms. Tall/high rooms. • Mechanical ventilation. (Moisture controlled). Automatic on/off function. Air exchange rate is at least 0,4/h and it is possible to have 0,6/h extra air exchange rate by manual opening af windows. • Heat recovery. • Ease of maintenance.	
	• Dust / fibre dust. Avoid dusty materials and heavily textured surfaces. Avoid places, where dust can collect. • Odour. Poison free surface treatment. • Radiation. Degassing. Radon. Vapour.	
	• Exploitation and effective use of daylighting. • Effective and comfortable artificial room lighting and work lighting.	
	• Avoid draught / draught along the floor. • Avoid overheating. From windows and heating system. • Avoid damp air.	
	• Noise from installations kept below 25 dB.	
	• Air tightness is measured to be less than 0,1/h.	
	• Passive solar energy design including shading so that indoor temperature is not exceeding 26 °C.	

7. Energy consumption in buildings

A. Possible enviromental impacts		B. Importance					
Possible impacts	Notes	Y	N	S	M	L	Priority
7.1 Energy consumption during construction?							
7.2 Risk of poor daylight quality?							
7.3 Risk of high consumption of electricity?							
7.4 Energy consumption for ventilation?							
7.5 Energy consumption for air conditioning?							
7.6 Is photovoltaic energy an option?							
7.7 Is wind energy an option?							
7.8 Energy loss due to insufficient insulation?							
7.9 Energy loss due to low insulating windows and doors?							
7.10 Passive solar energy is essential.							

C. Possible solutions

	Possible solutions	Notes
	• Reduce transportation requirements. • Reduce excavation work. • Avoid winter preparations. • Monitor heating of work areas.	
	• •Improve the quality of daylight in apartments through: • Well-designed apartments, windows etc. increases comfort and decreases energy required for lightning. • Well-designed sun shading.	
	• Reduce consumption of electricity through: • Individual metering of electricity. • Display of consumption in every apartment, increases awareness. Decreases energy consumption. • Low energy washing machines, dishwashers, refrigerators, freezers, lamps. • Common laundry. • Common cold storage. • Clothes-yards. • Automatic controls (on-off sensors).	
	• Decrease consumption of electricity by: • Natural ventilation from “dry rooms”. • Mechanical ventilation from “wet rooms”, based on level of moisture. Reduces energy consuming mechanical ventilation.	
	• Other methods should be used to avoid the need for air conditioning. (Shading, building orientation, regional building traditions).	
	• For demonstration purpose. • Prepare for future installations. • PV solar panels should be architecturally integrated. Prices will decline dramatically in the future.	
	• For demonstration purpose. • Prepare for future installations. • The development moves towards large scale systems, remote from urban areas.	
	• Demands are dependent on regional climate conditions. • Extra insulation of existing building. • Insulation of water heaters, pipes etc. • Mineral wool or cellulose (recycled paper) or other insulation materials. • Avoid thermal bridges.	
	• Well insulated. • Airtight.	
	• Exploitation of the free energy from the sun by: • Orientation. • Good wind conditions (shelter). • Heavy, energy accumulating materials. • Energy zones in the house. • Adding glasshouses. • Incorporating solar walls.	

7. Energy consumption in buildings

A. Possible enviromental impacts		B. Importance					
Possible impacts	Notes	Y	N	S	M	L	Priority
7.11 Is renewable energy an option?							
7.12 Is district heating an option?							
7.13 Energy loss from distribution?							
7.14 Energy loss due to poor installation techniques?							
7.15 Risk of high consumption of energy for heating?							

C. Possible solutions

	Possible solutions	Notes
	• Solar heat (solar collectors, solar walls). • Geothermal energy. • Heat pump system for both heating and cooling. • Underground energy storage. • Wood stoves.	
	• Based on combined heat and power, natural gas, biogas, biomass?	
	• Prefer a water based distribution, because of: • High flexibility. • Low temperature. • Thermostats on radiators. • Thermostats on taps.	
	• Dimensioning of plant (according to demands). • Energy control (CTS-system). • Heat regulation (climate controlled, night time reduction). • Heat recovery (with low air change). • Low temperature operation of district heating system. • Thermostats (radiators, fittings). • Hot water circulation (time controlled).	
	• Individual metering. A meter installed for every apartment. • Display of consumption in every apartment. Increases consciousness. Decreases energy consumption.	

8. Water consumption in buildings

A. Possible enviroment impacts		B. Importance					
Possible impacts	Notes	Y	N	S	M	L	Priority
8.1 High consumption of water?							
8.2 Water consuming installations?							
8.3 Waste of rain water?							
8.4 Can grey water be recycled?							
8.5 Can sewage be cleaned on site?							
8.6 Is separation of waste water relevant?							

C. Possible solutions

	Possible solutions	Notes
	• Individual metering. • Display of consumption in every apartment. Increases consciousness. Decreases water consumption.	
	• Reduced water consumption and reduced flow to the sewer by: • Water saving toilets, showers, taps, washing machines, dish washers etc. • Other toilet systems (separating toilets, composting toilets). • Common laundry.	
	• Consider rain water collection in case of lack of ground water, poor quality or if reduced flow to the sewer is needed. • For toilet flush. • For common laundry. • For cleaning/car wash. • For irrigation.	
	• For toilet flush. • For common laundry. • For cleaning/car wash. • For irrigation. • Needs cleaning in local system, e.g. plant based, biological.	
	• For toilet flush, common laundry, cleaning, car wash, irrigation, filtration or sent to e.g. a stream. • Perspectives depend on the local conditions. (More systems available, e.g. reed beds, aquaculture, small bio-systems).	
	• Separation of grey water and black water. • Increases the possibilities of diminishing water consumption.	

