



Sustainable building

Preamble

The concept of **sustainable development** can be traced to the fossil energy crisis and the environment pollution concern in the 1970s. The term was used by the Brundtland Commission, (formally **World Commission on Environment and Development (WCED)**, convened by the United Nations in 1983) which coined what has become the most often-quoted definition of sustainable development as development that "**meets the needs of the present without compromising the ability of future generations to meet their own needs**"¹.

In 1992 the Earth Summit held in Rio de Janeiro faced different topics, highlighting the fact that it is necessary to reduce the human impact in order to limit the loss of resources and the climate change, accelerated in the last century by the massive release of greenhouse gases.

In residential buildings, the energy consumption rises up to 30% of the total requirement, the same percentage for the transport sector. Most part of energy consumption in houses is represented by air conditioning and heating. The latter covers more than 70% of the consumption, when it is produced by the combustion of methane or gas oil. CO₂ emissions from combustion of fossil fuels are the main cause of global warming, which is already showing, in particular in the Alps, its effects with the dramatic melting of glaciers.

Another aspect which has to be considered is the choice of the building materials. **Some materials, in fact, require high quantities of energy for their production** (steel structures, for example) **or have to be transported from long distances** (e.g. wood from Siberia or oversea), affecting on pollution and global warming.²

Sustainable building (also known as **green construction or building**) refers to a structure and using process that **is environmentally responsible and resource-efficient throughout a building's life-cycle**: from siting to design, construction, operation, maintenance, renovation, and demolition. This practice expands and complements the classical building design concerns of economy, utility, durability, and comfort.

Although new technologies are constantly being developed to complement current practices in creating greener structures, the common objective is that green buildings are designed to reduce the overall impact of the built environment on human health and the natural environment by:

- Efficiently using energy, water, and other resources
- Protecting occupant health and improving employee productivity
- Reducing waste, pollution and environmental degradation³

For a lot of people saving energy is associated to sacrifices and loss of comfort. **Energy-efficient buildings** discredit this belief: in green buildings energy conservation goes with a gain in terms of both quality of life and cash. This kind of constructions, indeed, **require 80-90% of energy for heating less than "conventional" houses** and offer to inhabitants pleasant and constant temperatures - both in summer and in winter - in rooms flooded of light⁴.

Even in the renovation of existing buildings it is possible to carry out many aspects of energy-efficient building. And so also in the so-called "old buildings" it is possible to appreciably reduce energy consumption, increasing, among other things, the comfort of the house⁴.

¹ United Nation World Commission on Environment and Development (1987). *Our Common Future*. Oxford University Press. Oxford - New York. 400 pp.

² CIPRA International (2010). *Active climate protection*. URL: <http://www.cipra.org/fr/climalp/construction-renovation/protection-du-climat>

³ United States Environmental Protection Agency. *Green building*. URL: <http://www.epa.gov/greenbuilding/pubs/about.htm>

⁴ CIPRA International (2008). *Efficient houses*. URL: <http://www.cipra.org/fr/climalp/construction-renovation/maisons-efficientes>

Therefore, **energy-efficient technologies for building and renovation can provide a great contribution to the achievement of climate policy objectives of the Kyoto Protocol**⁵.

In conclusion, nature protection needs tangible examples and should be promoted with targeted measures. This means that **policy should not only have an exemplary role**, by building and renovating (public) buildings in an energy-efficient way, **but also has to create incentives for building plans and renewal of housing and business buildings at the same time**. Some alpine countries already support building and renovation with high energy-effectiveness technologies through direct contributions and subsidized credit⁵.

⁵ CIPRA International (2010). *Promotion of efficient building in the energy plan*. URL: <http://www.cipra.org/fr/climalp/construction-renovation/mesures-d2019aides>

Background on building regulations

International level

United Nations Framework Convention on Climate Change (UN FCCC)

This Framework convention has been adopted in 1992 during the Earth Summit in Rio de Janeiro. The objective of this agreement is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The treaty itself does not set mandatory limits on greenhouse gas emissions for each country and contains no enforcement mechanisms, but provides updates (called "protocols") that would set mandatory emission limits. The principal update is the Kyoto Protocol.

Subscribed by: Austria, France, Germany, Italy, Principality of Liechtenstein, Principality of Monaco, Slovenia, Switzerland

Kyoto Protocol

In 1997 the United Nations Framework Convention on Climate Change agreed for the Kyoto Protocol, in order to stop the global warming. By signing this agreement, the industrialised countries commit themselves to a reduction of four greenhouse gases (carbon dioxide, methane, nitrous oxide, sulphur hexafluoride) and two groups of gases (hydrofluorocarbons and perfluorocarbons) produced by them by 5.2% from the 1990 level in the period 2008-2012.

