Green Buildings, GRIHA, SVAGRIHA...

Innovations in Sustainable Habitats – the GRIHA approach

Bengaluru

7th December 2012
Need
India’s Urbanization

- Population of India will reach from current 1.2bn to **1.4bn by 2025**
- By 2030, **40.8% (600mn)** of India’s population will be living in urban areas compared to current 28.4%

**India's Population Growth**

![Graph showing population growth from 1901 to 2001.](image)
The current development model being adopted.....Gurgaon – The Millennium City!
Millennium City’s Power Bill To Go UP

By ugesh sarkar, Section Electricity
Posted on Tue Jun 15, 2010 at 10:01:18 PM EST

Power bills in Gurgaon -- which already pays the highest tariffs in the country, yet faces 8-10 hours of power cuts every day -- will go up further.

A hike of 20-27 paisa per unit of electricity, effective from July, has been finalised, in the guise of ‘fuel surcharge arrears’.

Haryana Electricity Regulatory Commission (HERC) has okayed the surcharge, paving the way for distribution companies to collect a whopping Rs 1,705 crore in the next 48 months from consumers, who -- because of the power cuts -- already pay a hefty bill for back up power.

"Fuel surcharge is due to the increase in cost of power production. The government is not counting it as a power tariff hike," M.B. Vashisth, director, Dakshin Haryana Bijli Vitaran Nigam, said. "We had sought the HERC's permission to collect the same from consumers."

Source: Hindustan Times By Sanjeev K. Ahuja Millennium City’s Power Bill To Go UP
EPI

kWh/sq.m./annum
BEE Star rating for Existing Offices

Air conditioned buildings:

The lowest benchmark is

200 kWh/sqm/annum – 1 star

| Estimated annual energy consumption, 2009 (kWh per square meter of block area) |
|-------------------------------|------------------|------------------|------------------|
| 2,500 and greater             | 1,250-2,499      | 600-1,249        | 300-599          |
| 1,250-2,499                   | 600-1,249        | 300-599          | 100-299          |
| 600-1,249                     | 300-599          | 100-299          | 1-99             |
| 300-599                       | 100-299          | 1-99             | No data          |
| 100-299                       | 1-99             | No data          | Open space       |

Source: National Geographic magazine – August 2011
We have always been sustainable in our construction since the beginning of time....
Learn from the Past, create the Future.....
Green Rating for Integrated Habitat Assessment
Genesis

2000
TERI Retreat

...2000
Over 100 audits

2005
TERI- GRIHA

2001
Advent of LEED: CII-
Sorabhji Godrej Green
Business Centre, Hyderabad- Platinum
Rated

2007
ECBC

2007
Ministry of New and
Renewable Energy, GoI

2009
ECBC

2009
CPWD adopts
GRIHA

2010
Capacity
building

2011
NMSH

2011
Setting up of
ADaRSH

2012
CPWD
adopts
GRIHA

2011
GRIHA
adopted by
PCMC

2012
SVA
GRIHA
Product
catalogue

Towards market transformation
Set of 34 criteria focusing on:

- Site Planning
- Building Design
- Energy Efficiency
- Water and waste management
- Sustainable Building Materials
- Occupant Health and comfort

100 (+4 innovation points) point system with differential weightage on various criteria:

- 51-60
- 61-70
- 71-80
- 81-90
- 91-100
Fast gaining acceptance across the industry

- Over 279 registered projects across India – 203 under GRIHA
  (KEY PROJECT: ITC, GMR, All upcoming AIIMS, All upcoming IITs, HIRCO, upcoming Airports, All upcoming IISERs, Goel Ganga etc.)

