European Charter for Solar Energy in Architecture and Urban Planning

Preamble

Roughly half of the energy consumed in Europe is used to run buildings. A further 25 % is accounted for by traffic. Large quantities of non-renewable fossil fuel are used to generate this energy, fuel that will not be available to future generations. The processes involved in the conversion of fuel into energy also have a lasting negative effect on the environment through the emissions they cause. In addition to this, unscrupulous, intensive cultivation, a destructive exploitation of raw materials, and a worldwide reduction in the areas of land devoted to agriculture are leading to a progressive diminution of natural habitats.
This situation calls for a rapid and fundamental reorientation in our thinking, particularly on the part of planners and institutions involved in the process of construction. The form of our future built environment must be based on a responsible approach to nature and the use of the inexhaustible energy potential of the sun.
The role of architecture as a responsible profession is of far-reaching significance in this respect. In future, architects must exert a far more decisive influence on the conception and layout of urban structures and buildings on the use of materials and construction components, and thus on the use of energy, than they have in the past.
The aim of our work in the future must, therefore, be to design buildings and urban spaces in such a way that natural resources will be conserved and renewable forms of energy - especially solar energy - will be used as extensively as possible, thus avoiding many these undesirable developments. In order to attain these goals, it will be necessary to modify existing courses of instruction and training, as well as energy supply systems, funding and distribution models, standards, statutory regulations and laws in accordance with the new objectives.

Planners

Architects and engineers must design their projects with a knowledge of local conditions, existing resources, and the main criteria governing the use of renewable forms of energy and materials. In view of the responsibility they are thus required to assume, their role in society must be

strengthened in relation to that of non-independent planning companies and commercial undertakings. New design concepts must be developed that will increase awareness of the sun as a source of light and heat; for an acceptance of solar technology in construction by the general public can only be achieved by means of convincing visual ideas and examples.

This means:
- cities, buildings and their various elements must be interpreted as a complex system of material and energy flows;
- the use of environmentally friendly forms of energy must be planned from a holistic point of view. A professional knowledge of all functional, technical and design relationships, conditions and possibilities is a precondition for the creation of modernarchitecture;
- the extensive and constantly expanding body of knowledge about the conditions governing the internal climate of buildings, the development of solar technology, and the scope for simulation, calculation and measurement must be systematically represented and made available in a clear, comprehensible and extendible form;
- the training and further education of architects and engineers must be related to future needs and should take place within mutually related systems on various levels, using the facilities afforded by the new media. Schools, universities, and professional associations are called upon to develop relevant options.

Building sites

The specific local situation, the existing vegetation and building fabric, climatic and topographical factors, and the range and availability of ecologically sustainable forms of energy seen in relation to the duration and intensity of their use, as well as local constraints, all have to be analysed and evaluated as the basis for each individual planning project.

The natural resources available in a given location, especially sun, wind and geothermal heat, should be harnessed for the climatic conditioning of buildings and should be reflected in the design of their layout and form. Depending on the geographical situation, the physical form, the material composition and the use to which a structure is put, the various existing or emerging patterns

of building development will enter into a reciprocal relationship with the following local factors:

- climatic data (elevation of the sun, seasonal and regional range of sunlight, air temperatures, wind force and direction, periods when winds occur, quantities of precipitation, etc.);
- the degree of exposure and aspect of open spaces and the surface of the ground (angle of slope, form, contour, proportion, scale, etc.);
- the location, geometry, dimensions and volume of surrounding buildings, topographical formations, areas of water and vegetation (changing patterns of shade, reflection, volume, emissions, etc.);
- the suitability of existing earth masses as thermal storage bodies;
- human and mechanical patterns of movement; existing building conventions and the architectural heritage.

The Materials and Forms of Construction

Buildings and urban open spaces should be designed in such a way that a minimum of energy is needed to light and service them in terms of harnessing heat for hot water, heating, cooling, ventilation and the generation of electricity from light. To cover all remaining needs, solutions should be chosen that meet the criteria of an overall energy balance and that comply with the latest technical knowledge on the use of environmentally compatible forms of energy.

