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Study of the Energy Efficiency of Buildings under Tropical Climate with a View to Sustainable Development: Choice of Material Adapted to the Protection of the Environment

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Abstract : In the context of sustainable development and climate change, the adaptation of buildings to the climatic context in hot climates is a necessity if we want to improve living conditions in housing and reduce the risks to the health and productivity of occupants due to thermal discomfort in buildings. One can find a wide variety of efficient solutions but with high costs. In developing countries, especially tropical countries, we need to appreciate a technology with a very limited cost that is affordable for everyone, energy efficient and protects the environment. Biosourced insulation is a product based on plant fibers, animal products or products from recyclable paper or clothing. Their development meets the objectives of maintaining biodiversity, reducing waste and protecting the environment. In tropical or hot countries, the aim is to protect the building from solar thermal radiation, a source of discomfort. The aim of this work is in line with the logic of energy control and environmental protection, the approach is to make the occupants of buildings comfortable, reduce their carbon dioxide emissions (CO₂) and decrease their energy consumption (energy efficiency). We have chosen to study the thermo-physical properties of banana leaves and sawdust, especially their thermal conductivities, direct measurements were made using the flash method and the hot plate method. We also measured the heat flow on both sides of each sample by the hot box method. The results from these different experiences show that these materials are very efficient used as insulation. We have also conducted a building thermal simulation using banana leaves as one of the materials under Design Builder software. Air-conditioning load as well as CO₂ release was used as performance indicator. When the air-conditioned building cell is protected on the roof by banana leaves and integrated into the walls with solar protection of the glazing, it saves up to 64.3% of energy and avoids 57% of CO₂ emissions.

Keywords : plant fibers, tropical climates, sustainable development, waste reduction
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