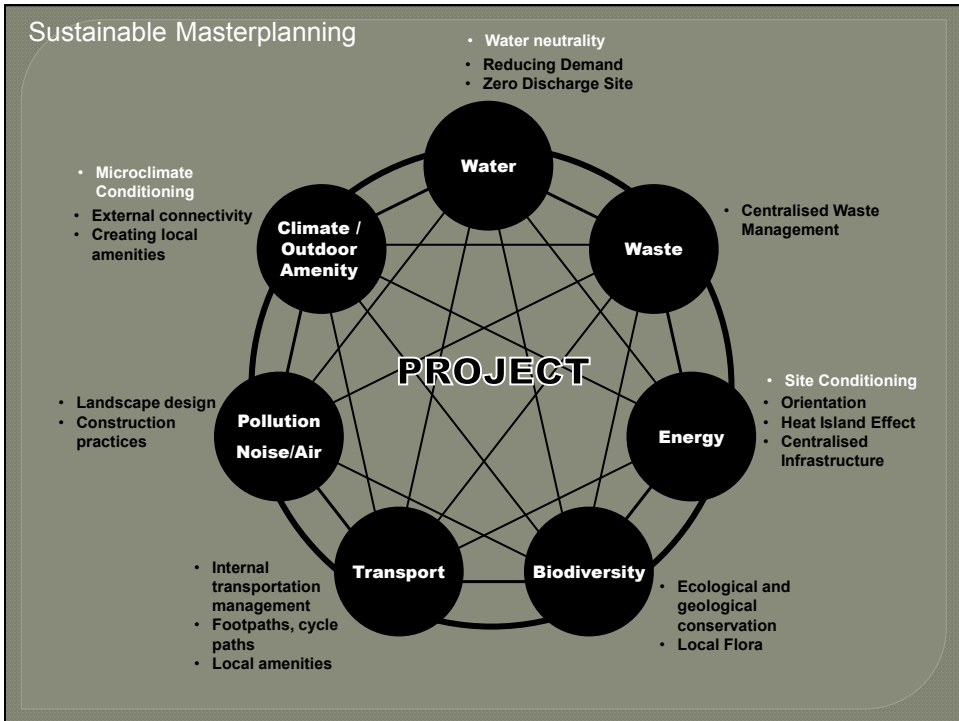
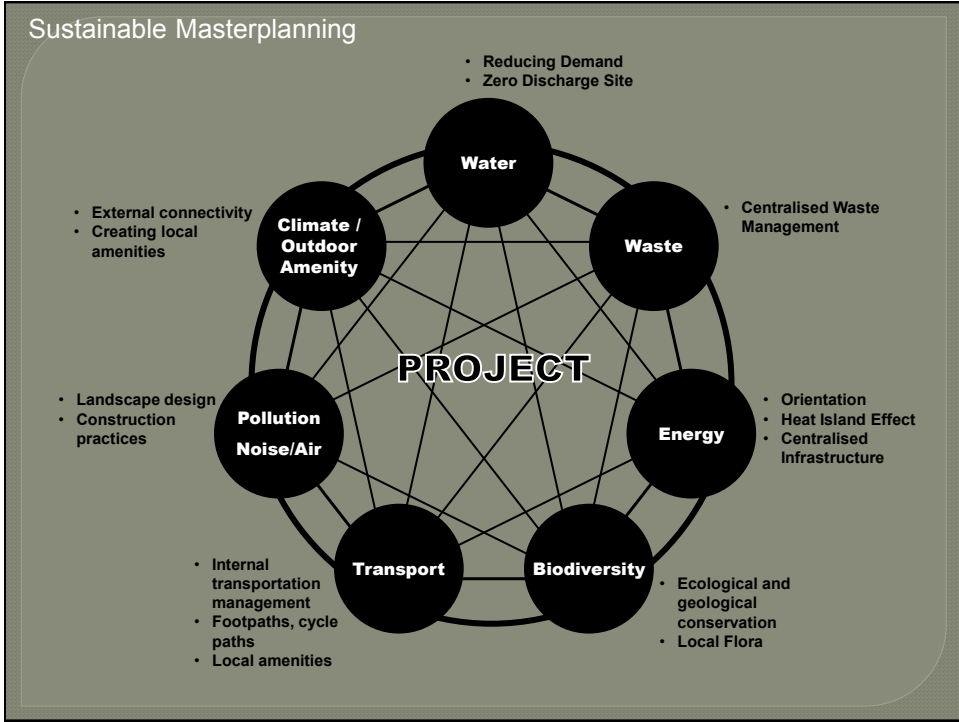


