

Abstract

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Low Carbon Residential Building for Climate Change Adaptation: The Case of a Village House in the Delta Region, Egypt

Rapid development of cities including buildings, energy supply and demands, transport and waste generation increase the risk of climate change, especially in the MENA region. The IPCC report on CC stated that Egypt is considered one of the countries that will be heavily influenced by CC risks despite its low CO₂ emission - 1% of the World's GHG emissions (CO₂/ population = 2.25 tCO₂/ capita). Green Economy is a vital tool in realizing Sustainable Development Goals. Residential buildings in Egypt consumed 43% of the total electrical energy generated in 2012/2013 resulting of 184.3Mt CO₂ emissions and around 70% in 2015. This highlights a vital question on the future sustainability of cities in terms of energy supply and how retrofitting of buildings to be low-carbon can make a great difference in reducing the demands on energy, yet meeting global carbon emissions reduction targets. The paper focuses on innovative sustainable model of an existing Egyptian village prototype. The objective is mainly to retrofit the village building by applying efficiency measures to make it low carbon. The method encompasses field visits, energy audit assessments and measurements of a village prototype residential house. Low-tech technologies (Thermal Shield paint – thermal insulation and green roof) and high-tech technologies (on-grid Solar PV array (6 kWp - generating clean electricity from renewable energy, and double efficient glass windows with a shading coefficient less than 0.30) were applied. An Infra-red FLIR type e6 compact thermal imaging camera was used to understand the heat gain and energy performance in June 2015 and June 2016.