STATE LEVEL WORKSHOP
ON
WATER CONSERVATION AND WASTE WATER RECYCLE & REUSE IN RAJASTHAN
ISSUES AND CHALLENGES
ON
February 07, 2013

SUPPORTED BY
CCCB NURM, Ministry of Urban Development, Government of India
AND
Department of Urban Development, RUFIDCO & HCM RIPA, Government of Rajasthan

PRESENTATION
ON
WATER EFFICIENCY IN BUILDINGS

N.S. RATHORE, ARCHITECT-PLANNER, PROFESSOR AND DEAN ACADEMICS
AAYOJAN SCHOOL OF ARCHITECTURE, JAIPUR
WATER GLOBAL PERSPECTIVE

Global Future Determinants

Energy And Land For Development

Water For Survival

Distribution of Earth's Water

- Freshwater 3%
  - Saline (oceans) 97%
  - Ground water 30.1%
  - Icecaps and Glaciers 68.7%
- Other 0.9%
- Surface water 0.3%
- Rivers 2%
- Swamps 11%
- Lakes 87%

ISSUES

- Scarcity amidst plenty
- Inequitable distribution
- Pollution

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Aayojan School of Architecture, Jaipur
Global average water footprint

ISSUES

- Developed countries have high consumption of water in all sectors
- Agriculture sector is the major consumer of water
WATER RAJASTHAN PERSPECTIVE

<table>
<thead>
<tr>
<th></th>
<th>INDIA</th>
<th>% of World</th>
<th>RAJASTHAN</th>
<th>% of India</th>
</tr>
</thead>
<tbody>
<tr>
<td>POPULATION</td>
<td>1,210,193,422</td>
<td>(17.4%)</td>
<td>6,86,21,012</td>
<td>(5.7%)</td>
</tr>
<tr>
<td>LAND AREA</td>
<td>3,287,240 Km²</td>
<td>(0.6%)</td>
<td>342,240 Km²</td>
<td>(10.4%)</td>
</tr>
<tr>
<td>FRESH WATER</td>
<td>1.4 million Km³</td>
<td>(4%)</td>
<td>0.02 million Km³</td>
<td>(1.2%)</td>
</tr>
</tbody>
</table>

ISSUES
• Acute shortage of fresh water
• Availability of water/capita/day is among the lowest in country

WATER JAIPUR PERSPECTIVE

WATER SOURCES Bisalpur 50 mld + Ground water 300 mld
WATER REQUIREMENT 445 mld @ 135 ltr./cap/day
WATER AVAILABLE 350 mld @ 114 ltr./cap/day
WATER SHORTAGE 95 mld

ISSUES
• Over exploitation of ground water resulting in depletion @2m/year
• High content of fluoride and nitrite in ground water
• Salinity

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WATER USE IN BUILDINGS

DOMESTIC WATER USE IN INDIA

- GARDENING 17%
- WASHING 33%
- BATHING 15%
- FLUSHING 30%
- DRINKING AND COOKING 5%

ISSUES

- Buildings Consume 10% of total Fresh water
- Availability of water is fixed, so efficiency in use is the only way to mitigate the ever increasing demand.
- Portable water is used in flushing and gardening.

END RESULT OF WATER

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WATER EFFICIENCY MEASURES

Reduction in losses
- Checking Leakages
- Water metering

Reduction in consumption
- Using water efficient domestic appliances
- Using water efficient faucets in toilets

Water conservation in landscape
- Native plant species
- Efficient irrigation systems
- Schedule for watering

Water reuse and conservation
- Reduce use of portable water for non portable applications
- Install duel plumbing line for fresh and treated water
- Harvest rain water

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### Water Efficiency Measures

<table>
<thead>
<tr>
<th>Category</th>
<th>Consumption (lpcd)</th>
<th>Reduced Consumption (lpcd)</th>
<th>Reduction in Fresh Water Demand</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>Fresh</td>
</tr>
<tr>
<td>Drinking &amp; cooking</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Bathing</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Flushing</td>
<td>45</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Washing</td>
<td>40</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Gardening</td>
<td>23</td>
<td>23</td>
<td>13</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>135</strong></td>
<td><strong>86</strong></td>
<td><strong>55</strong></td>
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</tbody>
</table>
GREEN BUILDING CHARACTERISTICS