Sustainable Masterplanning

An Alternate Approach
Future Proofing Design

Swati Puchalapalli
Terra Viridis
Regional GRIHA Conference
Bangalore 15th Nov 2013

**A Sustainable Master plan
has to be a means to creating a sustainable campus,
not the end**



Water Management

- Demand Reduction
- Waste water treatment and reuse
- Rainwater Harvesting
- Stormwater management

Manipal University Jaipur

Manipal University Jaipur – Sundaram Architects

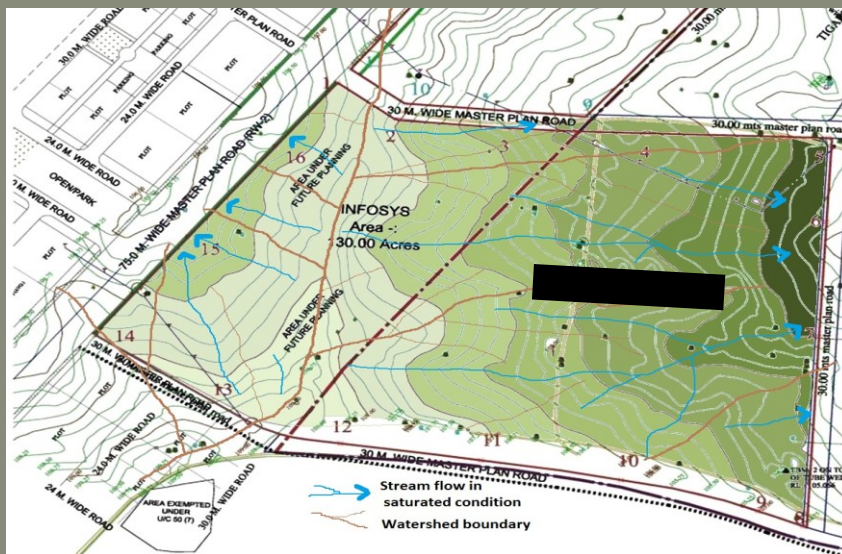


Water Neutrality

- Enhancign water neutrality of the site by Reducing Demand and Increasing onsite rain water collection

Infosys Indore Design Approach

Infosys Indore – Edifice Architects



Runoff pattern and Lakes formation



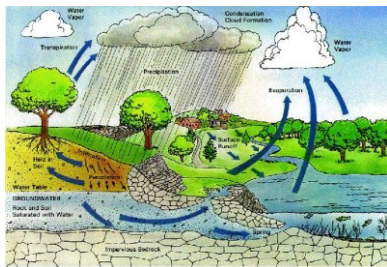
The Site Has a 550m Frontage towards the Super Corridor and is about a Kilometre long.

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 Proportion ate to Loss of Water.

Hence for Better Water Management, the Key to **bring down Run-off distance and time**

Enhancing Water Neutrality:

Standard Scenarios:



Roof Water: Friction & Other Losses = 10-15%
Evaporation Loss = 5%



Open Standard Swale.
Percolation 10%,
Other Losses= 30%



Rain Water Collection Ponds.
Percolation 10%,
Other Losses= 30%

Enhancing Water Neutrality:

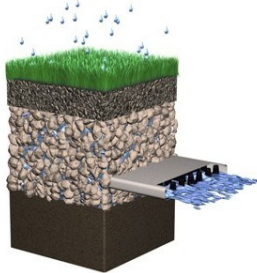
Reducing Friction Losses



Canopies



Smoother roof surfaces to reduce friction losses



Subsurface drains under groundcover and lawn areas



Strip Drains to increase surface water and sub surface 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 intermediately on its way to the lower most part of the site. This ensures reduction of run-off time resulting in higher level of water detention.

