



UNIVERSITY OF BAHRAIN
RENEWABLE ENERGY
CONFERENCE

**Energy saving of used
facades' designs
of commercial
buildings in Khartoum**

Mrs. Abeer A. Ibrahim

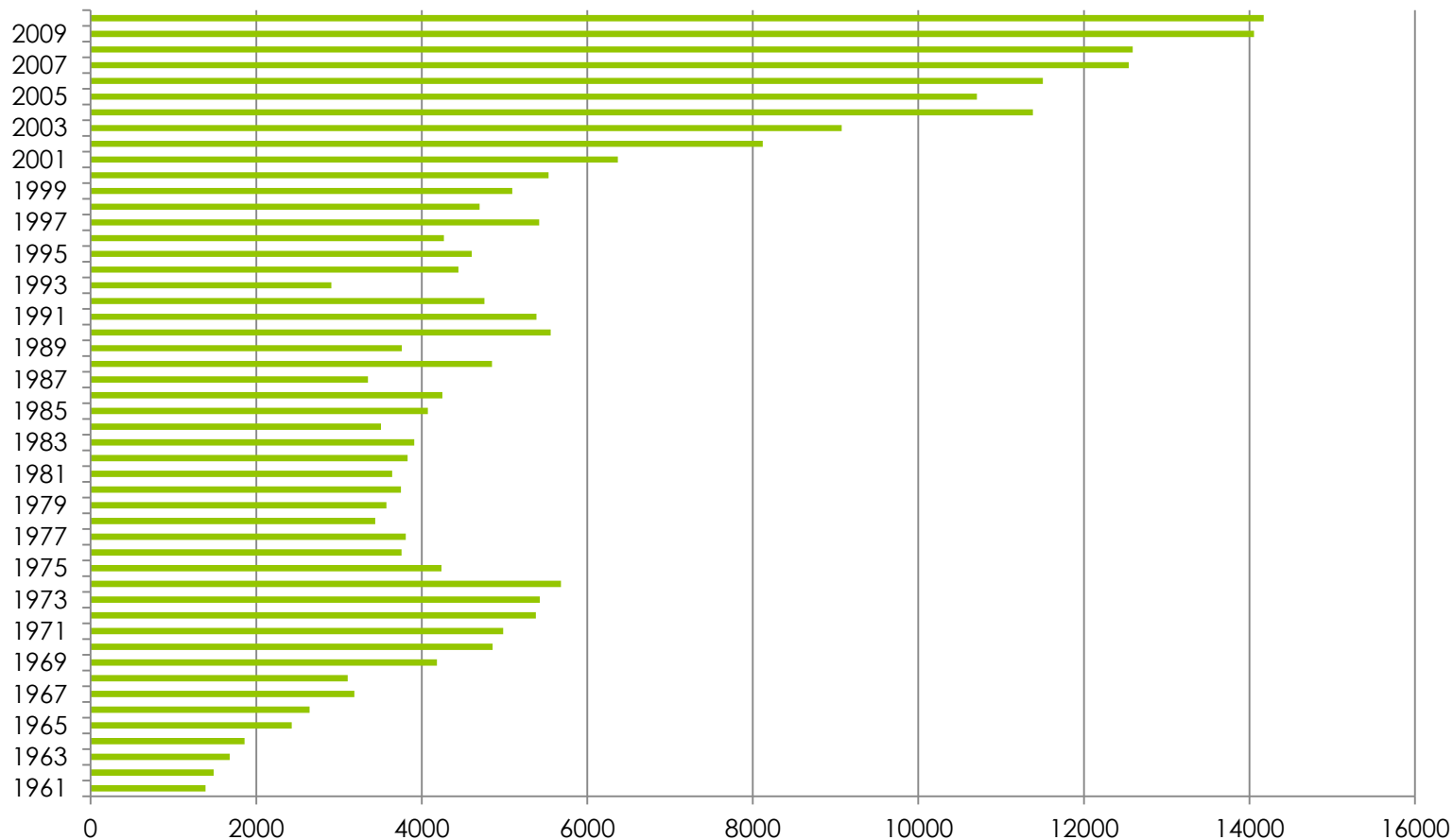
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Abstract

- The proposed research will study the outer shell of the building façade system for being the boundary between the internal and external environment of the building and the most influential and affected by the loss and gain of energy in buildings.
- It will focus on the façade designs of commercial buildings in Khartoum

