The building sector in Iran: procedures & potentials

Energieeffizienz und solares Bauen im Iran
Herausforderungen, Strategien und Chancen

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atene KOM GmbH | Agency for Communication, Organisation and Management
Main Topics

I. Building development in Iran, an overview

II. Building development actors

III. Building and construction facts and figures

IV. Energy fact and figures

V. Energy and building sector in Iran

VI. Energy efficiency initiatives and enforcement measures

VII. Barriers in building energy efficiency
Building development in Iran, an overview

Steering modalities

A. Policy making, standards & general rules
- Ministry of road and urban development and their provincial organizations
- Supreme council of architecture and urban development
- Construction engineering organization

B. Permit issuance and supervision
- Municipalities
- Construction engineering organization

C. Implementation
- Public and private actors depending on development types

Building construction request
- Controlling urban development regulations
  - Municipality based on Ministry of road and urban development plans and frameworks
- Construction permit issuance
  - Municipality
- Construction technical supervision
  - Municipality
  - Construction engineering organization
- Completion & utilization license
  - Municipality
  - Construction engineering organization

In practice
Building development actors

**Main actors**

**National and regional level**
- Road and urban development ministry and its provincial organizations
- Urban development & revitalization organization
- New town development company
- Construction engineering organization
- Road, housing and urban development research center

**Local level**
- Islamic city council
- Municipality
## Building development actors – National & regional

<table>
<thead>
<tr>
<th>Organization</th>
<th>Role</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing Foundation of Islamic Revolution</td>
<td>Affordable housing for low income social groups (i.e. maskane mehr housing plan)</td>
<td><a href="http://www.bonyadmaskan.ir/SitePages/Home.aspx">http://www.bonyadmaskan.ir/SitePages/Home.aspx</a></td>
</tr>
</tbody>
</table>
# Building development actors – National & regional

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Road, Housing and Urban Development Research Center</td>
<td>Research center of the MRUD</td>
<td><a href="http://www.irceo.net/">http://www.irceo.net/</a></td>
</tr>
</tbody>
</table>
Building development actors – Local

**Islamic City Councils**

**Role**

Supervision over municipalities

**Municipalities**

**Role**

Permit issuance and Supervision of any physical/spatial development within city’s territory

- **31 Provinces**
- **1240 Municipalities**

Building and construction facts and figures

Permits issued for construction of building in urban areas by land area and floor area (1000 sq m)

Stable and even reducing number of construction permits issued since 2011

Increased floor area ➔
Higher tendencies for multistorey building structures

Reduced number of permit issued in large cities i.e. Tehran in recent years

Source: Statistical Centre of Iran
Building and construction facts and figures

Permits issued for construction of building in urban areas by land area and floor area (1000 sq m) - 2014

Higher building densities and number of floors in larger urban areas

Lower building densities and number of floors in smaller urban areas

Tehran as a front runner in building construction!

Source: Statistical Centre of Iran
Permits issued for construction of building in urban areas by type of use

Example of Tehran in 2014

Source. Statistical Centre of Iran
Permits issued for construction of building in urban areas by type of skeleton and construction materials

Reinforced concrete becoming the dominant building structure in recent years!

Example of Tehran in 2014

Source: Statistical Centre of Iran
Building and construction facts and figures

Permits issued for construction of building in urban areas by number of storey

Increasing the number of multistorey building permits due to increasing the land prices and higher financial benefits for developers!

Source: Statistical Centre of Iran
Building and construction facts and figures

Average floor area ratio in housing units (issued permits by 2014)

Example of Tehran in 2014

- 5 & more storey: 70%
- 4 storey: 15%
- 3 storey: 11%
- 2 storey: 3%
- 1 storey: 1%

Source: Statistical Centre of Iran
Building and construction facts and figures

Estimated private sector investment in new buildings in urban areas (million Rials)

Increased investment of private sector in building construction sector

Source. Central Bank of Islamic Republic of Iran
Examples of large scale spatial/building development

- Maskane Mehr (National social housing plan)
- New towns plan (17 new towns)
- Urban regeneration plans in declined urban areas
- Parand New town (near Tehran)
- Urban regeneration and reconstruction
Energy fact and figures