TerraViridis
Environmental Design Consultants

EDIFICE

Enhancing Water Neutrality: Reducing Evaporation Losses

Sub surface rainwater collection tanks

Underground Tanks

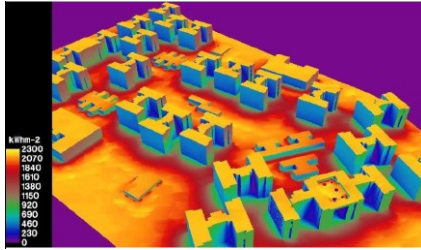
RainTank™

- 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

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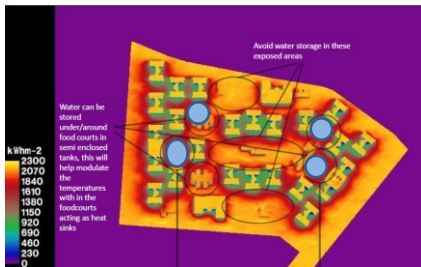
Enhancing Water Neutrality:
Reducing Evaporation Losses



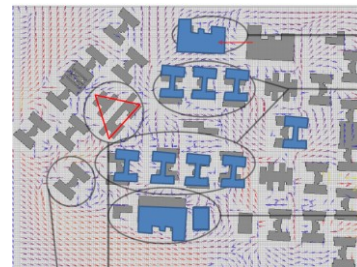
Wind Flow analysis & Irradiation Studies are done.

This Also Helps in establishing **Location of Built forms,**

& Identification of **Appropriate Location for Water Bodies**



Irradiation Studies



Wind Flow Analysis

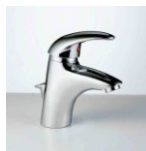


Enhancing Water Neutrality:

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



Enhancing Water Neutrality:

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

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Environmental Design Consultants

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Enhancing Water Neutrality:

The Occupancy Count:

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

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Recap:

CAMPUS FEEL

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





Microclimate Conditioning

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

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

Microclimate Conditioning

Infosys Indore Design Approach

Recap: the Site

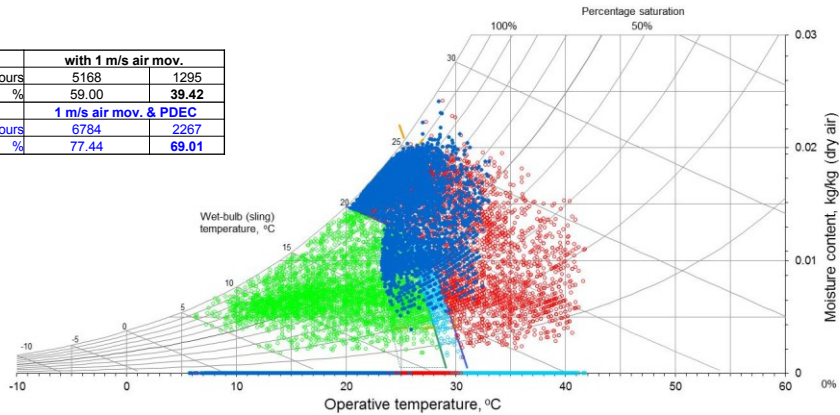


Climatic Study

FREQUENCY OF THERMAL COMFORT				
	Ashrae Summer		Szokolay	
	24 hours	from 8 to 18	24 hours	from 8 to 18
hours	3829	776	4264	1034
%	44	24	49	31
	with PDEC		with PDEC	
hours	4872	1422	5074	1575
%	55.62	43.29	57.92	47.95