9. Waste and waste removal

A. Possible enviromental impacts		B. Importance					
Possible impacts	Notes	Y	N	S	M	L	Priority
9.1 Production of waste from construction works?							
9.2 Production of waste from households?							
9.3 Production of organic waste from households?							
9.4 Workshops for repair and exchange of reusable goods?							

10. The outdoor areas

A. Possible enviromental impacts		B. Importance					
Possible impacts	Notes	Y	N	S	M	L	Priority
10.1 Poor performance due to inadequate design?							
10.2 Insufficient quality of surfaces and materials?							

C. Possible solutions

	Possible solutions	Notes
	• Reduce material waste. • Return packaging materials to the producer. • Reuse of buildings. • Selective demolition (for reuse of materials). • Local reuse (avoid transportation).	
	• Provide sufficient space in and near each apartment for separating at source. • Primarily in kitchen and immediate outdoors. • Locally placed environmental station. • Comfortable and well designed sites for waste containers etc.	
	• Individual composting. • Common in the neighbourhood. • Centralised (public system). • From households and/or green areas? For biogas, soil improvement or fertiliser.	
	• Common facilities. • Social aspects too.	

C. Possible solutions

	Possible solutions	Notes
	• Local areas with distinctive features and qualities. • Shelter, sun and shaded areas. • Kitchen gardens / green houses. • Waste separation and composting sites. • Abatement through the use of fences, berms or walls.	
	• Water permeable materials. (Rainwater percolation to ground water). • High durability. • Low maintenance. • Recycled building materials.	

10. The outdoor areas

A. Possible enviromental impacts		B. Importance					
Possible impacts	Notes	Y	N	S	M	L	Priority
10.3 Inappropriate vegetation?							
10.4 Poor conditions for flora and fauna?							
10.5 No use of rainwater / surface water?							
10.6 Energy consumption by outdoor lighting?							
10.7 Impact from operation / maintenance?							

C. Possible solutions

	Possible solutions	Notes
	• Primarily domestic species.	
	• Create new habitats: High diversity. Open water important for birds etc. Interconnected green areas. Suitable for residents, animals and plants. Important to support local biodiversity. Birds, butterflies etc.	
	• Can be used actively by: Collection. Rainwater containers, basins etc. Purification and reuse. Garden watering, etc.	
	• Low-energy fittings. • Twilight relay and sensors.	
	• Natural / ecological operation and maintenance. • No pesticides, low energy consumption, etc.	

Labelling housing projects

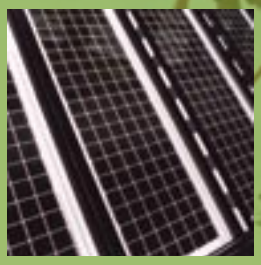
The new Energy Performance Directive (EPD) from the EC is now being implemented across Europe. This may be followed by a directive on the environmental performance of buildings.

These and similar initiatives reinforce the need for labelling the environmental performance of a housing project. It is extremely relevant to prepare such a document for every project, both because of the increasing environmental focus, and to better position the project in the competing housing market.

Many authorities and institutions in Europe have introduced different systems for labelling. However, it is difficult to carry out the labelling because of complexity and the lack of data. There is a need for a simple system for labelling environmental performance.

The three Danish partners SBS Byfornyelse (urban renewal company), Cenergia Energy Consultants and Dansk Center for Byøkologi (The Danish Centre for Urban Ecology) have proposed a simple system for labelling, based on 11 indicators. This system might serve as an inspiration for the partners in EGCN:

1. Annual energy consumption for heating (kWh/m2) and the related CO2-emissions.
2. Annual energy consumption for hot water (kWh/m2) and the related CO2-emissions.
3. Annual energy consumption for cooling (kWh/m2) and the related CO2-emissions.
4. Annual energy consumption for ventilation (kWh/m2) and the related CO2-emissions.
5. Annual energy consumption for lighting (kWh/m2) and the related CO2-emissions.
6. Annual water consumption (m3/m2).
7. Indoor climate: Daylight, acoustics, temperature max/min, humidity.
8. Impacts from building materials: A simple profile for specific materials and constructions.
9. Used materials, and those which are not recommended.
10. Volume of area per person or per work place.
11. Bio factor (calculated content of natural elements in the project).



Literature and links

Literature

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Links

www.greencity.dk Website of Green City Denmark A/S.

www.europeangreencities.com Website of European Green Cities Network.

www.abcplanner.dk A netbased tool for Environmental Management in Project Design. In Danish, but includes an English demo tour.

Green City Denmark would like to offer our partners in EGCN a useful tool, suitable for environmental management in housing projects.

The object is clear. All over the world the environment is under intense pressure. One of the reasons being that the built environment, both during construction and when being maintained, consumes an enormous amount of resources causing significant effects on the environment.

During the project design phase, it is possible to act with greater or less wisdom in relation to the environment. The decisions made here are crucial to the results. However, to reach the best result it is necessary to work systematically and to develop a sound working knowledge of the requirements.

This manual is intended to serve as a basic tool in this process. The manual is equally relevant to clients, architects, engineers and authorities.

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