- 48 projects under Pre-certification

- About 30 registered pilot projects under SVAGRIHA

- 2 pilot projects registered under Large Development Guidelines

- More than 100 mn sq ft of built-up registered under GRIHA
Ministry of New and Renewable Energy
- Solar buildings program for energy efficient buildings
- GRIHA- national building rating system (partly mandatory)
- Solar cities programme
- Incentives for integration of renewable energy & GRIHA

Bureau of Energy Efficiency, Ministry of Power
- Energy Conservation Building Code (voluntary)
- Appliance labelling (partly mandatory)
- Star rating programme for existing buildings (rates commercial buildings on energy performance)

Ministry of Environment & Forests
- Environmental Clearance (Mandatory)
- Resource (energy, water) efficiency integral part of clearance
- ECBC mandatory

Ministry of Urban Development
- National Mission on Sustainable Habitats
  - energy efficiency in buildings
  - management of solid waste
  - accelerating modal shift to mass transport

Central Public Works Department/Thiruvananthapuram PWD
- Mandatory to comply with GRIHA
- Revised specification, schedules and plinth area rates
Fast track clearance for GRIHA pre-certified projects
GRIHA positioned to give EIA compliance feedback to State

34 GRIHA criteria

25 criteria are met during EIA
Environmental clearance looks at the impact of the building on its surroundings

GRIHA looks at the construction activities inside the site
PCMC launches green building initiative

EXPRESS NEWS SERVICE
JULY 30

THE Pimpri-Chinchwad Municipal Corporation (PCMC) has become the first municipal corporation in the country to introduce energy efficient buildings by giving incentives to builders and property tax sops to residents. Officials of the Union Ministry of New and Renewable Energy made this announcement at the launch of PCMC’s ‘Green building initiative’ at Auto-cluster in Chinchwad on Saturday.

Municipal Commissioner Asheesh Sharma said the concept was started last week but was formally launched in the presence of ministry officials. “Through this initiative, there will be saving in potable water usage, waste water treatment and solid waste management. The developers will get a discount in premium for building permission charges as per GRIHA ratings. Also there will be a discount of 10 per cent in property tax for end users after possession from the developer. If the project is interested in seeking fast-track environmental clearance through GRIHA pre-certification, they can avail of this facility,” he said.

The property owners of green buildings will be benefited by reduction in pollution related to consumption of water.Officials said so far seven developers have submitted their projects. “The maximum discount a builder will get for a green building is 50 per cent which he will get on the premium amount. But that depends on the GRIHA rating. If the project gets five star rating, then the builder will get a maximum discount on premium. Similarly, residents will also get discount in property tax. The ‘Green building initiative’ was launched by Mayors Behl.”

Mayors Yogesh Behl inaugurates the scheme. PCMC Commissioner Asheesh Sharma, Dr Arun Kumar Tripathi, Dr Rajshekar Iyer and Priyanka Kocher are also seen.

Making a conscious effort towards its responsibility towards natural resources and the impact on society by incentivizing GRIHA (Green Rating for Integrated Habitat Assessment) Rating System in their jurisdiction.

The Energy & Resources Institute, TERI has conceived and developed jointly GRIHA with the Ministry of New and Renewable Energy, Government of India, which is suitable for all types of buildings in different climatic zones in India. This rating system not only take care of energy conservation but also look into water and waste management, minimum destruction of natural resources and various other aspects in an integrated way. ADaRSH, Association for Development and Research of Sustainable Habitats, is mandated to promote development of buildings and housing in India through GRIHA, officials said.
On its 157th Year CPWD dedicates itself to the cause of reducing Carbon foot prints by promoting construction of Green-Buildings

Steps taken for promoting Green Buildings

• All CPWD Constructions shall be essentially Green.
• CPWD provides mandatory internal certification based on GRIHA rating system of TERI.
• CPWD Training Institute Ghaziabad has been recognized as "Centre of Excellence" for Green Building by MNRE.
• Schedule of rates containing Green Building items under finalization.