NV – 24%
Fans - 40%
Evaporative Cooling – 44%
Evaporative Cooling + Fans – 69%

with 1 m/s air mov.	
hours	5168
%	59.00
1 m/s air mov. & PDEC	
hours	6784
%	77.44



EDIFICE

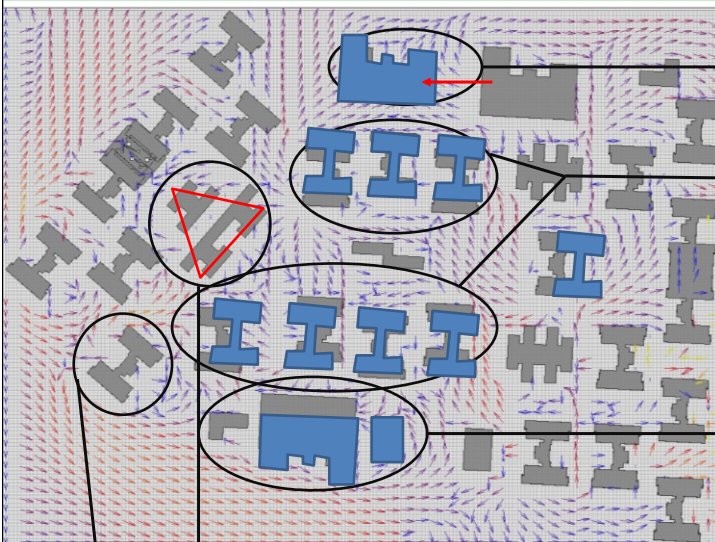
Recap:

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Wind Flow @1200mm



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

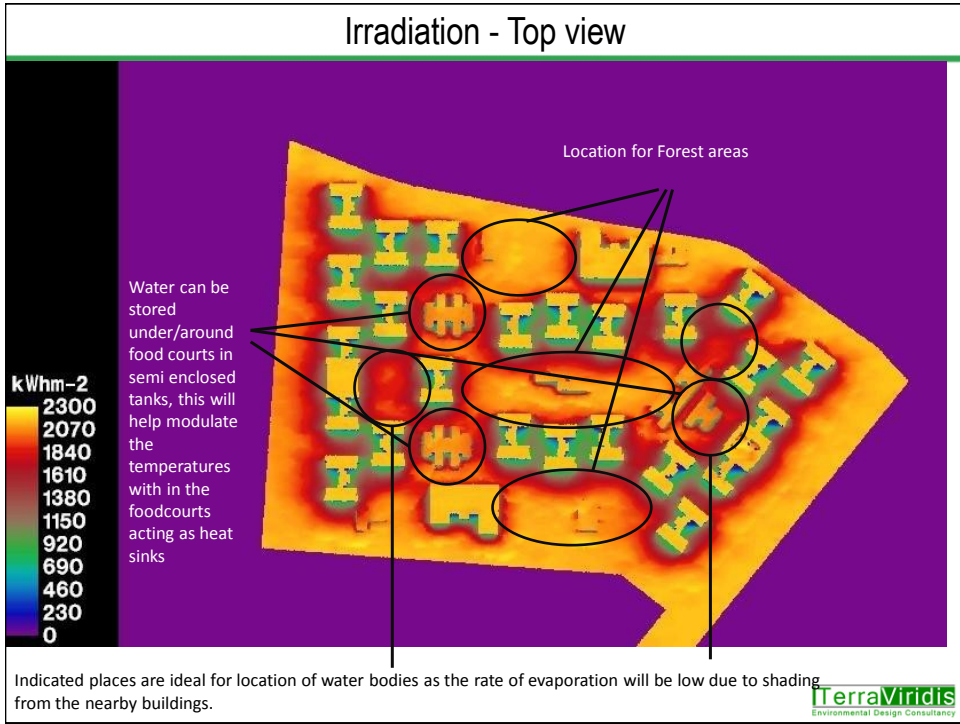
These building could be looked at as a set of linear buildings that will allow for better windflow through them and also create positive and negative pressures that will enhance natural ventilation through them

