Green Campus: From Knowledge to Practice

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New Delhi, August 23, 2019

AAETI

Environmental imperative of green campus.....

Unsustainable pressures on cities: Need solutions in built environment

-- Two-third of world's energy consumed in cities – by half of world's population.

-- By 2030 cities will consume 73% of world energy

-- Cities collectively consume 75% of world natural resources, generates 50% of waste, and emits 70% of greenhouse gases.

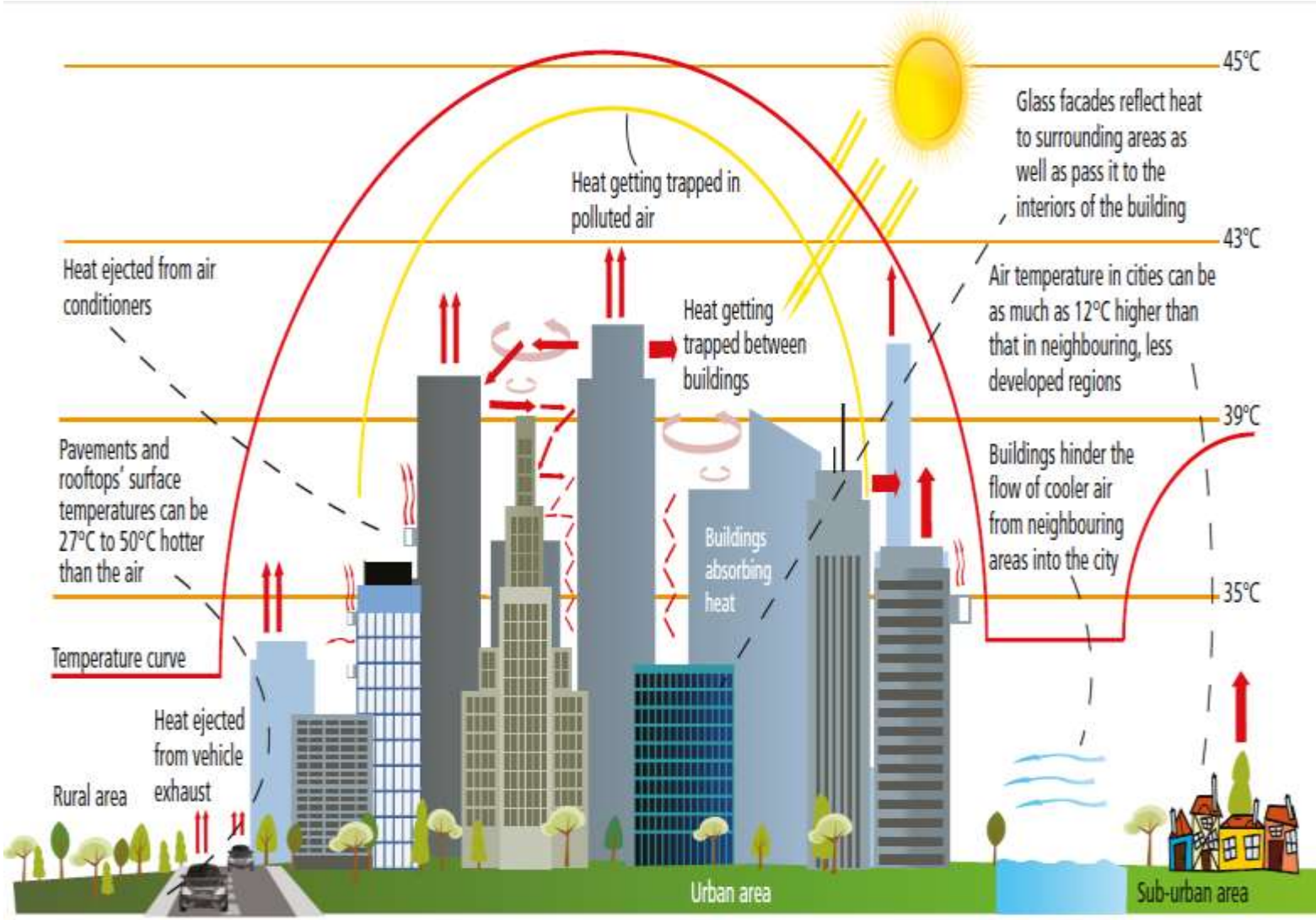
-- Cities vulnerable to extreme weather events – storm surge, heat waves, floods …..

-- More urban migration as people get displaced from ecologically sensitive areas… (UNEP says, nearly 40 million people in India will be at risk from sea level rise by 2050).

Need sustainable built environment

Inconvenient Truth….disregarding ecology

Cities are simmering in its own waste heat



Cities drowning in their own waste

Cities are losing battle of car bulge…..

Source: CSE

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Towards Green Campus?

Connecting buildings with the ecosystem….

CAMPUS AND SDG'S

CPWD moves forward – several initiatives

CPWD Green campus initiative

CPWD Manuals on sustainability

- CPWD Works Manual
- Integrated Green Design
- CPWD Green rating Manual

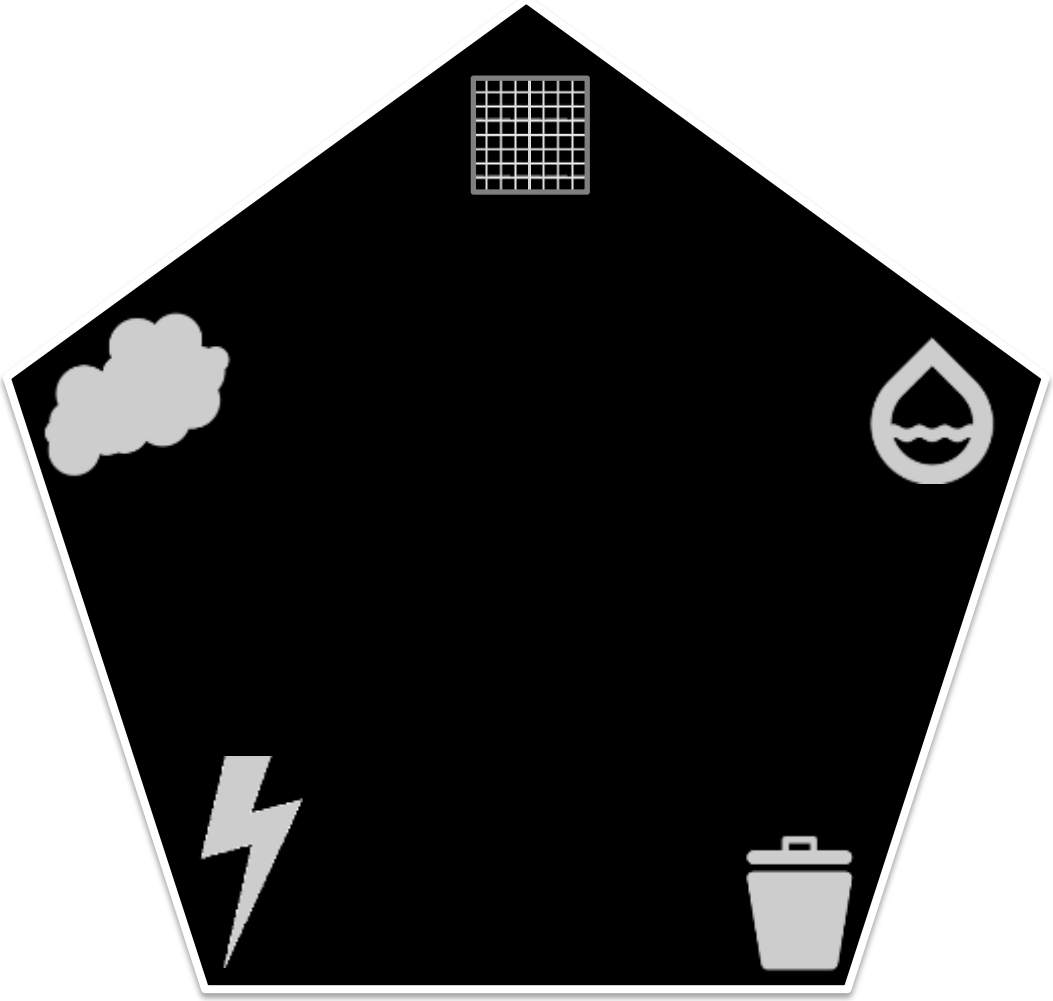
CPWD Guidelines for Sustainable Habitat: 2014 -- sets criteria for material selection and green design

RWA campaign – 100 days – 100 residential colonies in Delhi

- **Residential campaign – World Environment Day --** Habitat programme launched; Campaign - '*My Ability for Sustainability'*
- **CPWD green committee** for CPWD national academy.
- **Green education – training, handholding**