Subscribed by: Austria, France, Germany, Italy, Principality of Liechtenstein, Principality of Monaco, Slovenia, Switzerland

Agenda 21⁶

Agenda 21 is an action plan of the United Nations (UN) related to sustainable development and was an outcome of the Earth Summit in Rio de Janeiro (1992). This action plan for the XXI century permits to conceive a sustainable development process in a given territory, from the national to the local government level.

In particular, the chapter 9 "Protection of the Atmosphere" (Section II: Conservation & Management of Resources for Development) provides to reduce adverse effects on the atmosphere from the energy sector by promoting policies or programmes, as appropriate, to increase the contribution of environmentally sound and cost-effective energy systems, particularly new and renewable ones, through less polluting and more efficient energy production, transmission, distribution and use.

Subscribed by: Austria, France, Germany, Italy, Principality of Liechtenstein, Principality of Monaco, Slovenia, Switzerland

Alpine Convention

Signed in 1995, the Alpine Convention is an international territorial treaty for long-term protection of the natural ecosystem of the Alps and sustainable development in the area. The Energy protocol provides for the concerned countries concrete steps for saving energy and to enact measures for better thermal isolation of buildings. They should also encourage new energy-efficient buildings and use environment-friendly heating systems.

Subscribed by: Austria, France, Germany, Italy, Principality of Liechtenstein, Principality of Monaco, Slovenia, Switzerland

⁶ Source: United Nations (2011). *Core Publications: Agenda 21*. URL: <http://www.un.org/esa/dsd/agenda21/>

Background on building regulations

*European Community level*⁷

Directive 2002/91/EC "Energy performance of buildings"

The four key points of the Directive are:

- a common methodology for calculating the integrated energy performance of buildings;
- minimum standards on the energy performance of new and existing buildings that are subject to major renovation;
- systems for the energy certification of new and existing buildings and, for public buildings, prominent display of this certification and other relevant information. Certificates must be less than five years old;
- regular inspection of boilers and central air-conditioning systems in buildings and in addition an assessment of heating installations in which the boilers are more than 15 years old.

According to the Directive, each Member State has to determine the minimum requirements for the overall efficiency of new and old buildings. These requirements have to be adjusted to the state of technology. For new buildings, with a surface superior of 1,000 m², they have to check in advance whether it is possible to use renewable energy. For each building an energy performance certificate should be drawn up. This certification has to be presented when a building is offered for sale or for rent and must be updated every 10 years. The energy certification is mandatory for already existing buildings too.

Acknowledged by: Austria, France, Germany, Italy, Principality of Liechtenstein, Slovenia

Directive 2010/31/EC "Energy performance of buildings"

This directive is an update of dir. 2002/91/EC. It introduces new elements:

- Parameters which have be considered in the methodology for calculating the energy performance of buildings;
- Encourage the increase of nearly zero-energy consumption buildings by implementation of national plans;
- Creation of a list of the existing and potential instruments used to promote improvements in the energy performance of buildings in each Member State.

New buildings shall comply with the minimum requirements and should to have been submitted to a feasibility study before construction start, looking at the installation of renewable energy supply systems, heat pumps, district or block heating or cooling systems and cogeneration systems, while existing buildings should have their energy performance upgraded so that they also satisfy the minimum requirements.

By 31 December 2020, all new buildings should be nearly zero-energy consumption buildings. New buildings occupied and owned by public authorities have to comply with the same criteria by 31 December 2018.

To be transposed, from 18 June 2010 until 31 December 2015 (for the art. 12)

Directive 2006/32/EC "Energy end-use efficiency and energy services"

The purpose of the Directive is to make the end use of energy more economic and efficient by:

- establishing indicative targets, incentives and the institutional, financial and legal frameworks needed in order to eliminate market barriers and imperfections which prevent efficient end use of energy;
- creating the conditions for the development and promotion of a market for energy services and for the delivery of energy-saving programmes and other measures with the aim to improve end-use energy efficiency.

Member States must adopt and achieve an indicative energy saving target of 9% by 2016 in the framework of a national energy efficiency action plan (NEEAP). They must also appoint one or more new or existing independent

⁷ Source: European Union (1995-2011). *Summaries of EU Legislation*. URL: http://europa.eu/legislation_summaries/index_en.htm

public sector authorities or agencies to ensure overall monitoring of the process set up to achieve these targets.

Acknowledged by: Austria, France, Germany, Italy, Slovenia

Building regulations

Austria⁸

In Austria there has never been a National building law; each of its nine *Länder* (states) has a different system, consisting of a building law (covering the procedures and functional requirements for building works) and related 'ordinances' (covering the technical requirements). In the future (for most of the *Länder* starting in 2008 or 2009) the requirements will be purely functional and harmonized at the level of provincial laws. Detailed requirements will be set in so called 'OIB-guidelines', issued by the *Österreichische Institut für Bautechnik* (Austrian Institute of Construction Engineering, OIB).