Urban population in 2050

IRAN

83 M urban Pop
86% Urban

In 2010
52 M urban Pop
71% Urban

### Energy consumption by sector in IRAN - 2013

<table>
<thead>
<tr>
<th>Sector</th>
<th>in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential and commercial</td>
<td>35.8</td>
</tr>
<tr>
<td>Industry</td>
<td>24.5</td>
</tr>
<tr>
<td>Transport</td>
<td>25.3</td>
</tr>
<tr>
<td>Agriculture</td>
<td>4</td>
</tr>
<tr>
<td>Non-energy use</td>
<td>10.3</td>
</tr>
</tbody>
</table>

# Energy fact and figures

## Share of energy carriers in total final consumption in IRAN - 2013

<table>
<thead>
<tr>
<th>Sector</th>
<th>in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petroleum products</td>
<td>35.3</td>
</tr>
<tr>
<td>Natural gas</td>
<td>53.9</td>
</tr>
<tr>
<td>Coal</td>
<td>0.4</td>
</tr>
<tr>
<td>Combustible renewables</td>
<td>0.7</td>
</tr>
<tr>
<td>Electricity</td>
<td>9.8</td>
</tr>
</tbody>
</table>

Energy fact and figures

Share of energy use by sectors

**Electricity**
- Agriculture: 16%
- Transport: 0%
- Industry: 35%
- Non-energy use: 2%
- Residential, public and commercial: 47%

**Natural gas**
- Non-energy use: 10%
- Agriculture: 1%
- Transport: 6%
- Industry: 34%
- Residential, public and commercial: 49%

**Petroleum products**
- Non-energy use: 13%
- Agriculture: 5%
- Industry: 8%
- Transport: 62%
- Residential, public and commercial: 12%

1. Residential, public and commercial
2. Industry
3. Agriculture

1. Residential, public and commercial
2. Industry
3. Transport

1. Transport
2. Residential
3. Industry
### Total emissions and sectorial share (2010-2030)

<table>
<thead>
<tr>
<th>Sector</th>
<th>2010</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CO₂</td>
<td>CO</td>
</tr>
<tr>
<td>Household, commercial, public (%)</td>
<td>28</td>
<td>1</td>
</tr>
<tr>
<td>Manufacturing industry (%)</td>
<td>19</td>
<td>3</td>
</tr>
<tr>
<td>Agriculture (%)</td>
<td>2.4</td>
<td>0.2</td>
</tr>
<tr>
<td>Transportation (%)</td>
<td>24</td>
<td>95</td>
</tr>
<tr>
<td>Power generation plants (%)</td>
<td>27</td>
<td>2</td>
</tr>
<tr>
<td>Total emission (million tons)</td>
<td>737</td>
<td>8.25</td>
</tr>
</tbody>
</table>

Climate conditions

According to the Köppen climatic classification there are three prevailing climate zones in Iran:

- the dominant climate type is arid and semi-arid climate, covering 81% of the country,
- 17% of the country is of temperate or mesothermal climate
- 2% of the country is of continental-microclimate

More need for space cooling!

Source. M. C. Peel, B. L. Finlayson, T. A. Mcmahon. Updated world map of the Köppen-Geiger climate classification.
Energy and building sector in Iran

Energy consumption in building sector

- Energy sources
- Urban planning and architectural design
- Consumption habits
- Technologies
  - Insulations
  - Heating & cooling
  - Appliances
Energy and building sector in Iran

Urban planning and architectural design

- Limited energy efficiency planning and design measures in urban development
- Limited knowledge and awareness among experts and local authorities
- Limited initiatives and instruments in building scale

The notion of energy efficiency is almost unknown to the building and construction industry in Iran, but mindsets have started to change!

Technologies

- Since the heating system and the building envelope are the main sources of energy waste, major efforts should be made to improve heating systems for existing and new buildings, as well as exterior materials and insulation, particularly for new buildings.
- In addition to poor materials and designs, there is a lack of knowledge and skills and a shortage of energy efficiency experts in the construction industry.
For the existing building stock, **improvements in the heating** system would lead to huge energy savings.

**Heating systems** differ, depending on the type of building. Most old buildings use **natural gas boilers**. Large buildings often use **fan coils for dual purposes** (heating and cooling).

**The boiler rooms’ structure and poor maintenance** are the major factors contributing to energy waste in buildings. There are many pipes, valves and other equipment that needs to be monitored and adjusted manually on a regular basis.

