Implementing Sustainability

Creating a Platform for Sustainable Design

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A Sustainable Master plan is a means to creating a sustainable campus, not the end
Sustainable Masterplanning

Water

- Reducing Demand
- Zero Discharge Site

Waste

- Centralised Waste Management

Climate / Outdoor Amenity

- Orientation
- Heat Island Effect
- Centralised Infrastructure

Pollution

- Noise/Air

Transport

- Internal transportation management
- Footpaths, cycle paths
- Local amenities

Biodiversity

- Ecological and geological conservation
- Local Flora

Energy

- Construction practices

Landscape design

- Site Conditioning
- Orientation
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Pollution

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Sustainable Masterplanning

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Enhancing water neutrality by
- Reducing Demand
- Increasing onsite rain water collection

Infosys Indore Design Approach
Runoff pattern and Lakes formation

The Site
Enhancing Water Neutrality:

We looked at improving rain water collection / detention and minimizing water demand by various methods.

Black Cotton Soil property:
- Water Retained = 60%
- Water percolated under ground = 10%
- Water available for run-off = 30%
  (Considering effective cleaning of leaves from ground)

Longer the distance and duration of run-off is equally proportionate to loss of water.

Hence for better water management, the key is to bring down run-off distance and time.

Enhancing Water Neutrality:

Standard Scenarios:

- Roof water: friction & other loses = 10-15%
- Open standard swale: percolation 10%, other loses = 30%
- Rain water collection ponds: percolation 10%, other loses = 30%
Reducing Friction Losses

Enhancing Water Neutrality:
Reducing Friction Losses

Canopies

Smotherer roof surfaces to reduce friction losses

Subsurface drains under groundcover and lawn areas

Strip Drains to increase surface water and subsurface water collection

Reducing Percolation Losses by reducing runoff time

Effective Water Detention. Series of interconnecting swales running parallel along the slope with a maximum Spacing of 100m. Water is detained intermittently on its way to the lowermost part of the site. This ensures reduction of run-off time resulting in higher level of water detention.
Enhancing Water Neutrality:
Reducing Evaporation Losses

Sub surface rainwater collection tanks

Shading tanks with Solar panels or trees
Creating wind barriers around the tanks
Water tanks around and under food courts so that they can act as heat sinks without evaporation losses

Wind Flow analysis & Irradiation Studies are done.
This Also Helps in establishing Location of Built forms,
& Identification of Appropriate Location for Water Bodies
Enhancing Water Neutrality:
Minimizing Water Demand: Internal
Consumption per day can be Optimized to 25li/per/day

WCs:
Pocharam = 6/3 Li
Proposed = 4/2 Li Dual Flush

Faucets:
Pocharam = 1.2 li/min
Proposed = Same

Urinals:
Pocharam = 0.5 – 1.5 Li
Proposed = Waterless Urinals (nano coating)

Washing Machines:
Standard Machines = 50-70 li/cycle
Steam Washing Machines (with solar steam generators) = 20-30li/cycle

Dishwashers:
Standard Machines = 14 li/cycle
Steam Dish washers (with solar steam generators) = 9 li/cycle

Showers:
Pocharam = 6 li with Aerators
Proposed = Same

Minimizing Water Demand: By opting for low water consuming Plants and Irrigation methods

Ground Cover
Plants
Trees
Drip Irrigation
Micro Sprinkler
Natural Habitat with no irrigation demand
Enhancing Water Neutrality:

The Occupancy Count:

<table>
<thead>
<tr>
<th>SN</th>
<th>DESCRIPTION</th>
<th>BASECASE</th>
<th>TARGETED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Water requirement in Ltrs per person per day</td>
<td>61.07</td>
<td>39.85</td>
</tr>
<tr>
<td>2</td>
<td>Water requirement in Cum per person per day</td>
<td>0.061</td>
<td>0.040</td>
</tr>
<tr>
<td>3</td>
<td>Water requirement in Cum per person per annum</td>
<td>17.099</td>
<td>11.158</td>
</tr>
<tr>
<td>4</td>
<td>Water Collected, Cum / Anum</td>
<td>207440</td>
<td>235029</td>
</tr>
<tr>
<td>4</td>
<td>Water Neutrality can be achieved for</td>
<td>12132</td>
<td>21064</td>
</tr>
</tbody>
</table>

Master-Plan Layout

58,200 Occupants
Recap:

THE CAMPUS EXPERIENCE IS ENVISAGED AS A WALK THROUGH A 42 ACRE FOREST AND LAKE PARKLAND, MEETING POROUS ARCHITECTURE TO EFFECT A SOFT TRANSITION BETWEEN THE CAMPUS AND THE BUILT ENVIRONMENT.

Phase-1
4036 Occupants
Water Neutrality for Phase 1 and 2:

<table>
<thead>
<tr>
<th>Sl.no</th>
<th>Particulars</th>
<th>Occupancy</th>
<th>Fresh Water Requirement (Ltrs/day)</th>
<th>Recycled Water Requirement (Ltrs/day)</th>
<th>Water Balance for Phase 1 &amp; 2 (Ltrs/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>SDB - for (Domestic Only)</td>
<td>12,127</td>
<td>30</td>
<td>363,810</td>
<td>16</td>
</tr>
<tr>
<td>B</td>
<td>Food Court</td>
<td>12,127</td>
<td>19</td>
<td>230,413</td>
<td>14</td>
</tr>
<tr>
<td>C</td>
<td>ECC / Accommodation for 245</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>HVAC Requirements</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Irrigation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Laundry</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reduction in Fresh Water Demand by 32% - 48l/per/day
Reduction of Recycled Water Demand by 51% - 72l/per/day