Indira Prayavaran Bhawan, Jor Bagh, New Delhi - Green Building with Platinum rating of LEED & 5 Star GRIHA Rating (under construction)

General Pool Office Complex, INA, New Delhi (at finishing stage)

MESSAGE

The Central Public Works Department (CPWD) is completing its 157th year of existence on 12th July, 2011. CPWD today has emerged as a premier Government construction agency and is providing yeoman’s service in construction activities for Central & State Governments and other Public bodies.

In keeping with its fine tradition, CPWD is creating modern buildings with adaptive architectural design having stata of the art facilities. It has also ventured into new areas such as the Tsunami Reconstruction Project for the Andaman & Nicobar Islands and Construction of State highways in Bihar, etc.

While congratulating the staff and officers of CPWD on this occasion, I exhort them to continue working with commitment and dedication.

MESSAGE

It gives me a great pleasure to note that CPWD is celebrating its 157th Annual Day on July 12th, 2011. CPWD is the premier public works department of the country with an unbroken track record of 157 years and is dedicated to the service of nation even in the most adverse and difficult circumstances. There have been great achievements by CPWD in building infrastructure of various departments and organizations all over the country. Some important works executed by it pertain to Roads under R S V V, PMGSY in other Jeeves for INRA, CPWF works for ISS, DRIP, ITDP, S S R, Health Projects under PMGSY and Border fencing, Roads and Fencing in Pakistan, and Bangladesh.

I have been informed that CPWD is executing works for 323 Departments out of 45 Ministries. Its work portfolio consists of over 4000 projects of different magnitude costing over Rs. 23000 crores and in the last six months alone, 49 major works costing over Rs. 2750 crores have been entrusted to CPWD. This is a testimony to the dedication, commitment and hard work of our officers and staff.

I wish all success to Central Public Works Department in its efforts.

MESSAGE

CPWD in a span of 157 years has grown into a large professional organisation which has developed expertise in various areas of construction work. It is now established that CPWD is not only the country’s largest public works department but is also able to maintain itself in a robust state of health and continues to contribute to the development of the Nation in a very significant manner. The stupendous growth achieved by the Department and the modern infrastructures that have been created and are being created across the length and breadth of the country is the standing proof of our technical excellence, dedication and high calibre of our officers and staff.

The CPWD has contributed with dedication by creating infrastructure for Agriculture, Textiles, Education, Health at various locations in the country. CPWD is looking Green by its construction in a big way. All clients vying for Green Construction have facility for single window service in CPWD.

On 157th Anniversary, I hereby convey my best wishes to all the Members of the CPWD family on this occasion and urge them to strive even harder in their endeavours.

MESSAGE

CPWD Day function shall be held on 12.7.2011 at 1000 hrs at Vigyan Bhawan, New Delhi.
Advantages of GRIHA
Lays emphasis on “cost-effective” strategies for making green buildings – through INTEGRATED DESIGN APPROACH
Are green buildings more expensive?
Green Buildings

3000~4000 Rs/sqft
- 350 kWh/sqm/annum

2000 Rs/sqft
- 200 kWh/sqm/annum

GRIHA

4000~4500 Rs/sqft
- 210 kWh/sqm/annum
- 40% reduction

2500 Rs/sqft
- 120 kWh/sqm/annum
- 40% reduction
For conserving energy – in a cost-effective manner

Cheapest Solution

Passive design of building

Use of Efficient Systems

Use of Renewable Energy

Most Expensive Solution
For conserving water – in a cost effective manner

Cheapest Solution

Optimization of water demand

Use of water efficient Systems

Use of recycled water and rainwater harvesting

Most Expensive Solution
INFOSYS, Hyderabad
Versatile rating system
- Building types
  - Commercial
  - Residential
  - Institutional
  - Hospitals
  - Hotels
  - Any building as long as it's not a factory building

- 5 climatic zones
  - Hot – Dry
  - Warm – Humid
  - Composite
  - Temperate
  - Cold
HIRCO, Panvel Residential project
Suzlon OneEarth, Pune – 5 star GRIHA rated
Police Training School, Sangli – 4 star GRIHA rated
PCNTDA Headquarters, Pimpri-Chinchwad