CONVENTIONAL V/S GREEN BUILDINGS
• Same in functionality and appearance
• Different in concern for resource conservation and human productivity.
• Little costlier in construction cost, but economical considering social and environmental cost.
• Saves energy up to 50% and water up to 35%
• Human productivity improves up to 10% due to improved day lighting, views and air quality
# GREEN BUILDING RATING SYSTEMS – LEED INDIA (IGBC)

## LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN

<table>
<thead>
<tr>
<th>S.no.</th>
<th>Credits</th>
<th>NC (new construction)</th>
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<tbody>
<tr>
<td>1.</td>
<td>SUSTAINABLE SITES</td>
<td>14</td>
</tr>
<tr>
<td>2.</td>
<td>WATER EFFICIENCY</td>
<td>5</td>
</tr>
<tr>
<td>3.</td>
<td>ENERGY AND ATMOSPHERE</td>
<td>17</td>
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<tr>
<td>4.</td>
<td>MATERIALS AND RESOURCES</td>
<td>13</td>
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<tr>
<td>5.</td>
<td>INDOOR ENVIRONMENT QUALITY</td>
<td>15</td>
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<tr>
<td>6.</td>
<td>INNOVATION</td>
<td>5</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>69</strong></td>
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**CERTIFIED**  
26-32  
**GOLD**  
39-51  
**SILVER**  
33-38  
**PLATINUM**  
52-69  

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## GREEN BUILDING – RATING SYSTEMS - LEED INDIA (IGBC)

### WATER EFFICIENCY

<table>
<thead>
<tr>
<th>CREDITS</th>
<th>DESCRIPTION</th>
<th>POINTS</th>
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<tr>
<td>CREDIT 10</td>
<td>WATER EFFICIENT LANDSCAPING</td>
<td>2</td>
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<tr>
<td>CREDIT 2</td>
<td>INNOVATIVE WASTEWATER TECHNOLOGIES</td>
<td>1</td>
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<tr>
<td>CREDIT 3</td>
<td>WATER USE REDUCTION</td>
<td>2</td>
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</tbody>
</table>

**Diagram:**
- ROOT ZONE TREATMENT SYSTEM

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GREEN BUILDING – RATINGS SYSTEMS - GRIHA (TERI)

GREEN RATING FOR INTEGRATED HABITAT ASSESSMENT

<table>
<thead>
<tr>
<th>S.no.</th>
<th>CRITERIA</th>
<th>POINTS</th>
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<tbody>
<tr>
<td>1.</td>
<td>SUSTAINABLE SITE PLANNING</td>
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<tr>
<td>2.</td>
<td>BUILDING DESIGN OPTIMIZATION</td>
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<tr>
<td>3.</td>
<td>ENERGY PERFORMANCE OPTIMIZATION</td>
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<tr>
<td>4.</td>
<td>RENEUABLE ENERGY UTILIZATION</td>
<td>8</td>
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<tr>
<td>5.</td>
<td>WATER, WASTE WATER AND SOLID WASTE MANAGEMENT</td>
<td>18</td>
</tr>
<tr>
<td>6.</td>
<td>LOW ENERGY BUILDING MATERIAL AND CONSTRUCTION TECHNOLOGY</td>
<td>14</td>
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<tr>
<td>7.</td>
<td>HEALTH, WELL BEING &amp; ENVIRONMENT QUALITY</td>
<td>12</td>
</tr>
<tr>
<td>8.</td>
<td>INNOVATION (BEYOND 100)</td>
<td>4</td>
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<tr>
<td></td>
<td>TOTAL</td>
<td>104</td>
</tr>
</tbody>
</table>

51-60 ★ 61-70 ★★ 71-80 ★★★ 81-90 ★★★★ 91-100 ★★★★★

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## GREEN BUILDING – RATING SYSTEMS - GRIHA (TERI)