LAND

AIR



WATER

ENERGY

WASTE

Green Campus: Knowledge Centres

CSE
Tughlaqabad

CPWD
Academy

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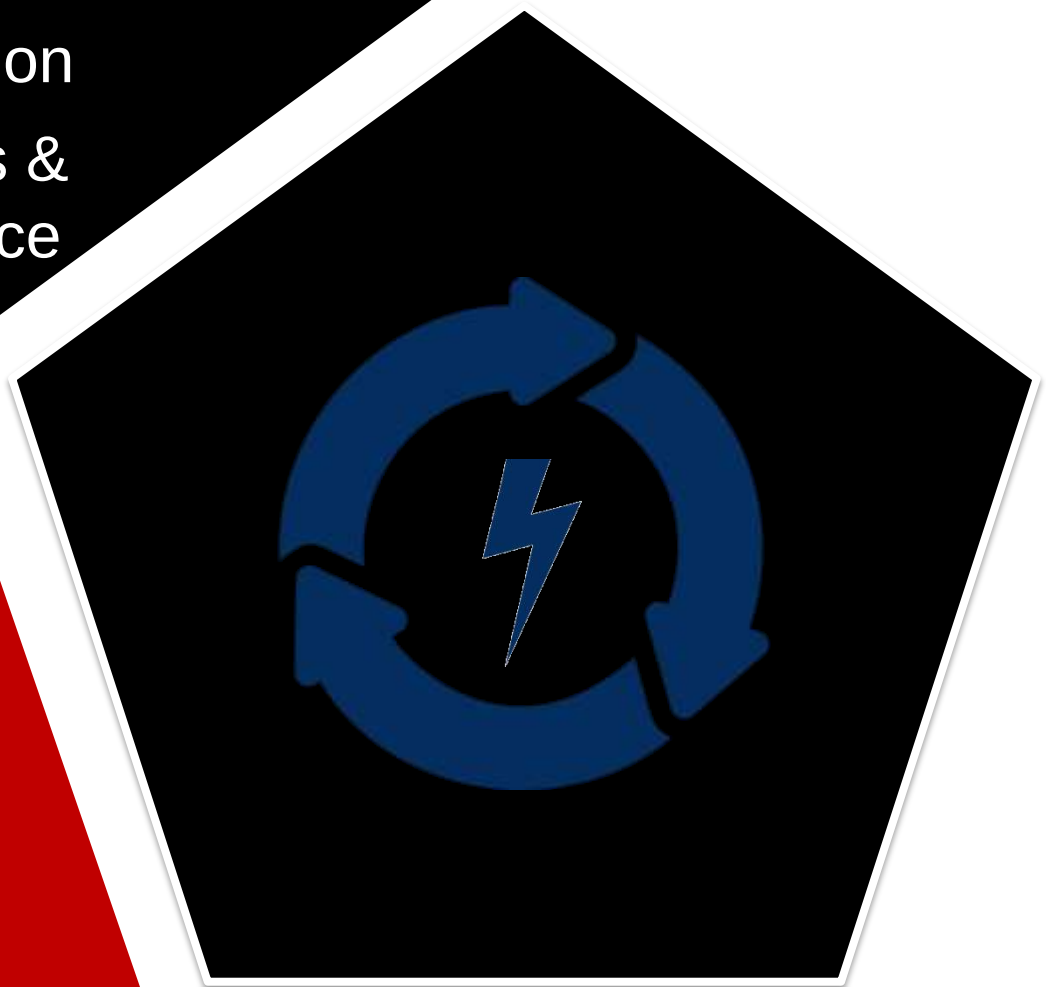
ENERGY

Consumption

Conservation

Operations & Maintenance



CSE

Towards holistic energy management
Material, energy efficiency and thermal comfort

India's Cooling Action Plan asks for thermal comfort for all

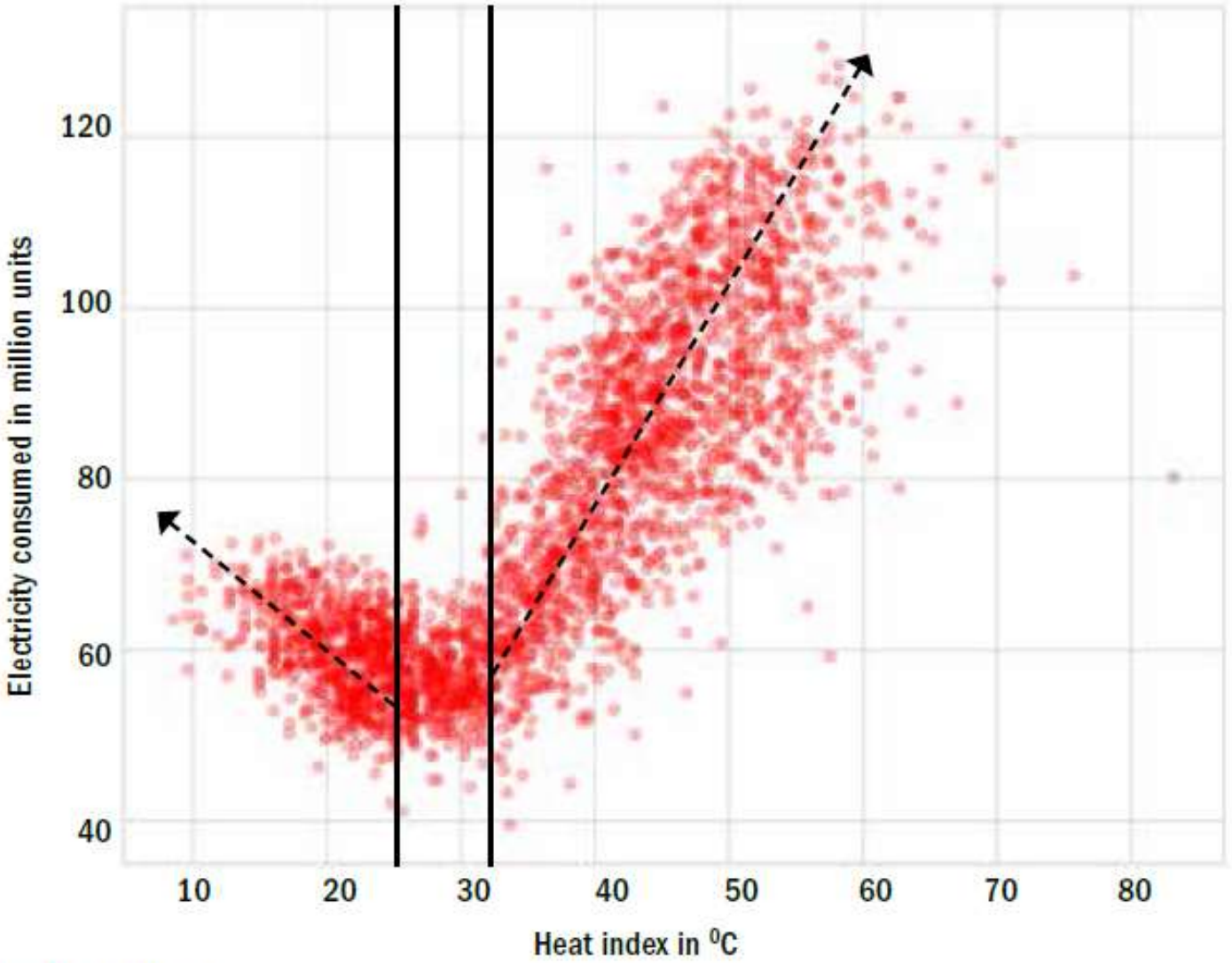
Recommends Thermal comfort standards

24 C degree rule

Design interventions to reduce heat load and improve thermal comfort of structures

Address WWR, orientation, shading and material to reduce AC hours….. Energy efficiency of appliances

Delhi's electricity consumption as a proxy to its thermal discomfort



Source: CSE analysis

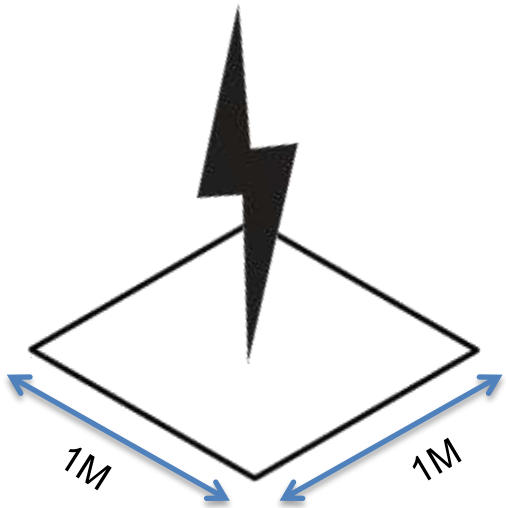
ENERGY

Consumption

EPI – Energy Performance Index

Energy
Performance
Index

$$= \frac{\text{Energy Consumed Annually (KWh)}}{\text{Built Up Area (sq.m.)}}$$



AEETI: Our experiment

ENERGY Consumption – Passive Technique

Window Wall Ratio

Window Wall Ratio = $\frac{\text{Window Area on a facade}}{\text{Total external Surface of wall}}$

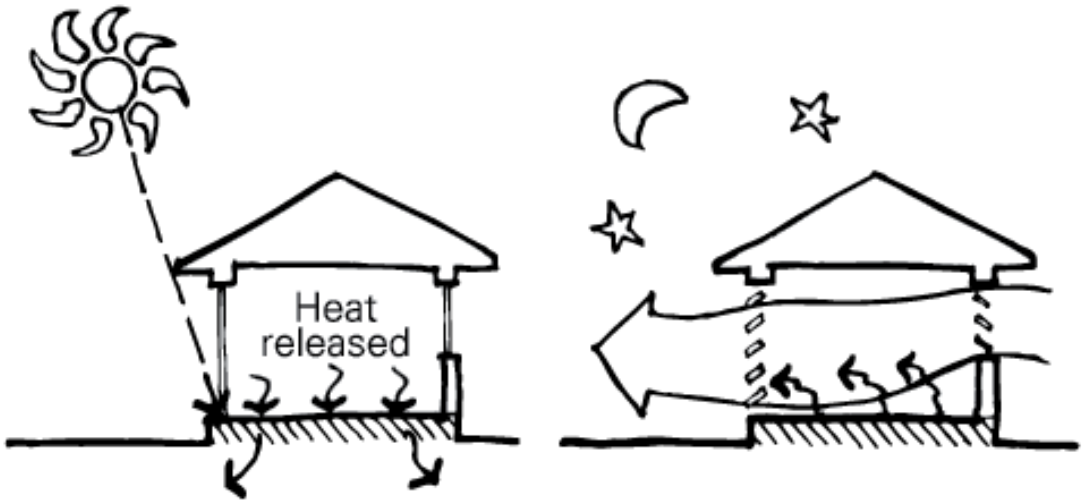
ENERGY

Consumption – Passive Technique

Natural Ventilation

OR

Night Purge

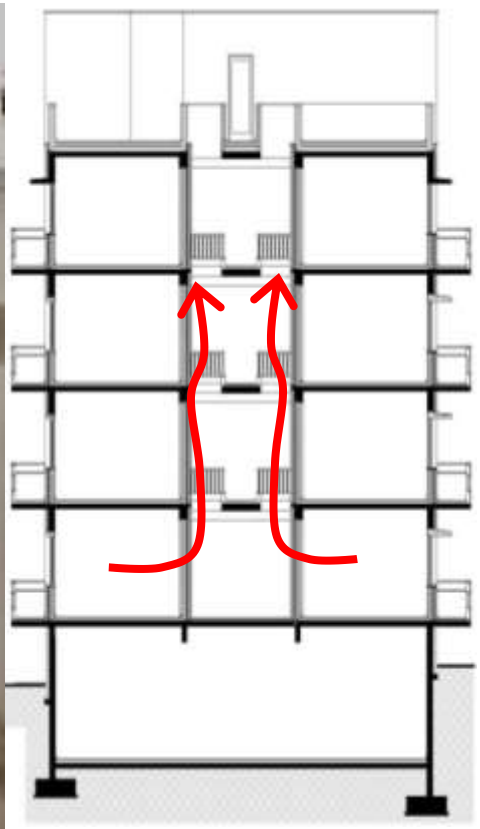


ENERGY

Consumption – Passive Technique

Natural Ventilation

Light shelves in corridors allow natural light to filter in and allow hot air to escape