The use of materials, forms of construction, production technology, transport, assembly and dismantling of building components must, therefore, take account of the energy content and the life cycle of materials.
- Regenerable raw materials that are available in adequate quantities and forms of construction that have a minimal primary energy / "grey" energy content should be given preference.
-The recycling of materials should be guaranteed, with scope for eventual reuse or for ecologically sustainable disposal.
- Load-bearing structures and the skins of buildings must be of great durability so as to ensure an efficient use of materials, labour and energy, and to minimize the cost of disposal. An optimal relationship between production or

embedded energy, (also known as embodied energy), and longevity should be achieved.
- Building elements that serve the passive or active harnessing of solar energy and that can be easily accommodated to constructional, design, modular and dimensional requirements should be subject to further development and given priority in use.
- New systems and products in the field of energy and construction technology should be capable of simple integration into a building and should be easy to replace or renew.

Buildings in use

In terms of their energy balance, buildings should be regarded as self-contained systems with an optimal exploitation of environmentally sustainable forms of energy to meet various needs. They should be developed as permanent systems that will be capable of accommodating different uses over a long period.

- Functions should be laid out in plan and section in such a way that account is taken of changes of temperature and thermal zones.
- The planning and execution of buildings and the choice of materials should be based on a flexible concept, so that later changes of use can be accommodated with a minimum expenditure of materials and energy.
- The permeability of the skin of a building towards light, heat and air, and its transparency must be controllable and capable of modification, so that it can react to changing local climatic conditions (solar screening, protection against glare, light deflection, shading, temporary thermal protection, adjustable natural ventilation).
- It should be possible to meet comfort requirements largely through the design of the building by incorporating passive measures with a direct effect. The remaining energy needs in terms of heating, cooling, electricity, ventilation and lighting should be met by active systems powered by ecologically sustainable forms of energy.

The technical and energy resources used in a building should be appropriate to its function. Graphs showing the requirements for different user categories should be reconsidered and, where appropriate, modified. Buildings with special uses, such as museums, libraries, hospitals,

etc., should be considered separately, since specific climatic constraints exist for these types.

The City

Renewable forms of energy present an opportunity to make life in cities more attractive. In the realms of energy supply and transport infrastructures, the use of these kinds of energy should be maximized through the actual form of the building. The existing building fabric should be used as far as is practical and possible. The combustion of fossil fuels must be drastically reduced.
The relationship between cities and nature should be developed to achieve a symbiosis between the two. Alterations and other measures carried out in public spaces or existing buildings, or caused by new construction, must take account of the historical and cultural identity of a location and the geographic and climatic conditions of the landscape.

The city must be comprehended in its entirety as a self-contained long-living organism. It must be possible to control the constant changes in its use and appearance, as well as in technology, in order to ensure a minimum of disturbance and a maximum conservation of resources. Cities are resources in built form and have a high primary energycontent. To achieve a closer integration with the overall balance of nature, their various neighbourhoods, buildings and open spaces, their infrastructures, and their functional, transport and communication systems must be subject to a constant process of modification and reconstruction that follows natural cycles of renewal.

The form of the urban and landscape structures that man creates must be governed by the following environmental and bioclimatic factors:
- orientation of streets and building structures to the sun;
- temperature control and use of daylight in the public realm;
- topography (land form, overall exposure, general situation);
- direction and intensity of wind (alignment of streets, sheltered public spaces, systematic ventilation, cold-air corridors);

- vegetation and distribution of planted areas (oxygen supply, dust consolidation, temperature balance, shading, windbreaks);
- hydro-geology (relationship to water and waterway systems).

Urban functions such as habitation, production, services, cultural and leisure activities should be co-ordinated with each other where this is functionally possible and socially compatible. In this way the volume of vehicular traffic can be reduced. Production and service facilities can complement each other and be used more intensively and efficiently.
Pedestrians, and vehicles that are not propelled by the combustion of fossil fuels must be given privileged treatment in urban areas. Public transport should enjoy special support. Parking needs should be reduced and the consumption of petrol and other fuel minimized.
An economic use of land, achieved through a reasonable density in new planning schemes coupled with a programme of infill developments, can help to cut expenditure for infrastructure and transport and reduce the exploitation of further areas of land. Measures to restore an ecological balance should also be implemented.
In the public spaces of towns and cities, steps should be taken to improve the urban climate, temperature control, wind protection and the specific heating or cooling of these spaces.

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