In drafting the OIB-guidelines, the principles of performance based building regulations have been taken into account as far as possible. Nevertheless, the first generation of these guidelines will include a mix of performance based and prescriptive requirements, in order to insure a kind of continuity in the practical application of building regulations in the Austrian provinces. Regulations on energy performance and waste reduction also apply for existing buildings.

The governmental regulations only relate to energy saving. The theme of sustainable construction is left to initiatives, and sometimes the regulations are counterproductive or even contradictory to the different themes of sustainable construction.

France⁸

The construction regulatory system has been mainly established by the government and is - in part - gathered in the Housing and Building Code. The Housing and Building code defines the requirements in the field of safety, accessibility, acoustics and thermic insulation, and leaves the other performances to technical standards of a contractual nature.

There is also the local town-planning which sets rules on sustainability. Building executive plans are checked on functional and technical quality and compliance, but not on economic quality and social quality.

Since 2006 the plan "Régulation thermique (RT 2005)" has been adopted. It aims to reduce energy consumption in buildings by 15% compared to the level of the RT 2000 to be reduced. The RT 2005 is accompanied by comprehensive programs to promote technologies for the use of renewable energies and promote energy-efficient heating systems. However there is no specific national policy to encourage the use of Renewable Energy Sources (RES) in the urban planning process. In response to this lack of national policy, some local authorities have implanted local policies.

Germany⁸

The system of building regulations and building control in Germany is mainly determined by the federal structure of the country and the reliance on a strict system of product approval. The building regulations differ from *Land* to *Land*, and are laid down in the *Landesbauordnungen* (Building Code of the *Länder*). The *Musterbauordnung* (Model Building Code) at Federal level offers a prototype for the individual *Landesbauordnungen*.

A lot of sustainable regulation issues are regulated in Germany, at different governmental levels (national/state/local). Many of the regulations that apply to new buildings also apply to existing buildings, but in most cases with a lower level of requirements.

Italy⁸

The D.P.C.M. of 16th July 2009, the National Plan of Housing, distributed 200 million € to the regions in order to start intervention targeted to

⁸ Source: Vermande, H. M. and van der Heijden, J. (2011). *The Lead Market Initiative and Sustainable Constructions: Lot 1, Screening of National Building Regulations*. European Commission, Delft, Netherlands. PDF document, v + 105 pp.

increase the house offer. The interventions are mainly the construction of new buildings and the recovery of existing buildings respecting the criteria of energy efficiency and reduction of polluting emissions. Anyway, in principle there is no national system, regulation are in the competence of the 20 Regions (for laws go to http://www.itaca.org/speciale_sostenibile.asp).

Principality of Liechtenstein

The Liechtenstein-energy policy is mainly referable to energy savings and increased use of renewable energies.

The Energy law of the 21st August 2007 lays down the minimum of requirements for saving energy during the construction and management of the buildings, the technical requirements of building's energy efficiency and the evaluation of their energy potential. Conditioning plants have to respond to an economic and functional use of energy and it is introduced the energy certification. It is also enhanced the use of renewable energies.

The law on the promotion of energy efficiency and renewable energies (24th April 2008) regulates the organisation of contributions for measures which increase the energy efficiency and the use of renewable energies. In particular the State is commissioned to promote the thermal insulation of already existing buildings, the realisation of *Minergie* buildings, the use of high environmental and energetic efficiency systems of heating, solar water heating and the production of energy from renewable sources.

Principality of Monaco⁹

The Principality implemented an Energy Climate Plan to develop an energy policy aimed to lead to the realization, or even exceeding, of its objectives. For the buildings a reduction by 20% of energy consumption unit from the levels of 2007 is expected for 2020.

The Plan consists in three axes:

- Management of the demand for energy: improvement of energy efficiency and reduction of energy consumption;
- Control of the local energy production: energy from municipal waste, development of renewable energy;
- Reduction of the emissions greenhouse gases: direct emissions and indirect (electricity, transportation).

For each axis, technical, regulatory, financial and making aware actions are carried out in the sectors of: land use, real estate of the state (new and old buildings), private buildings (new and old) and energy supply.

Since 2001 the Principality is partner of the programme *SwissEnergy*, in particular, it is member of the *Energy Cities* Association.

Since 2007, to all new public constructions the approach "Environmental Quality" is applied.

Slovenia¹⁰

In Slovenia most topics related to ecological quality are regulated. Topics which were not regulated include water conservation, water efficiency techniques, waste minimizing and the use of renewable materials. The use of recyclable materials will be regulated in future.

Most regulation is on a national/federal level. Local requirements are set for a few topics such as waste separation/recycling, the support of local economic diversity, access to green space and design optimization.