Mix of Passive and Active Design

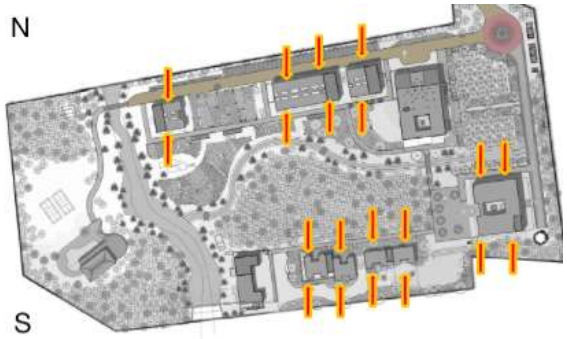
csi

PASSIVE DESIGN

AAETI (Anil Agarwal Environment Training Institute), Neemli, Alwar

Building envelope

- **Envelope and window shading**, **highly efficient HVAC**, natural ventilation, etc
- All buildings oriented in N-S direction reducing exposure to harsh summer sun



Site design

- Buildings with courtyards or cut-outs to provide **natural ventilation and day-lighting**
- Extensive and deliberate use **of chajjas – horizonal sunshades** – on all windows

Building Material

- **Highly insulated walling** combination with a U-value considerably better than the prescribed standard of ECBC
- Use of Aerated Autoclave Concrete (AAC) blocks manufactured using high recycled waste (flyash)
- Flyash bricks used for non-structural work and partition
- **Use of "cool roof" technique** to reflect solar heat with broken white and recycled ceramic tiles

Good insulation protects the outside heat to enter inside.

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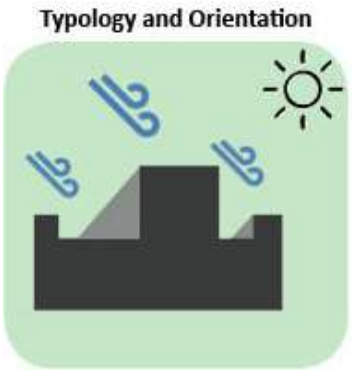
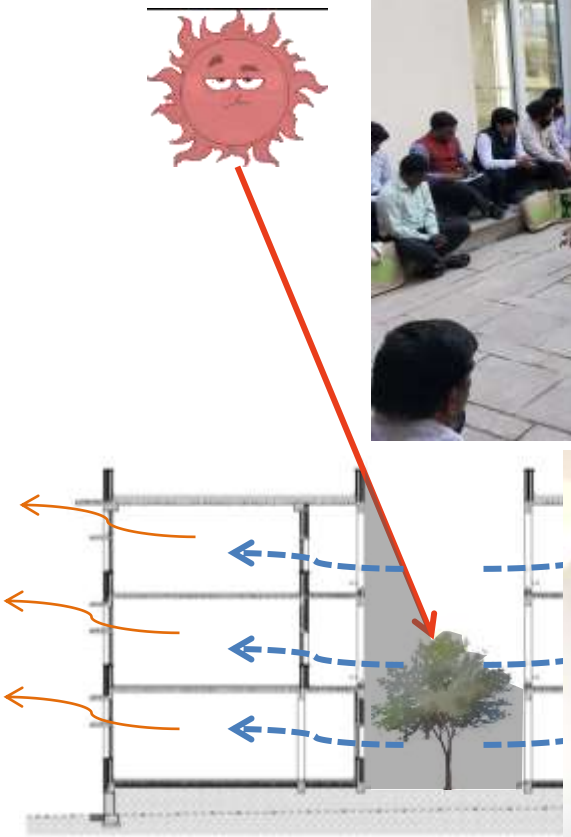


AAETI – NIMLI TIJARA - CASE STUDY

Typology and Orientation

Narrow Courtyard Typology



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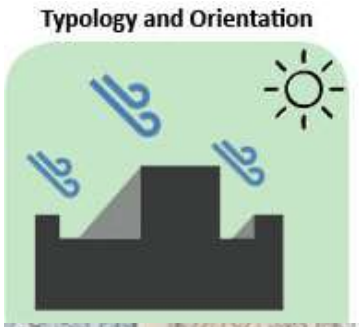
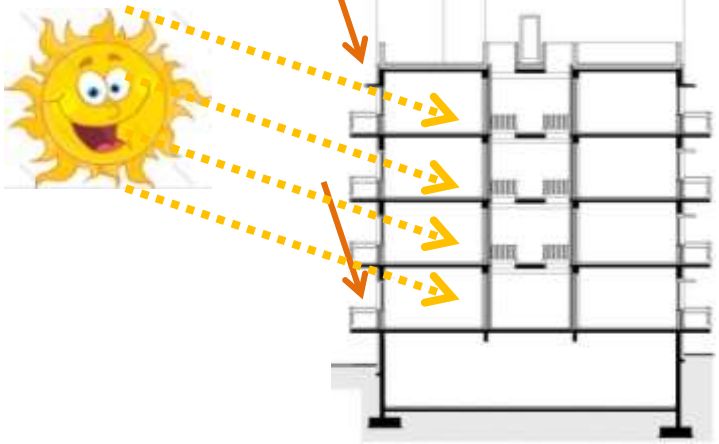
AAETI

AAETI – NIMLI TIJARA - CASE STUDY





Shading on the south facing windows

Response to wind

Response to sun for thermal comfort

Enable change through design…….. Orientation of mass housing and energy efficiency

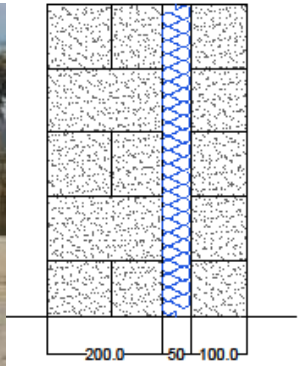
Proposed UTTIPEC guidelines for building orientation: All dwelling units should get minimum 2-hour solar access in at least one habitable area (living room, bedroom or private open space) on the shortest winter day of Dec 21 (Winter Solstice).

EIA committee in Delhi setting norms for orientation, depth of the building, shading, day lighting etc…..

Source: UTTIPEC

Heat, Lux and Air

Heat Gain Reduction



AAC Blocks + XPS

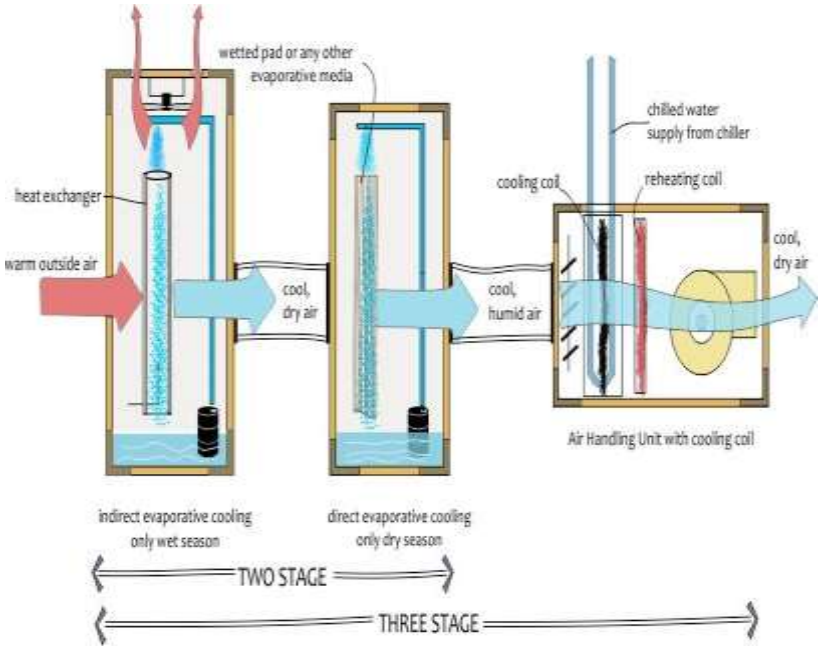
Highly reflective surfaces bounce off radiation.

Good insulation protects the outside heat to enter inside.

ENERGY EFFICIENT COOLING

AAETI (Anil Agarwal Environment Training Institute), Neemli, Alwar

- **A 3-stage evaporative cooling system** implemented in a decentralised manner
- System based on moving air, like the old-fashioned desert cooler - but more efficient
- Heat-pump chiller for de-humidification (during monsoons)
- **First stage**: Fresh air - air cooled
- **Second stage**: water is humidified through direct evaporation
- **Third stage**: uses refrigerant for cooling, but kicks in only when the ambient air has too much humidity
- **Hot-water** provided as the by-product also used to meet campus requirements.



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Heat Pump ➡ Hot Water

Heat Pump transfers excess heat to places here heat is needed

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Water-Energy Nexus

Efficient Techniques and equipments

Heat Pump transfers excess heat to places where heat is needed

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Water -Energy Nexus

Water-Energy Interface

Active Cooling Techniques

3 Stage Cooling

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Possible to combine thermal comfort and resource savings; need mixed mode buildings

ENERGY

Eye on the performance

Control energy hogs

27 degree C +

- TV on standby mode
- Plugged mobile charger
- Rebound effect of energy efficiency – over use of appliances and lighting

Consumer awareness

Annual tracking of electricity use

Box 6: BEE Star label app

The mobile app is developed by Bureau of energy efficiency, Ministry of Power. This mobile app serves as an awareness and outreach medium to consumers for purchasing decisions. Consumers can compare efficiency of star labeled products vs. baseline appliances as well as check the authenticity of the labeling.