Source: Landmark Design
Non-applicability clauses

incorporating COMMON SENSE in the rating...
Puts emphasis on Human Comfort
- since that’s what buildings are designed for!
CESE building, IIT Kanpur
Suzlon OneEarth, Pune
INFOSYS, Hyderabad
Evaluates against established energy efficiency benchmarks for evaluating Air-Conditioned, Non Air-Conditioned buildings as well as Hybrid buildings
<table>
<thead>
<tr>
<th>Climate Classification</th>
<th>Daytime occupancy EPI (kWh/m²/annum) 5 days a week</th>
<th>24-hour occupancy EPI (kWh/m²/annum) 7 days a week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>120</td>
<td>350</td>
</tr>
<tr>
<td>Composite/Warm &amp; Humid/Hot &amp; Dry</td>
<td>140</td>
<td>450</td>
</tr>
<tr>
<td>EPI for Residential Buildings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential Buildings</td>
<td></td>
<td>200 (kWh/m²/annum)</td>
</tr>
</tbody>
</table>
Extensive hand holding during site visits
Conditions on site before GRIHA
Conditions on site after GRIHA
what about small scale construction?
And the cumulative impacts....
SVAGRIHA

Simple

Versatile

Affordable
• Dedicated **design-cum-rating tool** designed for buildings with built-up area less than 2500 sqm.

• **14 criteria covering categories:** landscape, energy, water & waste, materials and lifestyle
<table>
<thead>
<tr>
<th>Sub-Group</th>
<th>Maximum points</th>
<th>Minimum points to be achieved</th>
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<tbody>
<tr>
<td>Landscape</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Energy</td>
<td>21</td>
<td>11</td>
</tr>
<tr>
<td>Water &amp; waste</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>Materials</td>
<td>8</td>
<td>4</td>
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<tr>
<td>Others</td>
<td>4</td>
<td>1</td>
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<table>
<thead>
<tr>
<th>Points achieved</th>
<th>SVAGRIHA Rating</th>
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<tbody>
<tr>
<td>25-30</td>
<td>★</td>
</tr>
<tr>
<td>31-35</td>
<td>★★</td>
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<tr>
<td>36-40</td>
<td>★★★</td>
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<td>41-45</td>
<td>★★★★</td>
</tr>
<tr>
<td>45-50</td>
<td>★★★★★</td>
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Designed for architects
# Rainwater Harvesting

## Rainwater Capturing

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<thead>
<tr>
<th>Location</th>
<th>Bhopal</th>
<th>Average Daily Rainfall (mm)</th>
<th>21.9</th>
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</thead>
<tbody>
<tr>
<td>Building Type</td>
<td>Commercial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total population</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total building</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 days (litre)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface Finish</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional Roof</td>
<td>20</td>
<td></td>
<td>416.1</td>
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<tr>
<td>Roof Garden</td>
<td>2</td>
<td></td>
<td>8.76</td>
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<tr>
<td>Concrete / Kota</td>
<td>1</td>
<td></td>
<td>20.05</td>
</tr>
<tr>
<td>Gravel</td>
<td>2</td>
<td></td>
<td>32.85</td>
</tr>
<tr>
<td>Brick Paving</td>
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<td></td>
<td>186.15</td>
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<tr>
<td>Total water</td>
<td></td>
<td></td>
<td>664.665</td>
</tr>
<tr>
<td>collected from</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>roof in 2 days</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size of the</td>
<td></td>
<td></td>
<td>550</td>
</tr>
<tr>
<td>rainwater</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>harvesting tank</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(litre)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ZED Earth Villa, Bengaluru – 5 star SVAGRIHA
GRIHA LD

- Launching February 2013
Online portals and services
GRIHA website
Welcome to GRIHA

GRIHA, an acronym for Green Rating for Integrated Habitat Assessment, is the National Rating System of India. GRIHA has been conceived by TERI and developed jointly with the Ministry of New and Renewable Energy, Government of India. It is a green building 'design evaluation system', and is suitable for all kinds of buildings in different climatic zones of the country.