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





Microclimate Conditioning

Manipal University Jaipur Hostels

Manipal University Jaipur Hostels –Architects Hafeez Contractor



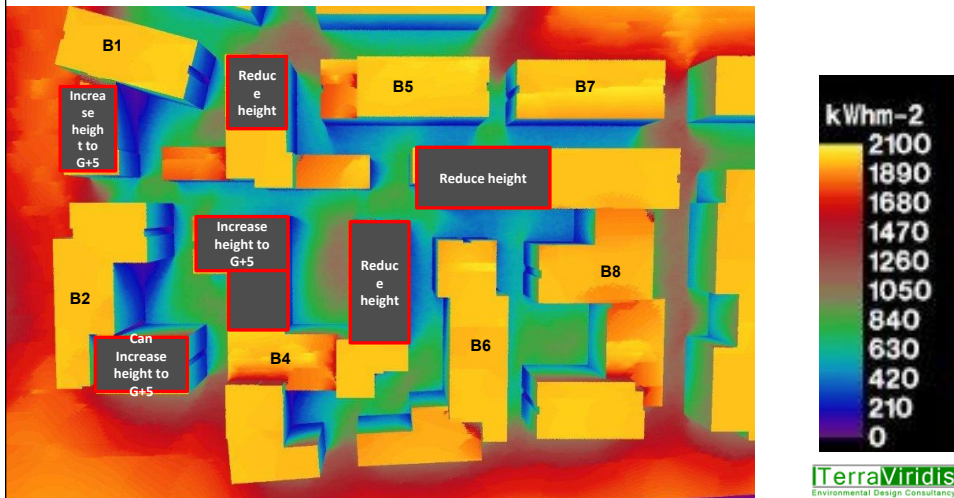
Manipal University Jaipur Hostels –Architects Hafeez Contractor



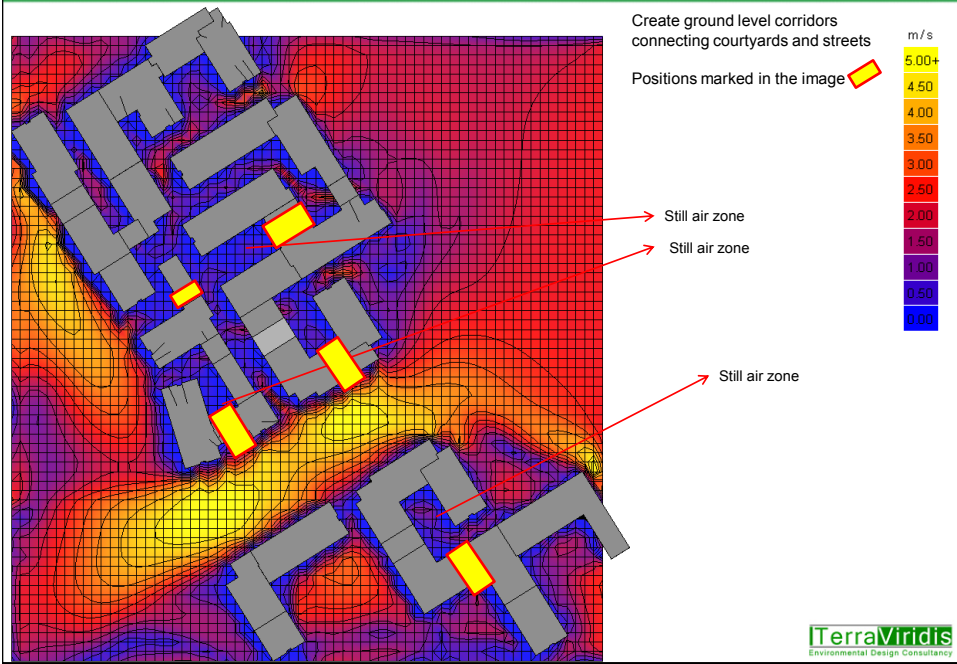
Manipal University Jaipur Hostels –Architects Hafeez Contractor