Source : https://www.beestarlabel.com/Home/MobileApp

CSE

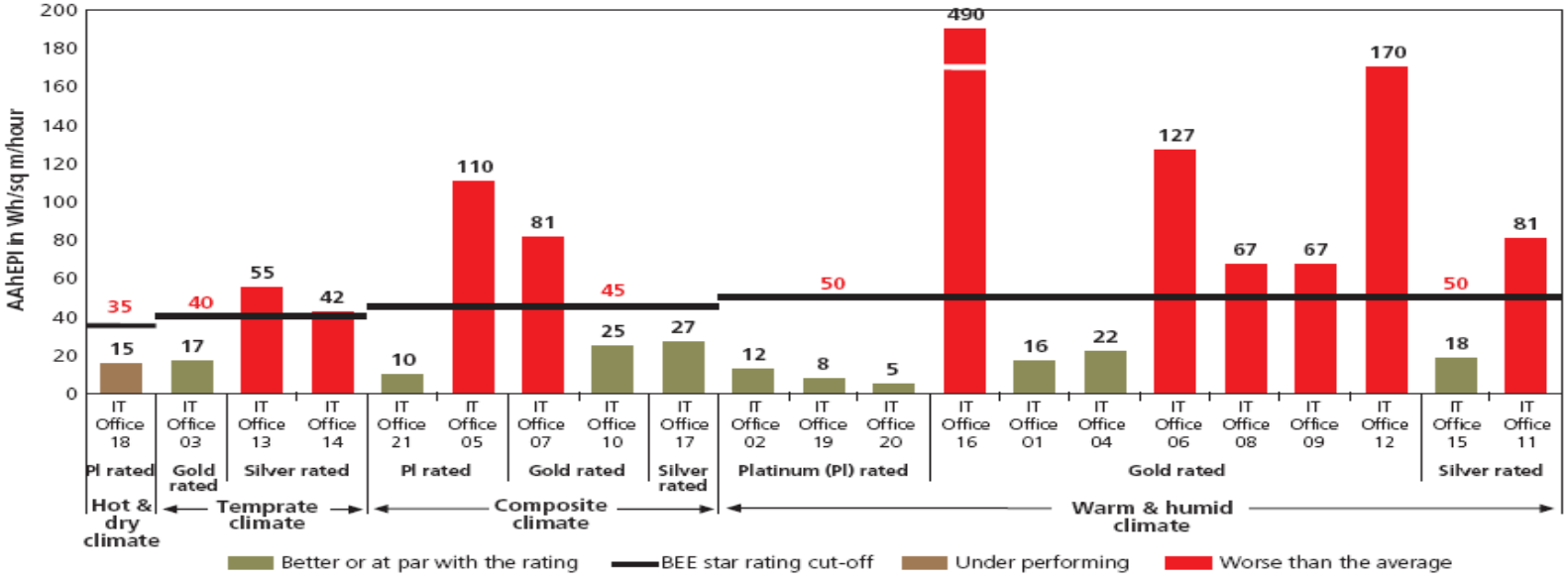
Building performance

Review of LEED rated buildings
Energy performance in relation to BEE's star rating for building performance…..

About 47% of the day time buildings as well as BPO/IT buildings did not meet the BEE one star label

GRAPH 4: ENERGY PERFORMANCE OF LEED-RATED BPO BUILDINGS

Based on annual average hourly energy performance, about 52 per cent seem to be non-performing



Note: See Annexure for the names of the buildings. AAhEPI – Annual Average Hourly Energy Performance Index
Source: Computed by CSE on the basis of LEED-India (IGBC) data

ENERGY

Consumption – Passive Techniques

Solar Penetration

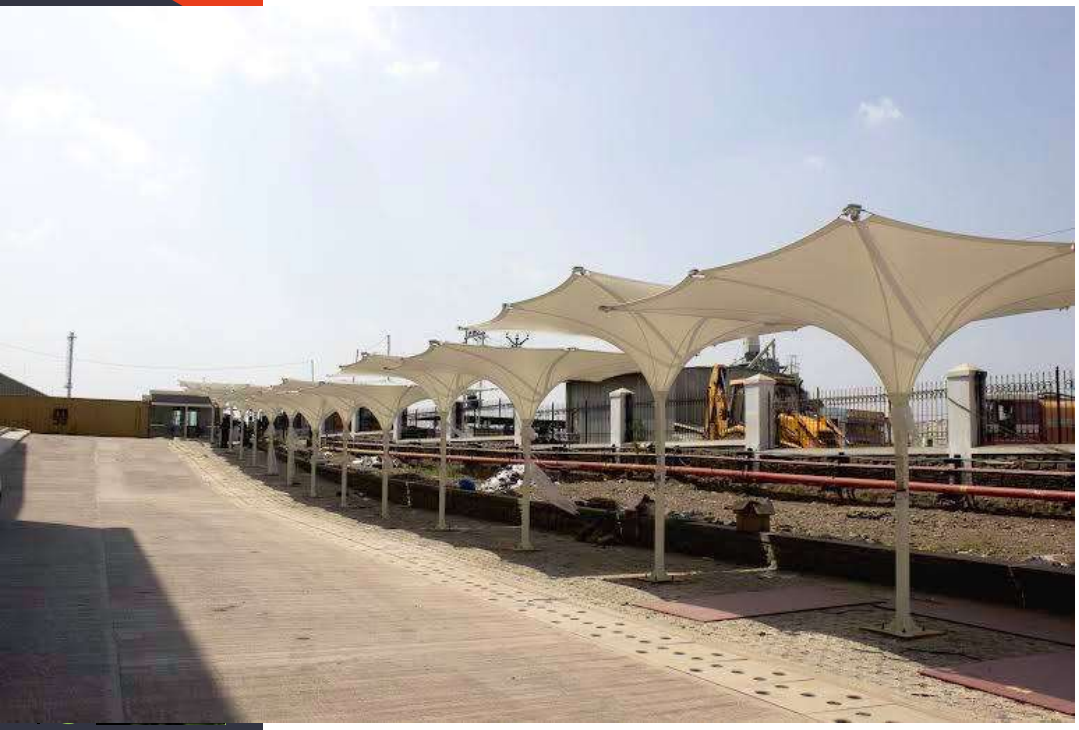
$$\text{Solar Penetration} = \frac{72\ \text{KWp}}{350\ \text{KW}}$$

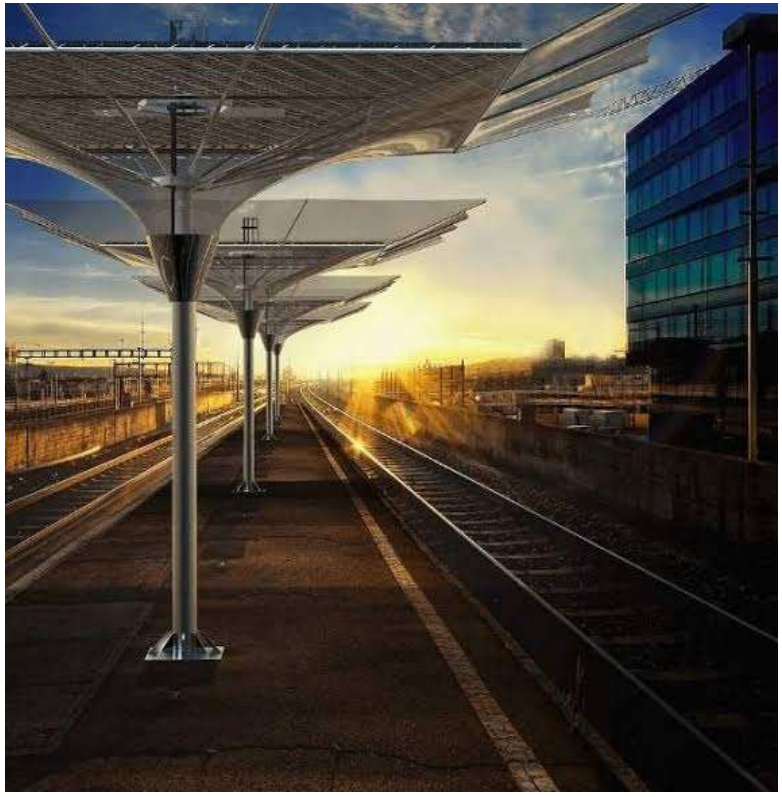
SOLAR ROOF TOP
Guru Nanak Dev University (GNDU), Amritsar

- **Solar PV power plant** of 1.48 MW capacity
- Total load of 3.3 MW sanctioned by Solar Energy Corporation of India (SECI) for the campus – to be achieved in stages

- **A few no-cost policy measures** to curtail energy consumption –use of ACs has been restricted to laboratories and assembly halls