Includes
1. Offices for 12,127 per
2. Food court for 12,127 per
3. ECC / Accommodation for 245 per
4. Landscaping and development of forest areas
The Occupancy Count: 12,172

Water Neutrality for Phase 1 and 2:

- Deficit of 24% Reduced to an excess of 22%
- Deficit Reduced from 35% to 5%

Microclimate Conditioning

Enhancing the Microclimate
to
maximise the ability to Naturally Ventilate buildings
Microclimate Conditioning

- Maximise self shading
- Reduce wind tunnel effect
- Avoid still air zones
- Landscape design
- Reduce air and noise pollution

Infosys Indore Design Approach
Recap: the Site

FREQUENCY OF THERMAL COMFORT

<table>
<thead>
<tr>
<th>Ashrae Summer</th>
<th>Psychomotor</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 hours from 8 to 18</td>
<td>24 hours from 8 to 18</td>
</tr>
<tr>
<td>3829</td>
<td>776</td>
</tr>
<tr>
<td>4264</td>
<td>1034</td>
</tr>
<tr>
<td>% 44</td>
<td>49</td>
</tr>
<tr>
<td>37</td>
<td></td>
</tr>
<tr>
<td>with PDEC</td>
<td>with PDEC</td>
</tr>
<tr>
<td>4872</td>
<td>1422</td>
</tr>
<tr>
<td>5074</td>
<td>1975</td>
</tr>
<tr>
<td>% 55.62</td>
<td>43.29</td>
</tr>
<tr>
<td>57.92</td>
<td>47.95</td>
</tr>
<tr>
<td>with 1 m/s air mov.</td>
<td></td>
</tr>
<tr>
<td>hour</td>
<td>5168</td>
</tr>
<tr>
<td>% 59.00</td>
<td>39.42</td>
</tr>
<tr>
<td>1 m/s air mov. &amp; PDEC</td>
<td></td>
</tr>
<tr>
<td>hour</td>
<td>6784</td>
</tr>
<tr>
<td>% 77.44</td>
<td>69.01</td>
</tr>
</tbody>
</table>

Climatic Study

NV – 24%
Fans - 40%
Evaporative Cooling – 44%
Evaporative Cooling + Fans – 69%
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Wind Flow @1200mm

moving this service building will improve windflow through the site, especially in the cooler months

These building could be looked at as a set of linear buildings that will allow for better windflow through them and also create positive and negative pressures that will enhance natural ventilation through them

moving the MLCP and placing the services here improves the windflow through the SDB’s and food courts.

This has to be relocated/removed to ensure better flow through the site

This group of buildings need to be more aerodynamic as indicated in red to improve the air flow at pedestrian level
Indicated places are ideal for location of water bodies as the rate of evaporation will be low due to shading from the nearby buildings.

Water can be stored under/around food courts in semi-enclosed tanks, this will help modulate the temperatures within the food courts acting as heat sinks.

**Microclimate Conditioning**

*Manipal University Jaipur Hostels*
Irradiation Studies
Ground level – Wind Studies

Create ground level corridors connecting courtyards and streets

Positions marked in the image

Still air zone

Still air zone

Still air zone

Manipal University Jaipur Hostels – Architects Hafeez Contractor

Landscape Consultants - Masterplan
Site Conditioning

Gradual adaptation between external and internal, air conditioned spaces

Prevailing wind can be used to enhance pedestrian comfort, particularly at Ground / Entrance Level as well as in public areas

Design of Ground Level can be optimised to improve on external comfort conditions

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean Wind Speed to be exceeded for no more than 6% of time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian Sitting</td>
<td>43m/s</td>
<td>Sitting for a long duration e.g. sitting at an external café or other comparable amenity area.</td>
</tr>
<tr>
<td>Pedestrian Standing</td>
<td>63m/s</td>
<td>Standing or sitting for a short time e.g. during window shopping, waiting at bus stops, within building entrances.</td>
</tr>
<tr>
<td>Pedestrian Walking</td>
<td>83m/s</td>
<td>Normal walking or strolling as in sightseeing.</td>
</tr>
<tr>
<td>Business Walking</td>
<td>93m/s</td>
<td>Walking from one place to another quickly or where individuals pass rapidly through local areas around buildings.</td>
</tr>
</tbody>
</table>

Site Conditioning

Feels like 45°C
- Outdoor (unprotected) (Minimal)
  - Unshaded, unprotected, un-controlled
  - Onsite open public spaces should be kept under shade and controlled

Feels like 36°C
- Outdoor (Protected) (Maximal)
  - Shaded and Protected but uncontrolled, Non Conditioned, Public Space

Feels like 32°C
- Semi - Outdoor
  - Conditioned, Non Conditioned Public Space
  - Public spaces within the building footprint
  - Social / interactive spaces as building entrances

Feels like 26°C
- Indoor
  - Conditioned, Conditioned using passive means
  - To consider orientation, occupancy - function of spaces, connectivity to adjacent semi outdoor space
Site Conditioning

Site Conditioning

OUTDOOR SPACES - DESIGN OPPORTUNITIES - TRANSITIONAL SPACES

Feels like 38°C
External spaces with protection from rain and direct solar gains to occupants
Site Conditioning

OUTDOOR SPACES - DESIGN OPPORTUNITIES - TRANSITIONAL SPACES

Feels like 35°C

Spaces adjacent to buildings (public semi-open spaces) with vegetation and shading design features to provide thermal and visual comfort.

Feels like 30°C

Buffer/transition spaces controlled and conditioned by passive cooling elements like water features, spray-ponds, PDCC (Evaporative cooling towers), etc.
Thank you

Sustainable Masterplanning

A means towards sustainable development, not the end