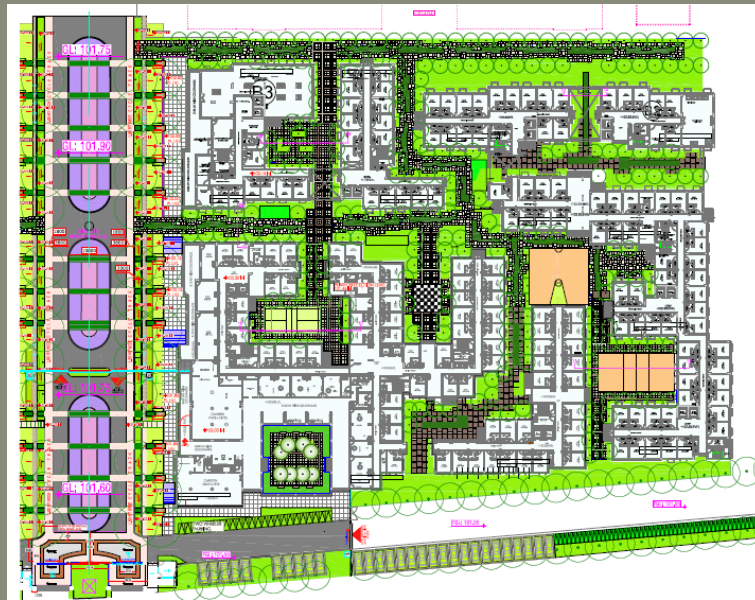
Irradiation Studies



Ground level – Wind Studies



Manipal University Jaipur Hostels –Architects Hafeez Contractor
Landscape Consultants - Masterplan



Site Conditioning

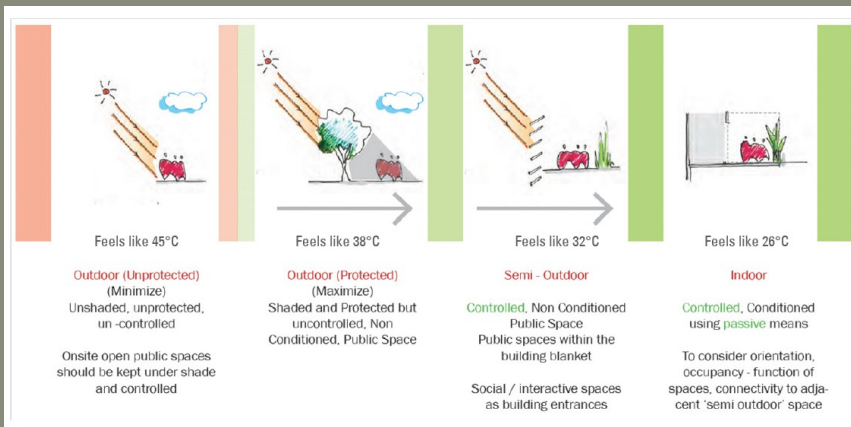
Gradual adaptation between external and internal, air conditioned spaces to

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

Category	Mean Wind Speed to be exceeded for no more than 5% of time	Activity
Pedestrian Sitting	4m/s	Sitting for a long duration e.g. sitting at an external café or other comparable amenity area.
Pedestrian Standing	6m/s	Standing or sitting for a short time e.g. during window shopping; waiting at bus stops; within building entrances.
Pedestrian Walking	8m/s	Normal walking or strolling as in sightseeing.
Business Walking	10m/s	Walking from one place to another quickly or where individuals pass rapidly through local areas around buildings.