Convergence
Shading + water harvesting+ solar panels





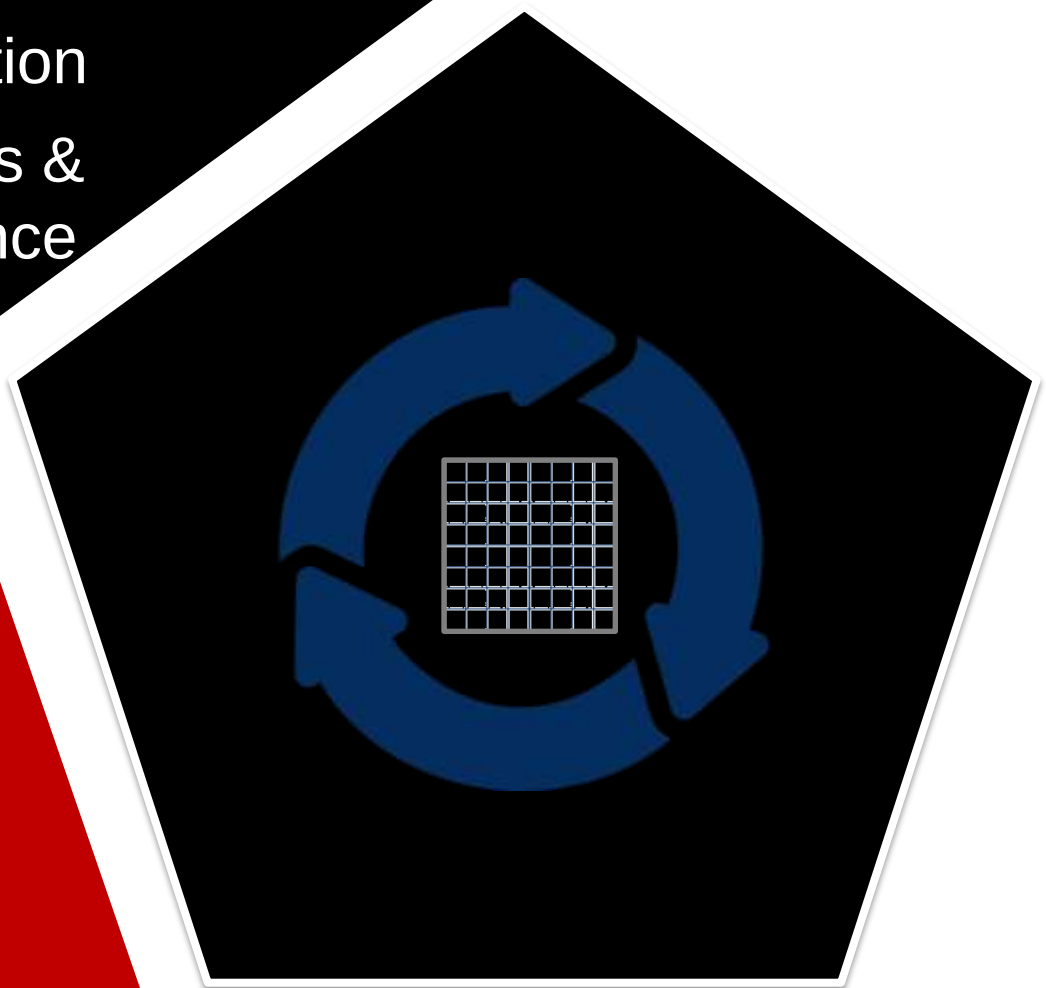
AAETI

LAND

Consumption

Conservation

Operations & Maintenance



CSE

LAND

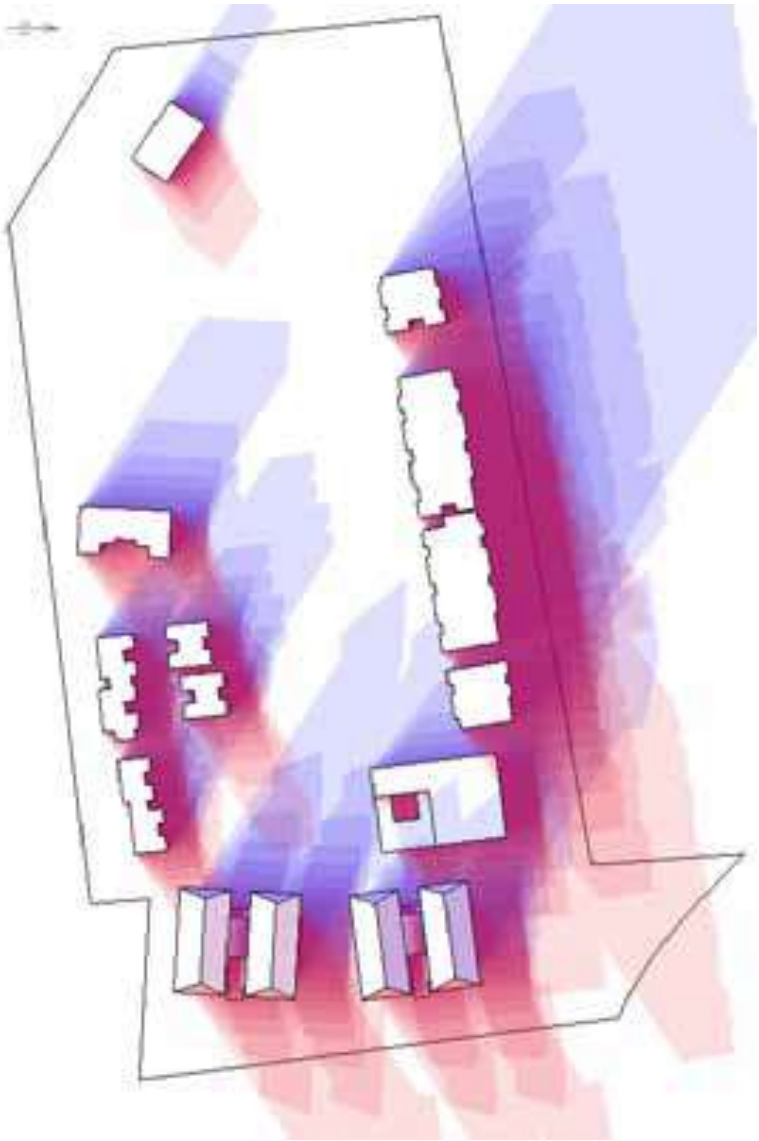
Consumption

Covered Area

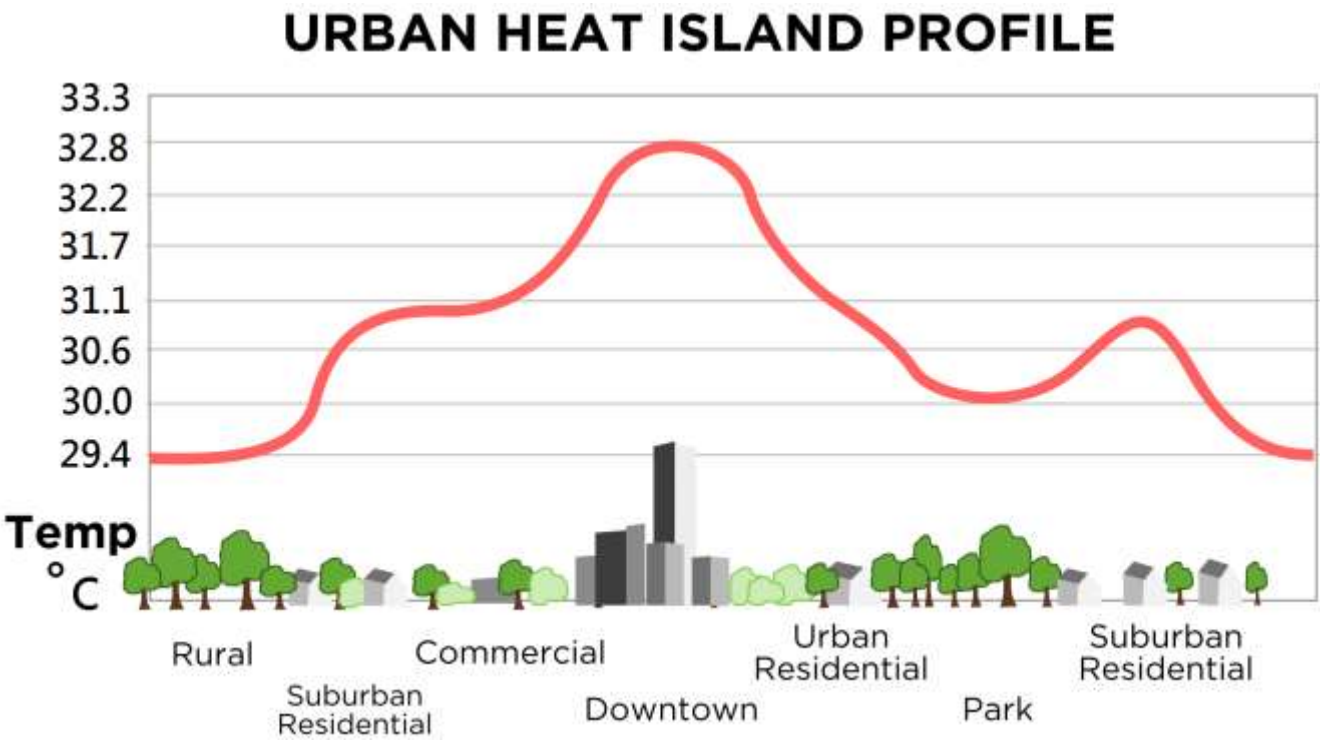
Covered Area

CSE

AAETI



LAND


URBAN HEAT ISLAND PROFILE
33.3
32.8
32.2
31.7
31.1
30.6
30.0
29.4
Temp °C
Rural
Suburban Residential
Commercial
Downtown
Urban Residential
Park
Suburban Residential

CSE

LAND


High use
Low use
Moderate use
Moderate use
High use
High use
Low use
Moderate use

CSE

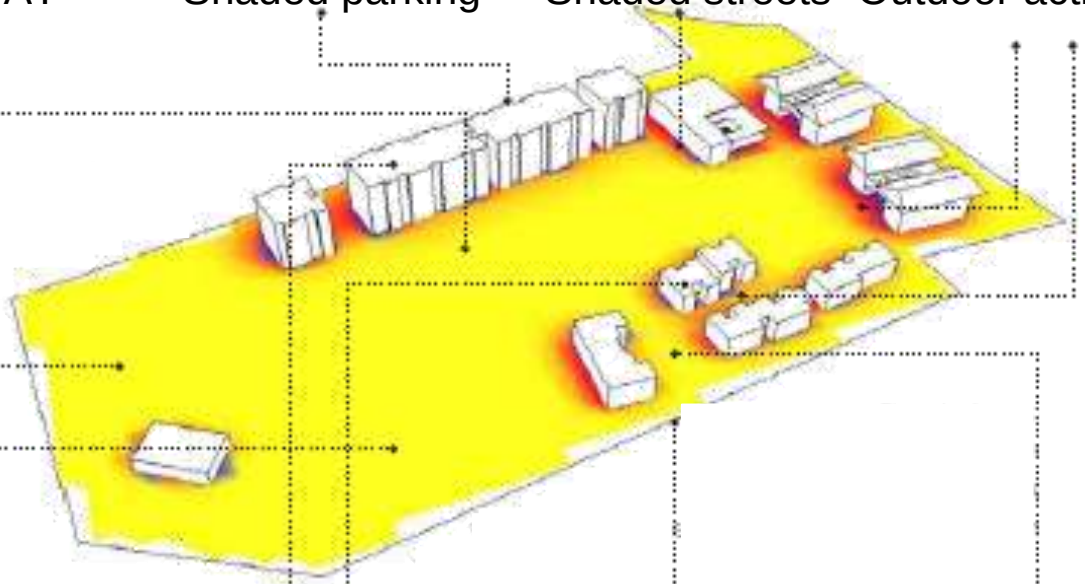
AAETI

Shaded OAT

Shaded parking

Shaded streets

Outdoor activities



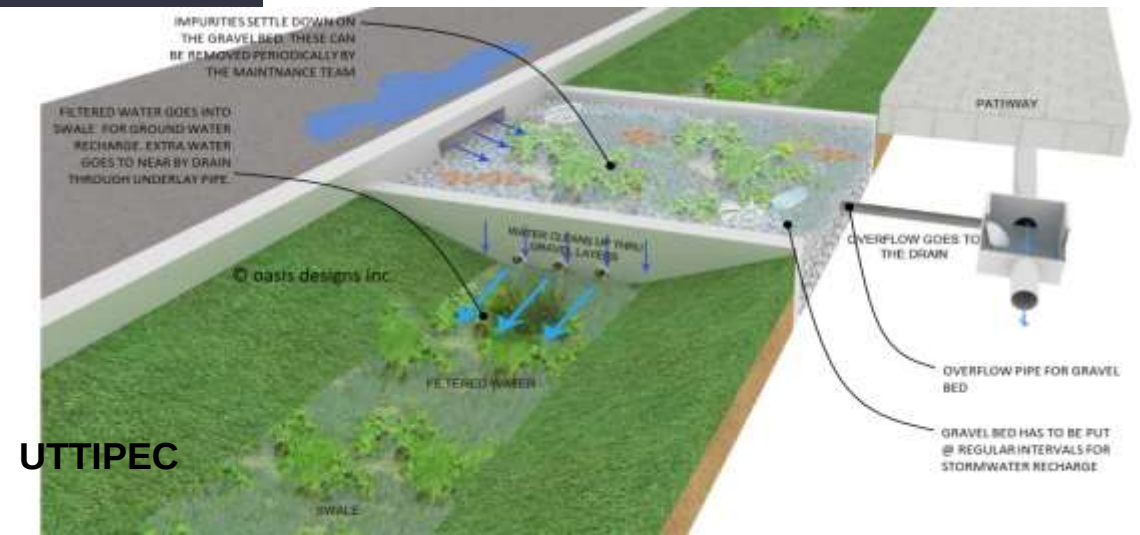
On-ground PV

Roof-top PV

Peripheral tree buffer

Minimize hard-paved areas

Leveraging the circulation system



Design roads to integrate natural storm water infiltration and absorption through bio-filtration beds, swales and detention ponds.

