

Sustainable development in Civil Engineering under the climate change and the increasing cost of the energy

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Summary

The climatic changes, the reduction of the energetic dependency and the increasing price of the fossil fuels are acting together requiring important changes in civil engineering.

The article is presenting some data in order to increase the sensibility of the building specialists because during the next decades the climatic changes will grow up throughout the world and in Romania, too.

KEYWORDS: climate change, sustainable development, civil buildings, construction.

1. GENERAL FRAME

The climate progressive change was considered in the middle of the last century as scientific hypothesis. Now it becomes certitude.

In this context, the Kyoto Protocol (1997) established important targets in order to reduce the emissions of greenhouse gases (GHGs).

Every day, new information about the possible dangerous consequences of the warming climate can be found on internet and mass-media.

A review of this data established by the specialists in the atmosphere's physics and meteorologists is presented considering the interest for civil engineers and architects.

2. CLIMATE CHANGE

Climate changes are the great danger which the humanity confronted in the past milleniums, threatening the environment, the global economy, our way of life, security and safety (Figure 1). Global warming, regional anomalies, tropical



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temperatures, increase of the seas' levels, floods, etc. are expected in the next decades /1/.

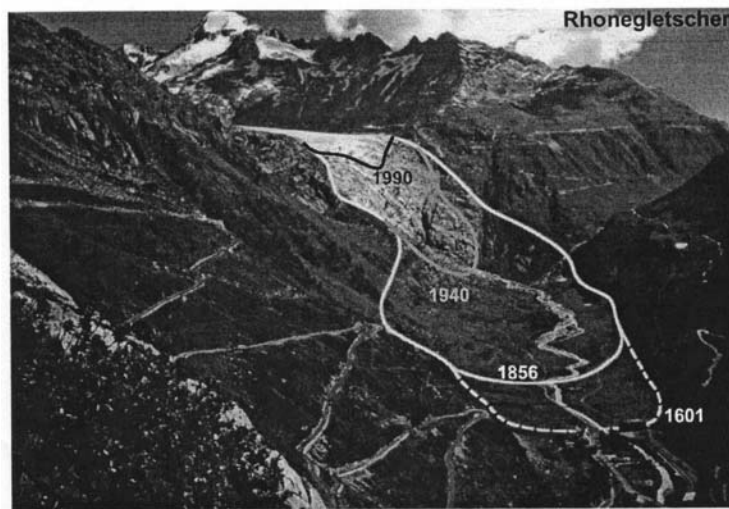


Fig. 1 – The progressive fount of the Rhon's glacier /2/

3. THE NATURAL ENERGY RESOURCES DEPLETION AND INCREASE OF THE ENERGY COST

Natural deposits constitute in millions of years. Now, the combustibles are consumed very quickly (at the geologic scale of time) – figure 2.

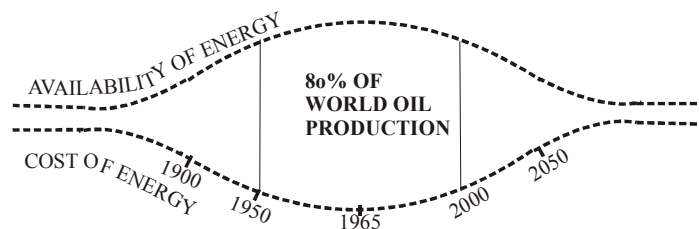


Fig. 2 – The end of the low-cost energy era /3/



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4. WORLD-WIDE SUSTAINABILITY CONCERNMENTS AND SOLUTIONS

- Factor 4; E.U.Weizsäcker (1995);
- Kyoto Protocol (1997);
- World Meteorological Organization Declaration (2004);
- Joint science academies' statement: Global response to climate change, addressed to the G8 Gleneagles Summit (2005) – figure 3;

- Climate change is real
- Most of the warming in recent decades can be attributed to human activities
- Reduce the courses of climate change
- Prepare for the consequences of climate change

Fig. 3 – The academies' statement basic ideas /4/

- „2000 Watt-Society” /2/ to be reached in 2050 (figure 4);