### WATER, WASTE WATER MANAGEMENT

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
<th>POINTS</th>
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<tr>
<td>Criteria 10</td>
<td>Reduce landscape water requirement</td>
<td>3</td>
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<tr>
<td>Criteria 11</td>
<td>Reduce building water use</td>
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<tr>
<td>Criteria 12</td>
<td>Efficient water use during construction</td>
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<tr>
<td>Criteria 20</td>
<td>Waste water treatment</td>
<td>2</td>
</tr>
<tr>
<td>Criteria 21</td>
<td>Water recycle and reuse (including rain water)</td>
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</tbody>
</table>

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GREEN BUILDING – CASE STUDIES

CII SOHRABJI GREEN BUSINESS CENTRE, HYDRABAD

BUILDING TYPE Office
BUILTUP AREA 1858 sq.m.
CLIMATE Warm & Humid
ARCHITECT Karan Grover
BUILDING FOOTPRINT 9.2% of the site

First LEED platinum rated green building in India

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GREEN BUILDING – CASE STUDIES

The outside brought in -COURTYARDS

Influences microclimate and hence human comfort

Contributes colour and is a visual delight

Defines and articulates space

Greenery and Landscape is proven to be therapeutic and a stress buster

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GREEN BUILDING – CASE STUDIES

WATER EFFICIENCY MEASURES

1) Root Zone Treatment Of Waste Water
2) Rain water harvesting
3) Water-less urinals in men’s restroom
4) Water-efficient fixtures: ultra low and low-flow flush fixtures
5) Water-cooled scroll chiller
6) Secondary chilled water pumps with variable frequency drives
7) Swales for storm water collection

WATER EFFICIENCY FEATURES

1) Zero Discharge Building
2) 35% reduction in potable water consumption
GREEN BUILDING – CASE STUDIES

2. CENTRE FOR ENVIRONMENTAL SCIENCE & ENGINEERING, IIT KANPUR

BUILDING TYPE: Educational
BUILTUP AREA: 4240 sq.mt.
CLIMATE: Composite
ARCHITECT: Kanvinde rai & Chowdhury

First GRIHA 5 star green rated building in India

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Grass swales for natural drainage

Pervious paving

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GREEN BUILDING – CASE STUDIES

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GREEN BUILDING – CASE STUDIES

WATER EFFICIENCY MEASURES
1) Reduced landscape water requirement
2) Reduced building water use
3) Efficient water use during construction
4) Waste water treatment
5) Water recycle and reuse

WATER EFFICIENCY FEATURES
1) Effective use of existing water body by North-South Building orientation.
2) 30% reduction in potable water consumption.

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3. PEARL GREEN ACRES, JAIUR

BUILDING TYPE: Group Housing
BUILTUP AREA: 5750 sq.mt.
Dwelling Units: 250
CLIMATE: Composite
ARCHITECT: M A Architects

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WATER EFFICIENCY MEASURES

STP for water recycling, reused for irrigation and flushing.

Rain water harvesting.

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4. **BIRKHA BAWARI, JODHPUR**

- **BUILDING TYPE**: Rain water harvesting structure
- **BUILTUP AREA**: 5750 sq.mt.
- **CLIMATE**: Hot & Dry
- **ARCHITECT**: Anu Mridul
- **COST**: 8 Cr. (2009)

*First contemporary subterranean rain water harvesting structure.*
GREEN BUILDING – CASE STUDIES

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GREEN BUILDING – CASE STUDIES

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GREEN BUILDING – CASE STUDIES

DESIGN FEATURES
- Designed for Umaid heritage housing township at foothills of Umaid Bhawan palace.
- Designed for a catchment area of 110 acres.
- Design to hold 150 million liters harvested rain water

ARCHITECTURAL STRUCTURE
- LENGTH: 224 M
- WIDTH: 10.5 M
- AVG. DEPTH: 11 M (FROM GL)
- MAX DEPTH: 18 M
- AVG. WATER DEPTH: 7 M
- WALL THICKNESS: 0.7 M

STRUCTURAL SYSTEM
- BARREL VAULTED TRABEATED STRUCTURE.

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STEP BACK IN TIME

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