• 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



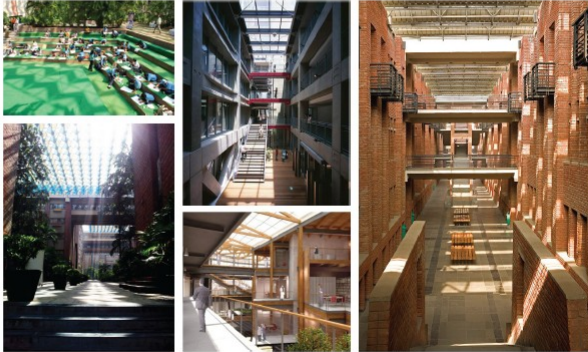
FEELS LIKE 38°C
EXTERNAL SPACES WITH PROTECTION FROM RAIN AND DIRECT SOLAR GAINS TO OCCUPANTS



OUTDOOR SPACES - DESIGN OPPORTUNITIES - TRANSITIONAL SPACES



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

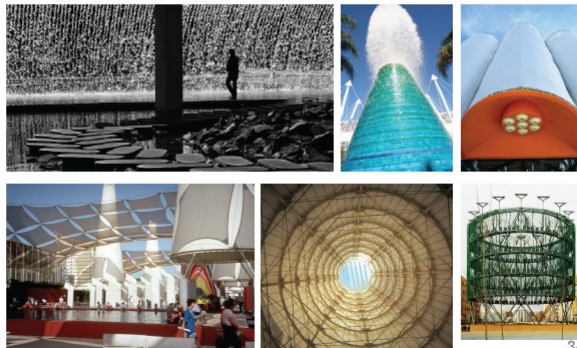


33

OUTDOOR SPACES - DESIGN OPPORTUNITIES - TRANSITIONAL SPACES



Buffer / transition spaces controlled and conditioned by passive cooling elements like water features, spray ponds, PDEC (Evaporative cooling towers), etc



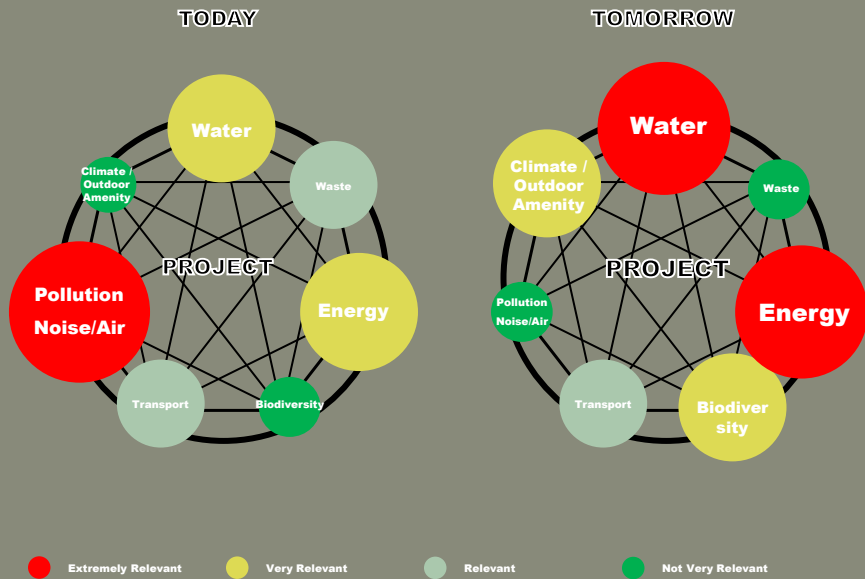
34

Sustainable Masterplanning – A Design Requirement

Future Proofing through Adaptability

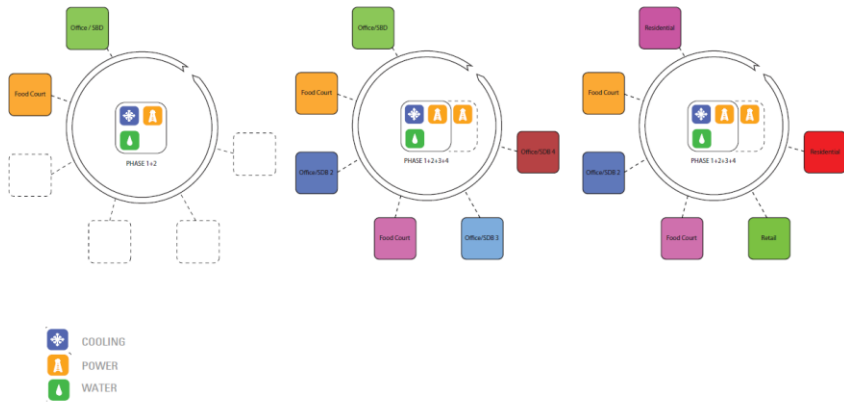
Site level
Infrastructure
Building
Interiors

