NEW TOWN DEVELOPMENT IN TEHRAN-KARAJ (Iran)

CODE: KAR-AB10

TOPICS:
ENERGY
PLANNING

ACTION BRIEF
NEW GENERATION OFFICE BUILDINGS

CHALLENGE

Residential and commercial buildings are responsible for more than one third of worldwide energy consumption. Iran's Building sector consumes for example over 40% of Iran's high energy consumption. More than 95% of Iran's total energy consumption comes from oil products and natural gas. The energy consumption of buildings in Iran is also very high so that the average energy consumption of buildings in Iran is about 2.5 times of the average of worldwide energy consumption (IFCO). In the Tehran province, the buildings are responsible for 41% of the CO2 emission. Despite of this high energy consumption of buildings in Iran, the thermal comfort in buildings is not at a good level. There are different studies and researches; and although this building has not been built yet, nevertheless, there are only a few substantial plans for such energy efficient pilot building for Iran, which could demonstrate the potentials for energy saving in such buildings.

ACTION

The primary objective of New Generation Office Building is the reduction of its total and primary energy demand as well as the improvement of internal thermal (and visual) comfort in comparison to existing office buildings in Iran. The secondary objective of this pilot project was to achieve an economic viability of investment for this pilot building as well as for the implemented energy saving measures. Thus, the pilot project is meant to demonstrate the energy efficiency in buildings.

As the main indicators, the total as well as the sum of the heating and cooling energy demand of New Generation Office Building must respectively be at least 40% and 60% less than existing office buildings in Iran.

The main approach for increasing energy efficiency in the New Generation Office Building comprised the implementation of a cost-neutral method of energy saving. Therefore, architectural energy saving (see: KAR-AB11: Architectural Energy Efficiency) is implemented as the main method of energy saving in designing of this pilot project. However, other measures of energy saving such as constructional and technological energy saving is implemented in this project as well.

The energy demands of New Generation Office Building for heating, cooling, lighting, DHW and room electricity are calculated via energy simulation. The energy demand of the building is as following:

- heating, 33 kWh/m^2 per year
- cooling, 27 kWh/m^2 per year
- lighting, 18 kWh/m^2 per year
- domestic hot water, 22 kWh/m^2 per year

The combination of these measures leads to the result that the total energy demand of this building will be less than 80% of existing office buildings in Iran. Based on the CO2 emission factors of electricity and natural gas in Iran, it is estimated that the New Generation Office Building will emit 381.950 tons of CO2 per year.

Figure 1: New Generation Office Building (F. Nasrollahi)

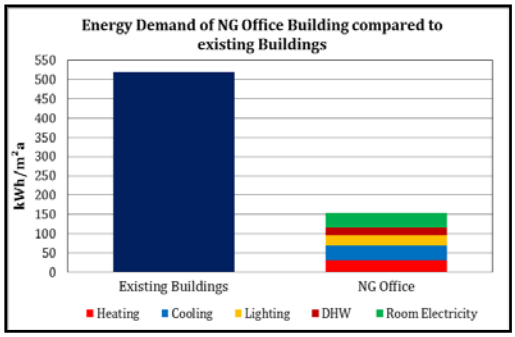

Figure 2: CO2 Emission of NG Office Building (F. Nasrollahi)

RESULTS

STATE OF IMPLEMENTATION:

- The New Generation Office Building has not yet been built, but existing plans are highly elaborated.

LOCAL USERS / TARGET GROUPS:

- This pilot project is designed for Hashtgerd branch of New Town Development Corporation (NTDC)
- Hashtgerd NTDC could benefit from this pilot project. As New Generation Office Building is a demonstrative pilot project regarding energy efficiency, building designers could benefit from this pilot building too.

IMPACTS:

Ecologic Impacts:

- Optimisation of architectural design of the office building and an increase of the thermal resistance of building envelope leads to high energy savings and to a reduction of CO2 emissions.
- The energy demand of the New Generation Office Building is decreased about 50% by optimisation of architectural design.
- The energy demand of the New Generation Office Building is additionally decreased about 20% by increasing the thermal resistance of building envelope.
- The New Generation Office Building has overall 70% less energy demand compared to the average energy demand of available office buildings in Iran.
- Because of low energy demand, the CO2 Emission of this building from energy combustion is very less than existing building.
- The CO2 Emission for production of building materials of this building is only a little more than normal buildings; however, this building has very less energy demand. That is because the energy saving in this pilot building is predominantly done by means of architectural design.

Economic Impacts:

- The construction cost of New Generation Office Building is only a little more than general buildings, while its energy costs within the life cycle are much less than other buildings.

Social-Cultural Impacts:

- The internal visual comfort and especially thermal comfort of New Generation Office Building is effectively increased compared to existing office buildings.
- Increasing the thermal and visual comfort within the building leads to a higher work motivation and work efficiency.

MULTIPLICATION:

- This pilot project is presented in some conferences and in a book chapter “Green Office Buildings: Low Energy Demand through Architectural Energy Efficiency”.

LONG-TERM CONSOLIDATION:

This pilot project can demonstrate the energy efficiency in buildings. One long-term impact of this pilot project is, therefore, lessons, which can learned from this pilot project regarding energy efficiency.

CONTACT

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