On narrower roads drains can be used to convey water to nearby large green areas for storage or recharge.

Include effective filtration systems of gravel or vegetative filters.

Bioswale can use bio retention media to improve water quality, reduce and moderate peak run off, and manage excess run off.

AAETI

WATER

Consumption

Conservation

Operations & Maintenance

CSE

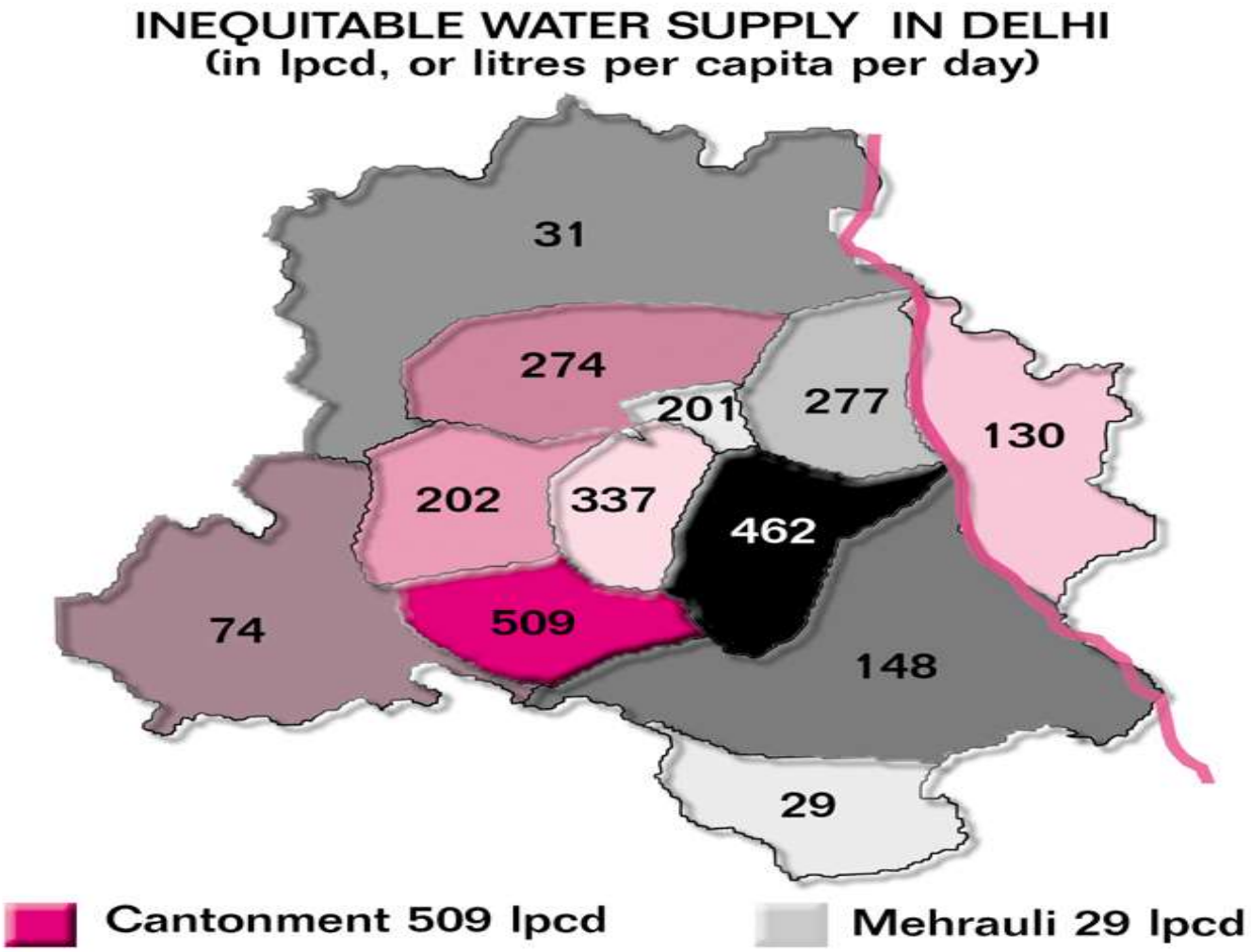
WATER

Consumption - Monitoring

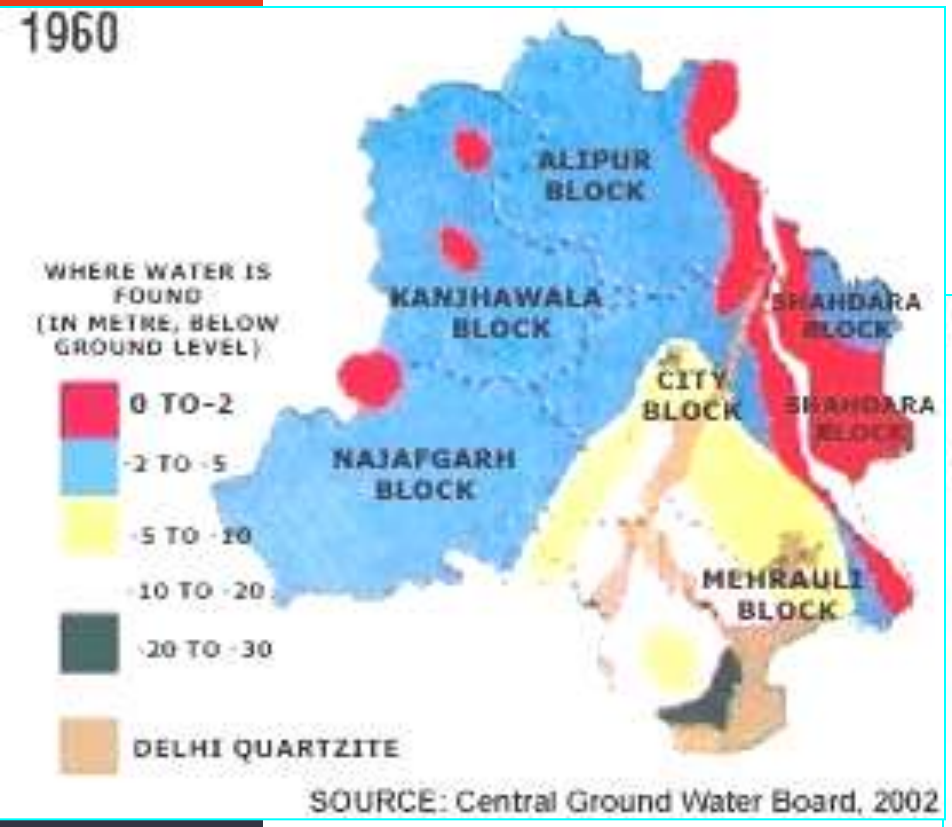
Per Capita Water Consumption

$$\text{Per Capita Water Consumption} = \frac{\text{Total Water Consumed}}{\text{Number of People}}$$

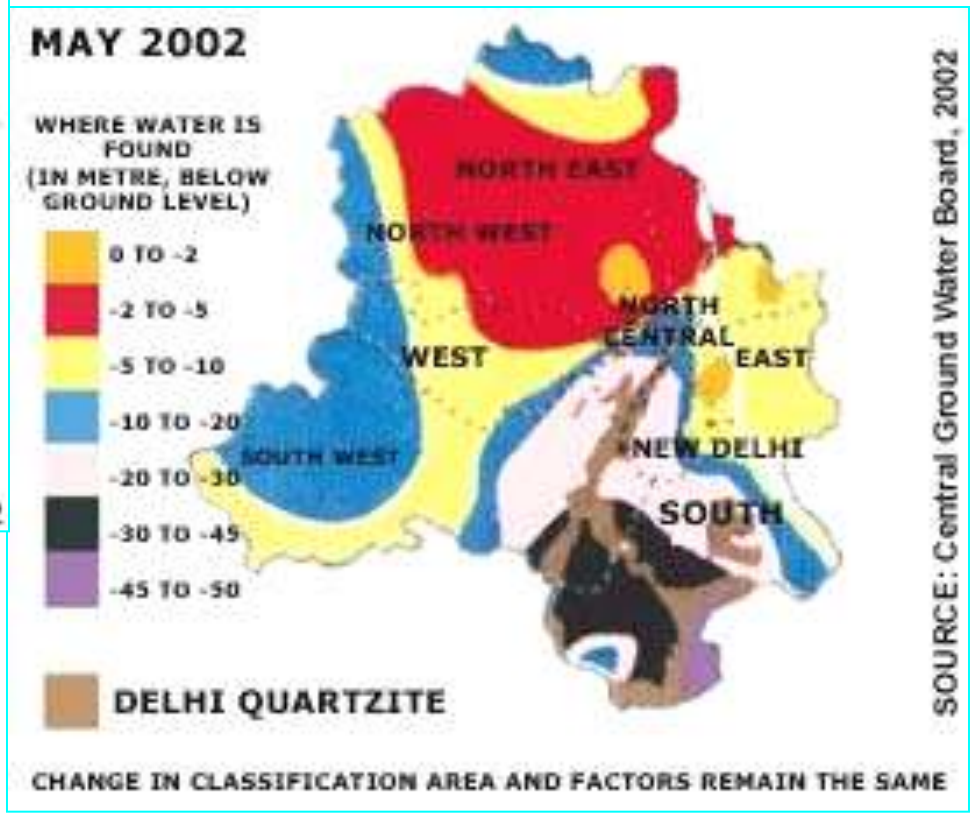
How to plan for reducing per capita requirements