Future Proofing
Today's Issues vs Tomorrow's Issues

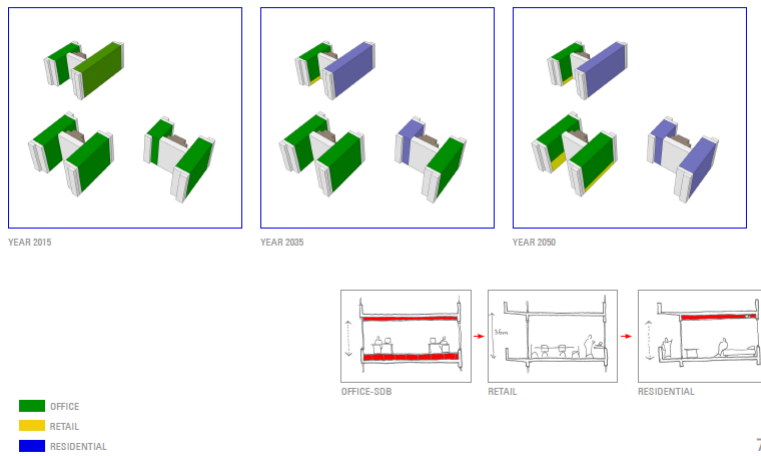


Future Proofing
Ability to incorporate future efficiency in technologies

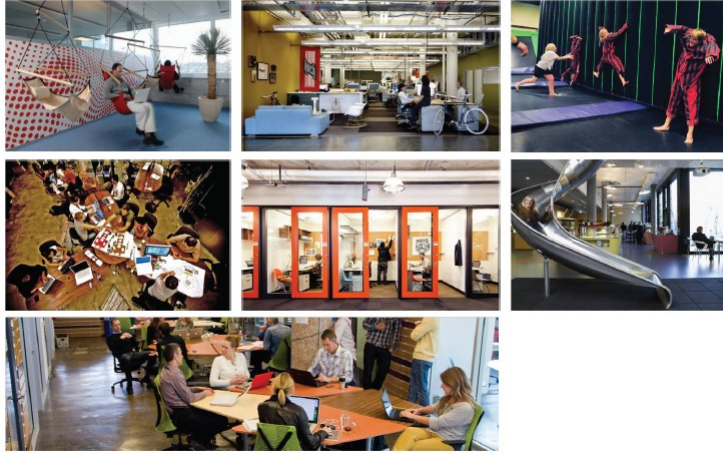
FUTURE THINKING - MASTERPLAN ADAPTABILITY



FUTURE THINKING - BUILDING ADAPTABILITY

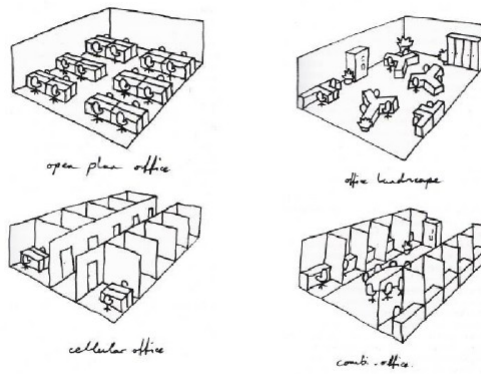


FUTURE THINKING - OFFICE ADAPTABILITY



10

FUTURE THINKING - OFFICE ADAPTABILITY



11

Thank you

Sustainable Masterplanning

A means towards sustainable development, not the end