ADaRSH, Association for Development and Research of Sustainable Habitats, is mandated to promote development of buildings and habitats in India through GRIHA. ADaRSH an independent platform for the interaction on scientific and administrative issues related to sustainable habitats in the Indian subcontinent. It was founded jointly by TERI (The Energy and Resources Institute, New Delhi) and MNRE (Ministry of New and Renewable Energy, Government of India) along with a handful of experts in the sustainability of built environment from across the country.

Know more >>

GRIHA feasibility tool for Self Assessment
Interested in getting your building evaluated under GRIHA, register your expression of interest online or download the form.

Member Zone
Already a member, please login
Username
Password
Sign In
Forgot Password?

National Conference on Green Design
Venue: Stein Auditorium, India Habitat Centre, New Delhi
Date: 14-15 February 2013

ADaRSH along with TERI and MNRE is organizing its flagship event the National Conference on Green Design 4th edition in New Delhi on 14-15 February 2013.

Photography and Documentary Competition
Last date of submission: 7 January 2013

Photography and Documentary Competition for undergraduate students of architecture, civil/mechanical/electrical/environmental engineering and film-making on the theme Sustainability in Lifestyle.

Committed to Green Competition
Last date of submission: 7 January 2013

Committed to 'Green' - Competition for Green Developers of India. Open for Real Estate Developers, Builders, and Promoters of buildings and construction.
GRIHA Product Catalogue
Product Catalogue

**Criterion 17**: [ ] Internal Partitions [ ] False Ceiling [ ] Flooring [ ] Inbuilt Furniture [ ] Panelling [ ] Doors & window: panels and frames [ ] Low-energy glass for interior applications

3 product(s)

- **AGV - 1150 S/D**, 1050 S/D, 1137 SW/DW, 3083 SW/DW
  - Criteria Applicable: GRIHA: 17, SVAGRIHA: 12
  - Product Topology: Doors & window: panels and frames

- **AGV - 1150 S/D**, 1050 S/D, 1137 SW/DW, 3083 SW/DW
  - Criteria Applicable: GRIHA: 17, SVAGRIHA: 12
  - Product Topology: Doors & window: panels and frames

- **AGV - 2100 S/D**, 2065, 2101, 4083 SW/DW
  - Criteria Applicable: GRIHA: 17, SVAGRIHA: 12
  - Product Topology: Doors & window: panels and frames

**Address**
VILLAGE RAMPUR JATTAN, BEHIND KALA AMB, INDUSTRIAL AREA P.O, KALA AMB,
Dist Sirmour – 173030 (HP)

**Contact Number(s)**
9310068401

**Email-ID(s)**
myemail@gmail.com
GRIHA documentation portal
## Site specific criterias

<table>
<thead>
<tr>
<th>Criteria Status</th>
<th>Action</th>
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<tbody>
<tr>
<td>Saved: 1</td>
<td>View Summary</td>
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<tr>
<td>Pending: 8</td>
<td>View Criteria</td>
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## Building(s) specific criterias

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<th>Building Type</th>
<th>Area (Sq. m.)</th>
<th>Criteria Status</th>
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<td>Fghfgh</td>
<td>Commercial</td>
<td>60000</td>
<td>Pending: 6</td>
<td>View Summary</td>
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## Last Activity In Your Project(s)

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<tbody>
<tr>
<td></td>
<td>Criteria Saved by Dummy client (grcl0034).</td>
<td>06:12:2012</td>
</tr>
</tbody>
</table>
Next online tools

• SVAGRIHA online tool

• GRIHA LD online tool
Individual choices, social impacts
Thank You

Apoorv Vij
Programme Officer & Associate Fellow
Association for Development and Research of Sustainable Habitats

apoorv.vij@grihaindia.org