Reality check
Delhi's alarming dip in water table



Dipping watertable



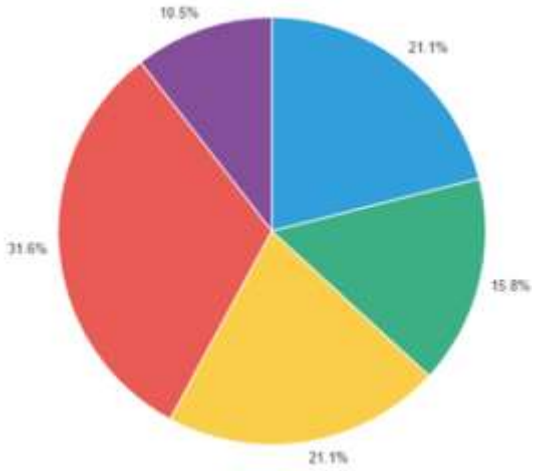
WATER

Consumption - Monitoring

Water Source Indicator

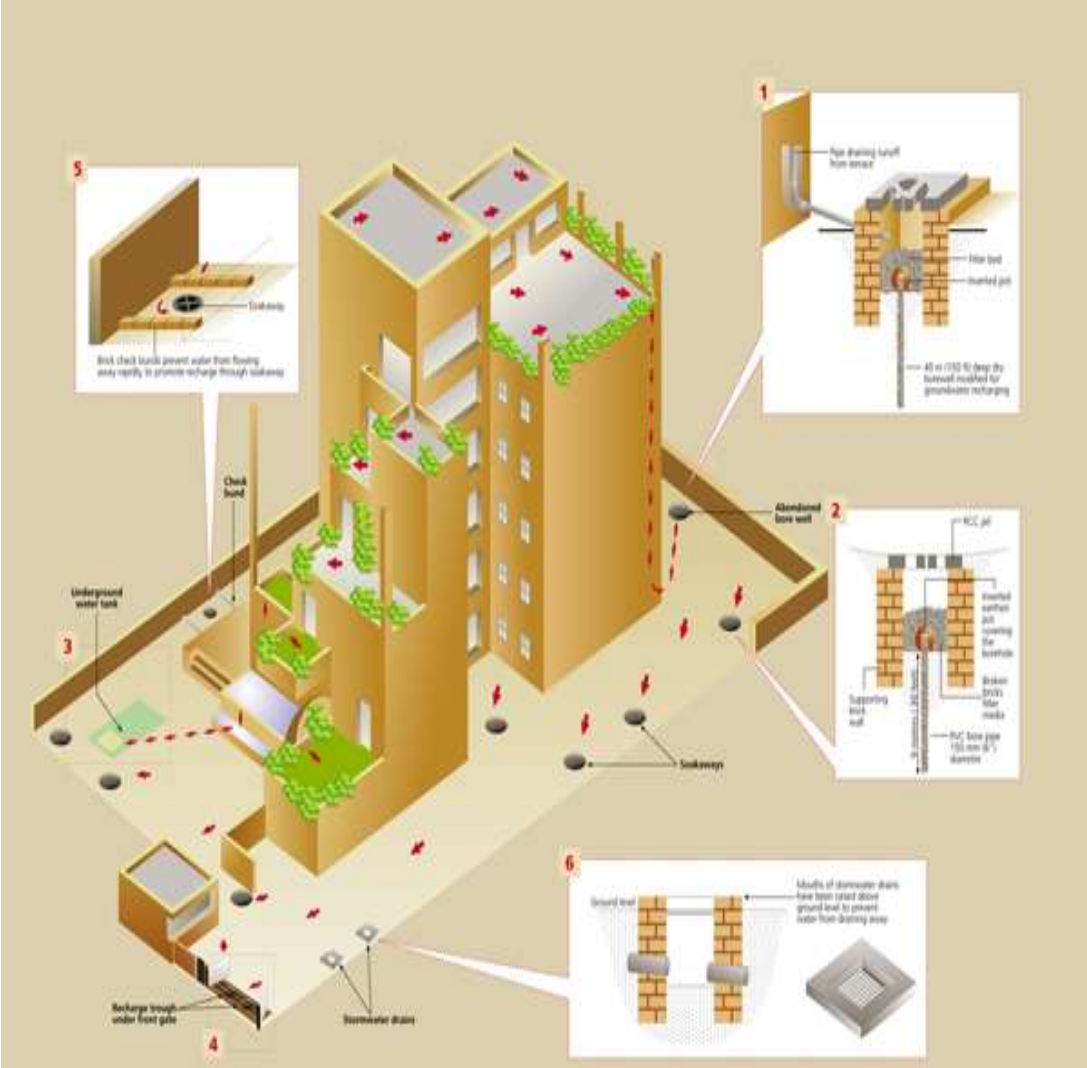
Sources of Water

- Municipal
- Water Body
- Under Ground Water
- Recycled Waste Water
- Stored Rain Water



Supporting a water literacy movement

- Even if 50% of rainfall in one ha of land is collected we get 0.5 million litres of water.
- This can provide 91 persons 15 litres per day for drinking and cooking for a whole year.
- Water harvesting in buildings



Catch water where it falls

Source: CSE

WATER

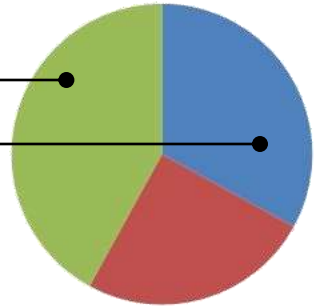
Consumption – Passive Techniques

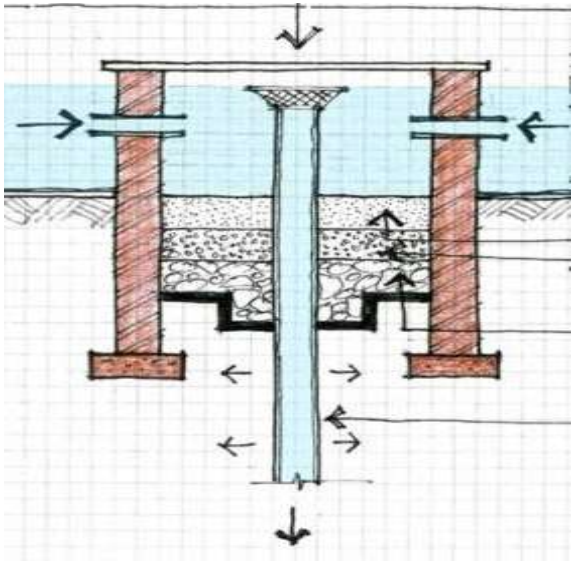
Harvesting Rain Water

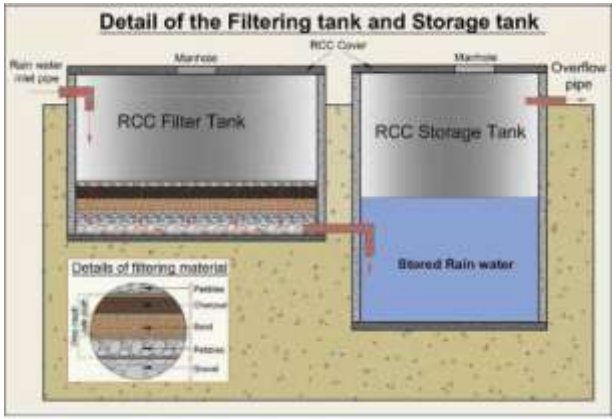
Do you harvest rain water ?

- Recharge Wells
- Storage Tanks

Capacities (Kilo Litres)