One of the problems with current heating systems is that while the system generates heating water, it also generates a lot of **heat that cannot be utilized**.

Radiators are also commonly used to heat rooms in Iran, but these are **regulated manually**.

A similar inefficiencies are observable in energy intensive cooling systems!
Energy and building sector in Iran

Technologies

- Households in Iran typically use most of their energy for heating/cooling, lighting and cooking. Inefficient appliances impact on higher energy consumption in households.
- Due to awareness raising programs and price sensitivity in recent years, a transformation towards more efficient appliances is observable.

Energy sources

- High environmental potentials, however limited use of renewable sources.
- High dependency on natural gas

Consumption habits

!!!
Initiatives and enforcement measures

Iran Energy Efficiency Organization (IEEO-SABA)

Active since March 1996 with the main aim of capacity building and think tank for energy efficiency in all sectors.

- Studies and research activities
- Research & development projects
- Training and awareness raising programmes
- Publications giving better scientific technical & proficiency services

Website:
Initiatives and enforcement measures

Policies and regulations

Operational

- National energy efficiency regulation; Building Code No. 19

Policy measures

1. National law on reforming the consumption patterns (section 5 – urban development and building sector)
2. Supreme leader general policies of reforming the consumption patterns
4. General policies in the third, fourth and fifth national development plan
National energy efficiency regulation; Code No. 19

The first national building code on energy conservation, Code No. 19, was approved in 1991 by the Ministry of Housing and Urbanism. It was revised several times and in 2001 finalized and imposed on construction and building organizations.

Code No.19 considers buildings energy conservation in different part of buildings, including:

- **Insulations**: i.e. external walls insulation, double glazing windows, thermal brick frames
- **Thermodynamic systems**: i.e. heating, cooling, ventilation and hot water production systems
- **Environmental design**: i.e. openings for lighting considerations, orientations, natural ventilation

The owner of the building must apply to the city for a construction permit. Once the permit has been issued, the city audits the building at different stages of construction to ensure that the regulations have been observed. Energy efficiency permits are quite new, and there is no data to verify how and to what extent the regulation is enforced.
Barriers in building energy efficiency

Integrated policy will and enforcement mechanism

- Energy efficiency is a **relatively new concept** in Iran
- Lack of a **consistent and systematic approach** for designing energy efficiency policies and enforcing mechanisms
- Education and training, and raising public awareness of energy efficiency standards in different sectors, is missed

- Although there are **new regulations and codes** for energy efficiency in buildings, they are **inconsistent**, and there is **lack of coordination between stakeholders**.

**Enforcing the regulations** is also a major challenge due to constantly changing regulations and multiple agents being responsible for monitoring.
## Barriers in building energy efficiency

### Energy price and subsidies

#### Households electricity

<table>
<thead>
<tr>
<th>Average monthly consumption (KWh/m)</th>
<th>Price for KWh (Rials)</th>
<th>Price for KWh (Cent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-100</td>
<td>450</td>
<td>1.3</td>
</tr>
<tr>
<td>100-200</td>
<td>525</td>
<td>1.5</td>
</tr>
<tr>
<td>200-300</td>
<td>1125</td>
<td>3.2</td>
</tr>
<tr>
<td>300-400</td>
<td>2025</td>
<td>5.8</td>
</tr>
<tr>
<td>400-500</td>
<td>2325</td>
<td>6.6</td>
</tr>
<tr>
<td>500-600</td>
<td>2926</td>
<td>8.4</td>
</tr>
<tr>
<td>More than 600</td>
<td>3226</td>
<td>9.2</td>
</tr>
</tbody>
</table>

Source: Iran Ministry of Energy available online at: http://tariff.moe.gov.ir/

#### Households Gas

**A. Warm months**

<table>
<thead>
<tr>
<th>Min per m3</th>
<th>Max per m3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rials</td>
<td>1081</td>
</tr>
<tr>
<td>Cent</td>
<td>3.1</td>
</tr>
</tbody>
</table>

**B. Cold months**

<table>
<thead>
<tr>
<th>Min per m3</th>
<th>Max per m3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rials</td>
<td>414</td>
</tr>
<tr>
<td>Cent</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Source: National Iranian gas company available online at: http://www.nigc-dist7.ir/
Any Other Questions?

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