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A NEW APPROACH TO THE DESIGN AND CONSTRUCTION FOR BUILDING IN THE FACE OF THE ENERGY AND CLIMATE CRISES: PRINCIPLES AND APPLICATIONS IN SUB-SAHARAN AFRICA

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Faced with the exponential growth in the world's population and, above all, the increase in population density in urban areas, housing is often designed without considering environmental constraints and specific regional features. The result is very high internal temperatures in premises that require the use of conventional electric air conditioners to maintain acceptable thermal comfort. Unfortunately, the use of these electrical appliances contributes to the increased consumption of fossil fuels and consequently to the deterioration of environmental conditions. Recent studies carried out on the stock of buildings in urban areas in African countries show that these buildings are poorly adapted to their climatic environment. Most buildings in African cities are made of concrete and glass, similar to those in temperate countries, and are therefore veritable greenhouses, requiring considerable air conditioning to extract the excessive heat they produce to ensure the thermal comfort of their occupants. All these reasons argue in favour of a different design for new buildings, which will be energy-efficient, environmentally-friendly, and make harmonious use of the renewable energies available to them. The building sector will use local, bio-sourced and geo-sourced materials while revitalising local economies, and these buildings will be sufficiently resilient to adapt to the phenomena caused by climate change. In 2010, on a global scale, the buildings sector was responsible for emitting 24% of the total amount of greenhouse gases from the combustion of fossil fuels, giving way only to the industrial sector. However, if the intrinsic energy of building materials is taken into account, this proportion is much higher, and the construction sector becomes the main emitter of greenhouse gases. Consequently, the design and construction of buildings have a considerable impact on the possibility of achieving the objective of limiting the increase in global temperature to 2℃, all the more so as most of the energy currently consumed in buildings in developing countries is biomass, and the expected improvement in housing conditions will lead to a switch from biomass to fossil fuels, which will considerably increase the rate of CO2 emissions in developed countries, as this sector is responsible for 40% of fossil fuel energy consumption. Without the design and construction of eco-responsible buildings, this increase would be all the greater in African countries in general, where the construction sector accounts for well over 60% of final energy consumption. Because of their economic development, developing countries are set to play a decisive role in the global energy landscape. Energy consumption in industry will continue to grow, and we can expect a sharp rise in energy consumption in the transport sector, marked by an increase in the number of vehicles on the roads, if the currently accepted global concept of mobility does not change. The increase in energy consumption in the building sector can be expected to become even more
marked, not only because of the expansion of air conditioning and the number of household appliances, but also because of the increase in the number of buildings. If the rate of new building construction between now and 2050 is around 25-30% in Europe, it is estimated that it will be around 75% in developing countries. If all these new buildings consume as much energy as the existing ones, it will be impossible to achieve the objective of reducing CO2 emissions to an acceptable level. The construction sector is therefore called upon to play its part, with the long-term objective of transforming energy-guzzling buildings into net energy producers. This transformation, of course, is only possible in new buildings, which will have to compensate for the inevitable energy consumption of existing buildings. This unprecedented challenge is already requiring a radical transformation in design and construction methods. Ultimately, the absolute priority for the building sector at the moment is to reduce its CO2 emissions by curbing its energy consumption. If humanity as a whole is to reduce energy consumption without ceasing to improve living conditions inside buildings, it will be essential to rethink the entire system. Every opportunity to save energy must be considered, and the most energy-efficient technologies and techniques must be applied.

Keywords : Energy-intensive buildings, eco-responsible buildings, greenhouse gases, passive cooling, local materials, thermal comfort, climate change, building envelope skin, energy efficiency, architecture.

Presenter: Prof. NOUGBLÉGA, Yawovi (Solar Energy Laboratory/ Phenomena of Transfer and Energetics Group, University of Lomé, Togo, Regional Centre of Excellence for Electricity Management (CERME), University of Lomé, Togo)

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