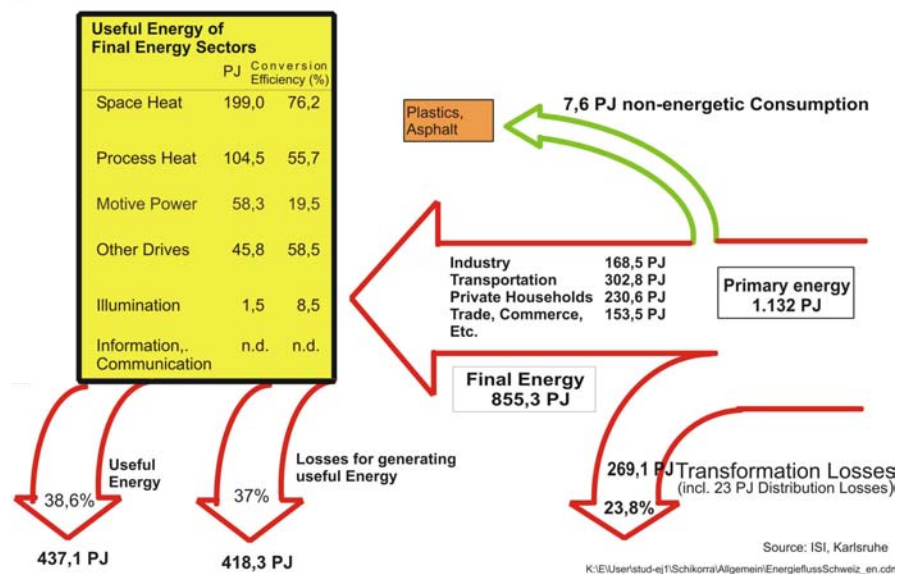


Fig. 4 – Swiss energy flow diagram in 2001 /5/



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- „Faisons vite ça chauffe. Plus de bien être en consommant 2 fois moins”; CITEPA, 2005 /6/

5. NEW OBJECTIVES FOR THE SUSTAINABLE DEVELOPMENT IN CONSTRUCTION

The contribution of a small country as Romania to the world sustainable development through the diminution of the GHGs emissions is certainly very important as an expression of solidarity with the countries from UE and with all the subscribers of the Kyoto Protocol. However, in absolute value, our contribution is relatively small, like a drop in a basin, proportional with the population and the economical potential of our country. Decisive to the world level are only G8 countries, China, India and Brazil. Therewith, the measures that are carried out in Romania concerning the decrease of fossil fuel consumption in all areas have very important consequences to the country and population level, and the adaptation at the consequences of regional climatic modifications, for all economic sectors of agriculture, transports, and construction, is a vital problem, national specific, of maximum importance and urgency, without of which the sustainable development will become impossible. Here are only some priority objectives for constructions, but exists much more possible measures of adaptation, which should be studied.

The fields periodic exhibited to inundation must be identified further. If they can not be protected, the dwellings could be moved on new sites in the frame of a systematic action. There when this thing is not possible, the buildings must be rebuilt, so that the first floor should remain free, to permit casually the pass of the waters. Something similar exists in tropical countries besides rivers and in Siberia, where the apartments of condominiums don't get in touch with the permafrost, in order to not warm and thaw it. Is not too important as the walls not to be from adobe masonry or another forms of stabilized earth, how much is obligatory to be protected against water and composed accordingly to rains, storms and earthquakes. In different zones of the country it should be prepared concreted platforms, lead to utilities, on suitable sites destined for the placement of victims of calamity. Based on guide projects, it should be benefic to begin the manufacture of some light modules and which can be rapidly installed, when necessary.

- The modification of the temperature shall have probably an important effect of heating. The inertia and the thermal protection, the ventilation and the utilization of the capacity of warm storage in the earth are ways of that could permit the achievement of comfort conditions in warm season, without using electric fittings of conditioned air. In the cold season, the same measures have only favorable effects. Concomitantly, are necessary collectors and



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photovoltaic panels, so that the buildings to dispose of a high level of energetic autonomy.

- Generally, the eolian regime will be modified, raising the risk of some storms with increased intensity and tornadoes. In present, the big majority of roof structures and roof coverings do not correspond to a raised level of wind action. The climatic loads and constructive systems should be revised. The windows and the additional external thermal insulations are, also, subjected to wind and hail disaster.
- The resistance structures and the nonbearing closing elements are, as a rule, designed to resist at seismic actions, what does not make them always resistant to the increased climatic actions too.
- The migration of some pests towards North (for instance termites), involves other protective solutions.

6. CONCLUSIONS

The difficult problem of adapting at the climate change raises numerous challenges for civil buildings practitioners. The necessary actions in civilian buildings include higher thermal efficiency through thermal rehabilitation at the level required by C-107 or even more, the extension of the C-107 requirements in rural environment, the use of renewable energy sources (solar, geothermal, biomass), new effective constructive solutions, education of people, etc. . An enormous effort should start immediately.

References

1. * * * *Les données de l'environnement*, Etudes documentaires CITEPA, 155, iunie 2005 (in French)
2. Eberhard Jochem – *Die 2000 Watt pro Kopf Gesellschaft in 2050 – eine denkbare technologische Entwicklung – falls die Gesellschaft sie will*, GRE Kongress 2005 (in German)
3. Dale Schueman (ed.) – *The Residential Energy Audit Manual*, The Fairmont Press, Inc., Lilburn, SUA, 1992
4. * * * *Joint science academies' statement: Global response to climate change (Brazil, France, Italy, United Kingdom, Canada, Germany, Japan, USA, China, India, Russia)*, Etudes Documentaires CITEPA, 155, iunie 2005
5. Eberhard Jochem (coord.) – *Steps towards a 2000 Watt-Society. Developing a White Paper on Research & Development of Energy-Efficient Technologies*, Pre-study, dec. 2002
6. * * * *Energies renouvelables. Faisons vite ça chauffe. Plus de bien être en consommant 2 fois moins*, Etudes documentaires CITEPA, 155, iunie 2005 (in French)