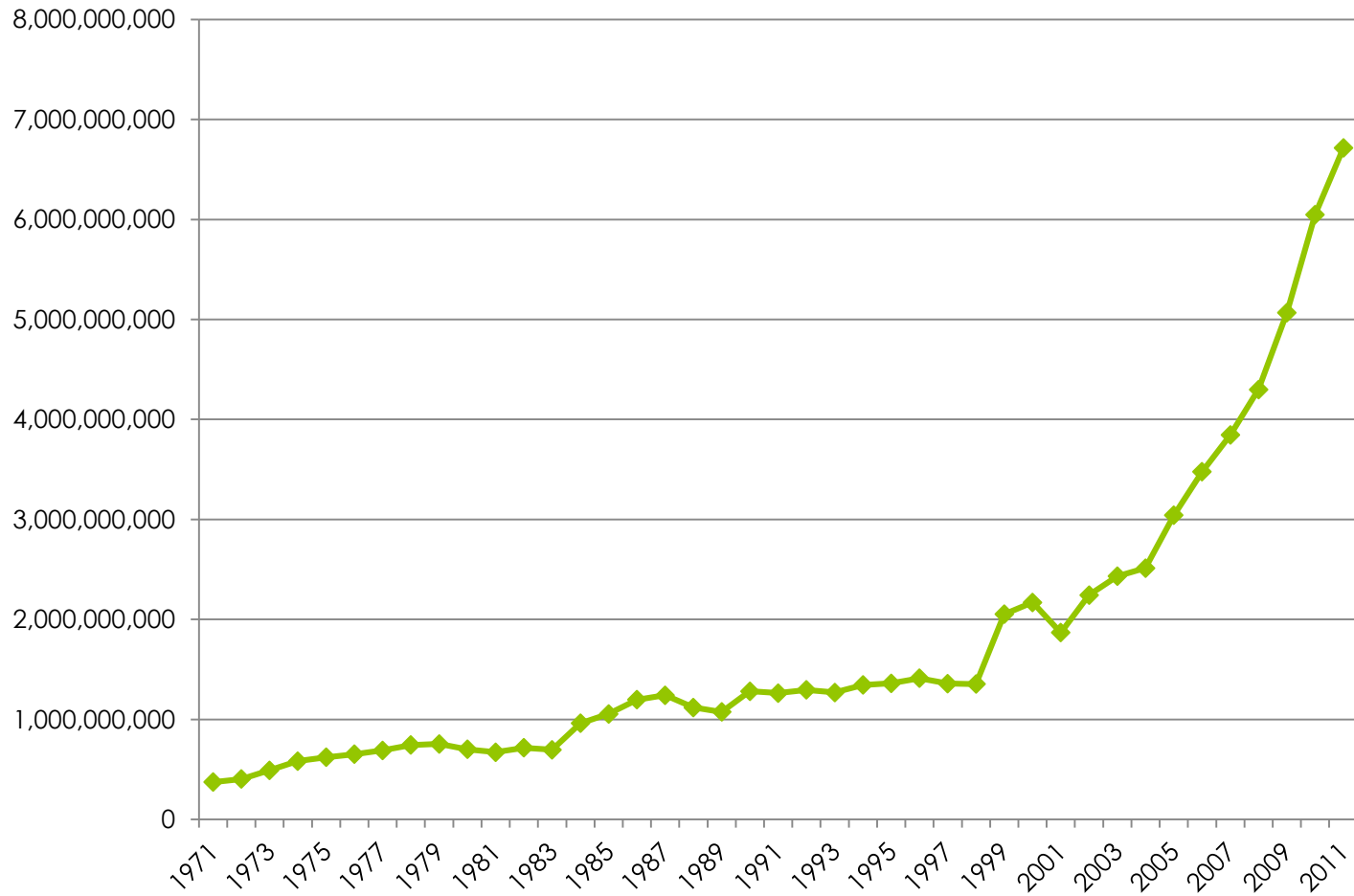
Research Problem

- The Huge Energy consumption of modern commercial buildings in Khartoum.
- The inappropriate designs of modern commercial buildings to the climate in Khartoum.



The average value = 5305 kt
 Minimum value = 1360.46 kt in 1960
 Maximum value = 14172.96 kt in 2010

Sudan Carbon Dioxide Emissions
 (The World Bank data for Sudan from 1960 to 2010)



Maximum value = 6,715,000,000 in 2011

Minimum value = 373,000,000 in 1971

Sudan Electric Power Consumption
(The International Energy Agency - IEA)

- The façades in commercial buildings have a very important role in terms of energy consumption.
- The amount of solar radiation penetrating the building through the glass exterior has a huge effect on the interior temperature which increases the need for air conditioning.
- From this point of view the designers must take into consideration these reasons carefully before starting to design the building façade in order to adapt the building to these harsh conditions.

- modern facade consists in most cases of more than 60% glass, reaching 80-90% in some cases. These facade surfaces are becoming thinner, lighter and smarter than the old facade technology.



Facade design factors that affect the energy performance of a building envelope:

- The form of the façade.
- The orientation of the building with respect to the sun.
- The façade Envelope.
- The façade openings Design.
- The glazing properties.
- The properties of sun shading devices, and how they are operated.

objectives of the study

- Find out how to achieve a measure of the efficiency of energy consumption which can be easily used and developed.
- Provide technical guidance to commercial buildings' design teams to decrease the energy consumption in new constructions.
- Identify appropriate facade adjustments to improve the energy consumption of buildings.
- Explore key questions surrounding sustainability of commercial building exterior designs used in Khartoum.

Research Methodology

- **Literature search.**
- **Microclimate analysis:**
 - Sudan Meteorological Authority.
 - Central Statistical Organization
 - National Center for Energy Research
 - The Ministry of Science and Technology, Energy Research Institute.
 - National Center for Research.

Research Methodology(cont.)

- **Case studies.**

- Multidisciplinary methods and case studies of modern commercial buildings within Khartoum specific climatic zones will be used to evaluate the use, technology and architectural design of commercial buildings.

- **Building Energy Modeling.**

- Autodesk BIM modeling software.

Research Methodology(cont.)

o **Computer Building Simulation.**

Software programs to simulate the building energy performance:

- Autodesk Insight, integrates lighting analysis, solar analysis, and energy analysis software to provide a holistic approach to building performance.
- Energy Plus, a publicly available building simulation engine.

Research Methodology(cont.)

- **Prototype Model:**

- Survey of a number of reports and datasets to develop typical large commercial building characteristics and obtain energy performance estimates.

- **Analysis:**

- Data analysis software
- Simulation Resulted models

References

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Thank You

Q. & A.

“High- performance façade systems can be as simple as the application of natural (age old proven) processes in a simple (known) kit of parts that one assembles.”

-Maurya McClintock, Façade Engineer