The criteria for ecological constructions are given by three different laws: law of environmental protection (for boilers), building law (requirements of energy) and energy law.

⁹ Source: Direction de l'environnement (2009). *L'Environnement en Principauté de Monaco : Recueil de données 2009*. Principauté de Monaco. PDF document, v+191 pp.

¹⁰ Source: Vermande, H. M. and van der Heijden, J. (2011). *The Lead Market Initiative and Sustainable Constructions: Lot 1, Screening of National Building Regulations*. European Commission, Delft, Netherlands. PDF document, v + 105 pp.

Switzerland

The federal law of the 8th October 1999 "CO₂ emissions reduction" states that by 2010 CO₂ emissions have to be reduced by 10% from the 1990 level for the consumption of energy produced by fossil energetic agents and by 15% for the consumption of energy produced by fossil fuels. In addition it is foreseen a contribution to reduce harmful effects on environment, to a more sparing and rational use of energy and a larger use of renewable energies.

The federal law of the 26th June 1998 introduces the concept of energy certification for buildings, assigning to Cantons the enacting dispositions on sparing and rational use of energy, use of renewable of energies and prescriptions on energy performances of buildings. In addition, the federal law of the 8th October 1999 "Building materials" gives criteria on building material characteristics and building techniques, which also have to respect the principle of sparing and rational use of energy.

The federal government promotes, in the field of research and development, projects aimed at the integration of new findings and technologies relating to building systems, shells and installations. It also secures the transfer of new findings to the market through pilot and demonstration projects and the provision of specific information.

In 2001 the programme *SwissEnergy* was launched. Its objectives are to promote efficient energy use and the use of renewable energy, support Switzerland's energy and climate policy goals through concrete measures, and thus to ensure a sustainable energy supply.

Further information

CIPRA International (2008). *Efficient houses*. URL: <http://www.cipra.org/fr/climalp/construction-renovation/maisons-efficientes> (de, fr, it, si)

CIPRA International (2010). *Active climate protection*. URL: <http://www.cipra.org/fr/climalp/construction-renovation/protection-du-climat> (de, fr, it, si)

CIPRA International (2010). *Promotion of efficient building in the energy plan*. URL: <http://www.cipra.org/fr/climalp/construction-renovation/mesures-d2019aides> (de, fr, it, si)

Direction de l'environnement (2009). *L'Environnement en Principauté de Monaco : Recueil de données 2009*. Principauté de Monaco. PDF document, v+191 pp. (fr)

European Commission: Enterprise and Industry (2011). *Construction: The Lead Market Initiative (LMI) and sustainable construction: Screening of national building regulations*. URL: http://ec.europa.eu/enterprise/sectors/construction/studies/national-building-regulations_en.htm (en)

European Union (1995-2011). *Summaries of EU Legislation: Energy Efficiency*. URL: http://europa.eu/legislation_summaries/energy/energy_efficiency/index_en.htm (de, en, fr, it, si)

Landesverwaltung Fürstentum Liechtenstein (2011). *Publikation von Rechtsvorschriften / Rechtssammlungen*. URL: <http://www.llv.li/amtstellen/llv-rdr-publikationen-von-rechtsvorschriften-rechtssammlungen.htm> (de)

Landesverwaltung Fürstentum Liechtenstein (2011). *Klimaschutzstrategie*. URL: <http://www.llv.li/amtstellen/llv-aus-klimaschutz/llv-aus-klimaschutzstrategie.htm> (de)

Permanent Secretariat of the Alpine Convention (2008). *The convention*. URL: http://www.alpconv.org/theconvention/index_en (de, en, fr, it, si)

Swiss Confederation (2007-2011). *Documentation: Swiss legislation: Search by keyword*. URL: <http://www.admin.ch/ch/d/sr/sachreq.html> (de, fr, it)

Swiss Federal Office of Energy SFOE (2007-2011). *Topics: Energy Efficiency: Energy efficiency in buildings*. URL: <http://www.bfe.admin.ch/themen/00507/00607/index.html?lang=en> (de, en, fr, it)

Swiss Federal Office of Energy SFOE (2007-2011). *SwissEnergy*. URL: <http://www.bfe.admin.ch/energie/index.html?lang=en> (de, en, fr, it)

United Nations (2009). *Core Publications: Agenda 21*. URL: <http://www.un.org/esa/dsd/agenda21/> (en, fr)

United Nations Framework Convention on Climate Change (2011). *Text of the Convention*. URL: http://unfccc.int/key_documents/the_convention/items/2853.php (de, en, fr)

United Nations Framework Convention on Climate Change (2011). *Kyoto protocol*. URL: http://unfccc.int/kyoto_protocol/items/2830.php (en, fr)

United States Environmental Protection Agency. *Green building*. URL: <http://www.epa.gov/greenbuilding/pubs/about.htm> (en)