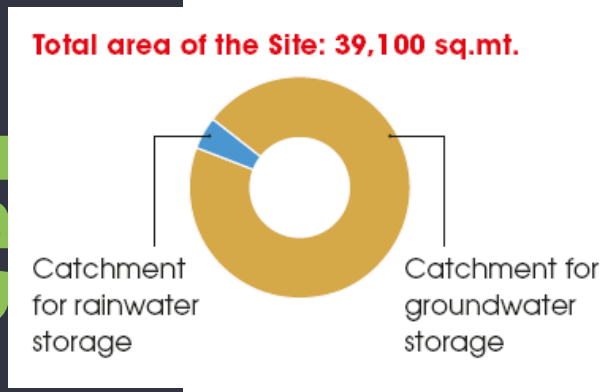


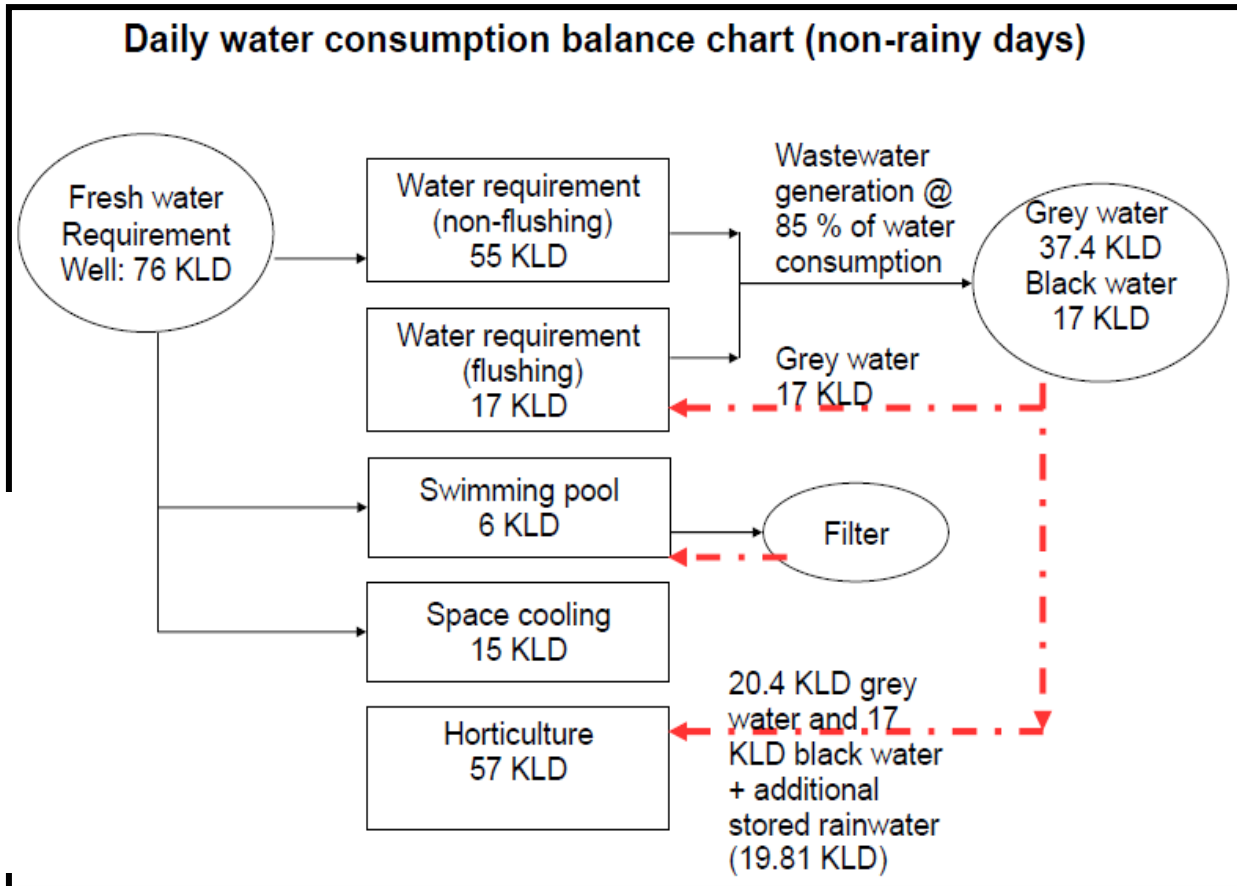


WATER Consumption – Passive Techniques

AAETI water balance

Pervious area helps greatly!



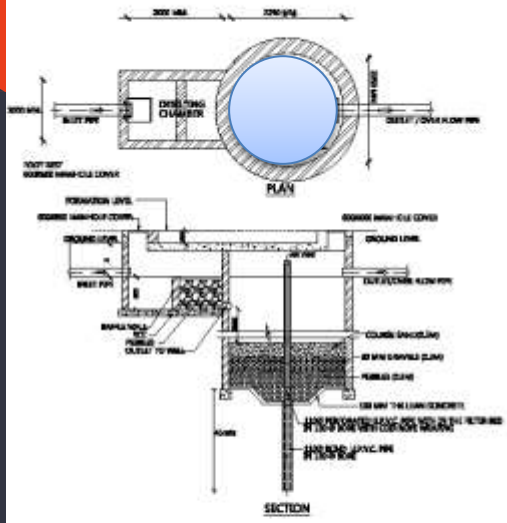


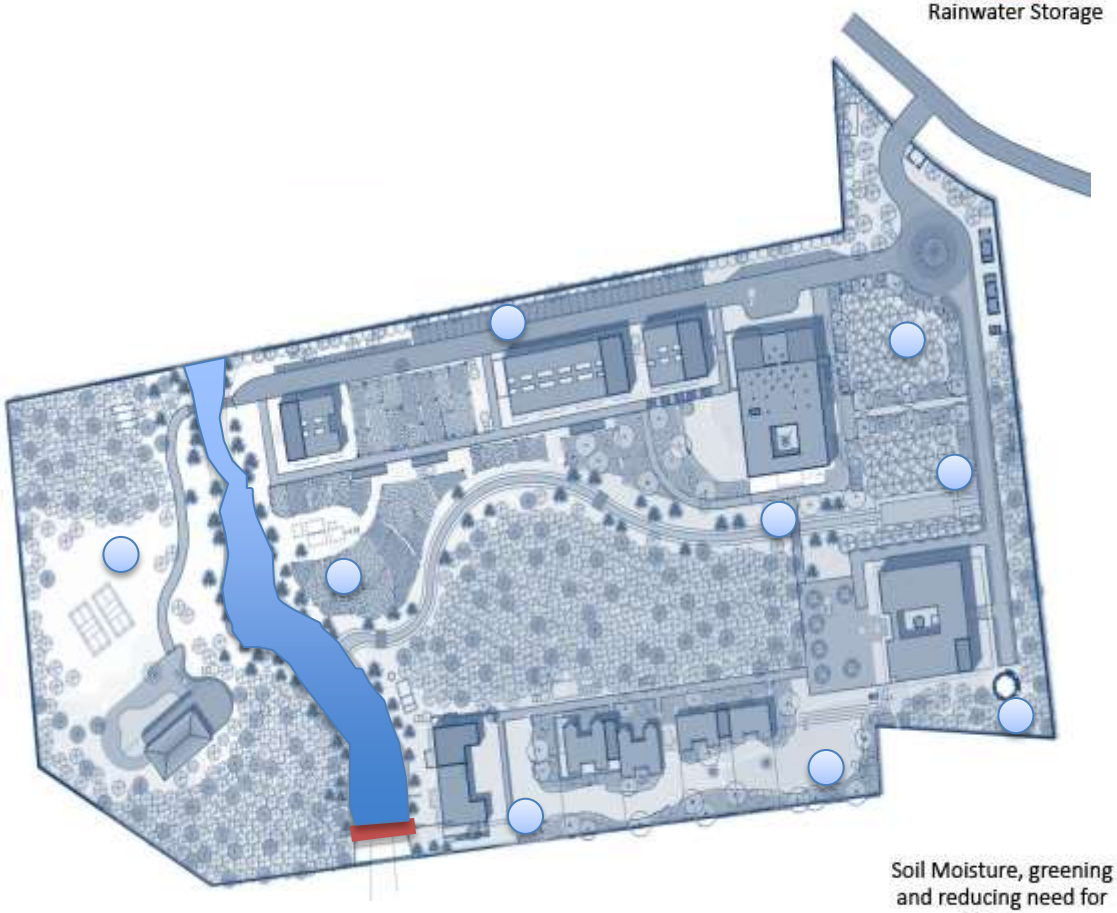
AAETI

Water

Water

Rainwater Storage





Ground Water Recharge

Soil Moisture, greening and reducing need for irrigation

9 Rain Water Recharge Wells were added on the site
2 Storage tanks with a combined capacity of 912KL

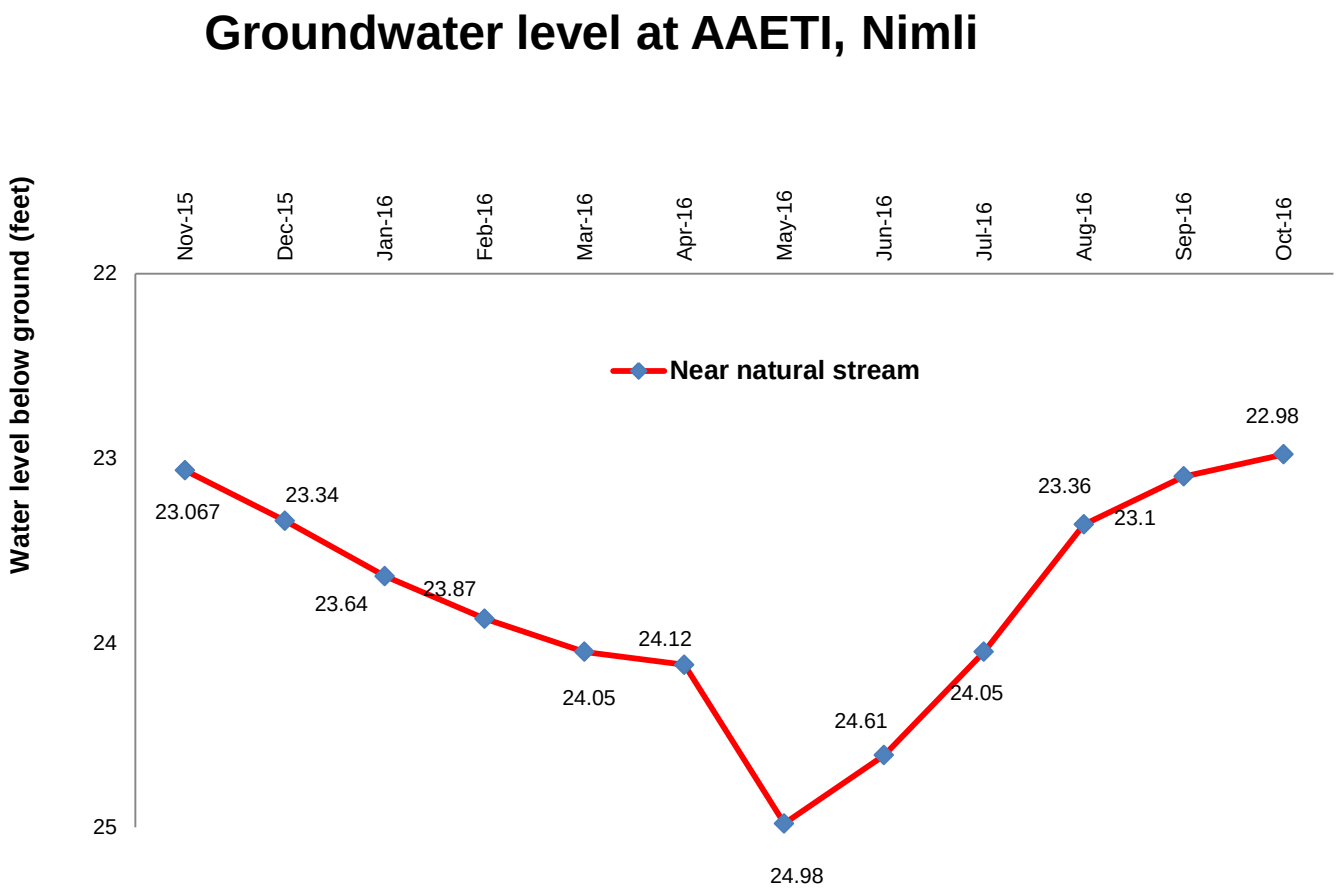
CSE

Area wide intervention -- Tijara

Source: CSE

Makes difference

Groundwater data near Check dam at CSE's AAETI, Nimli



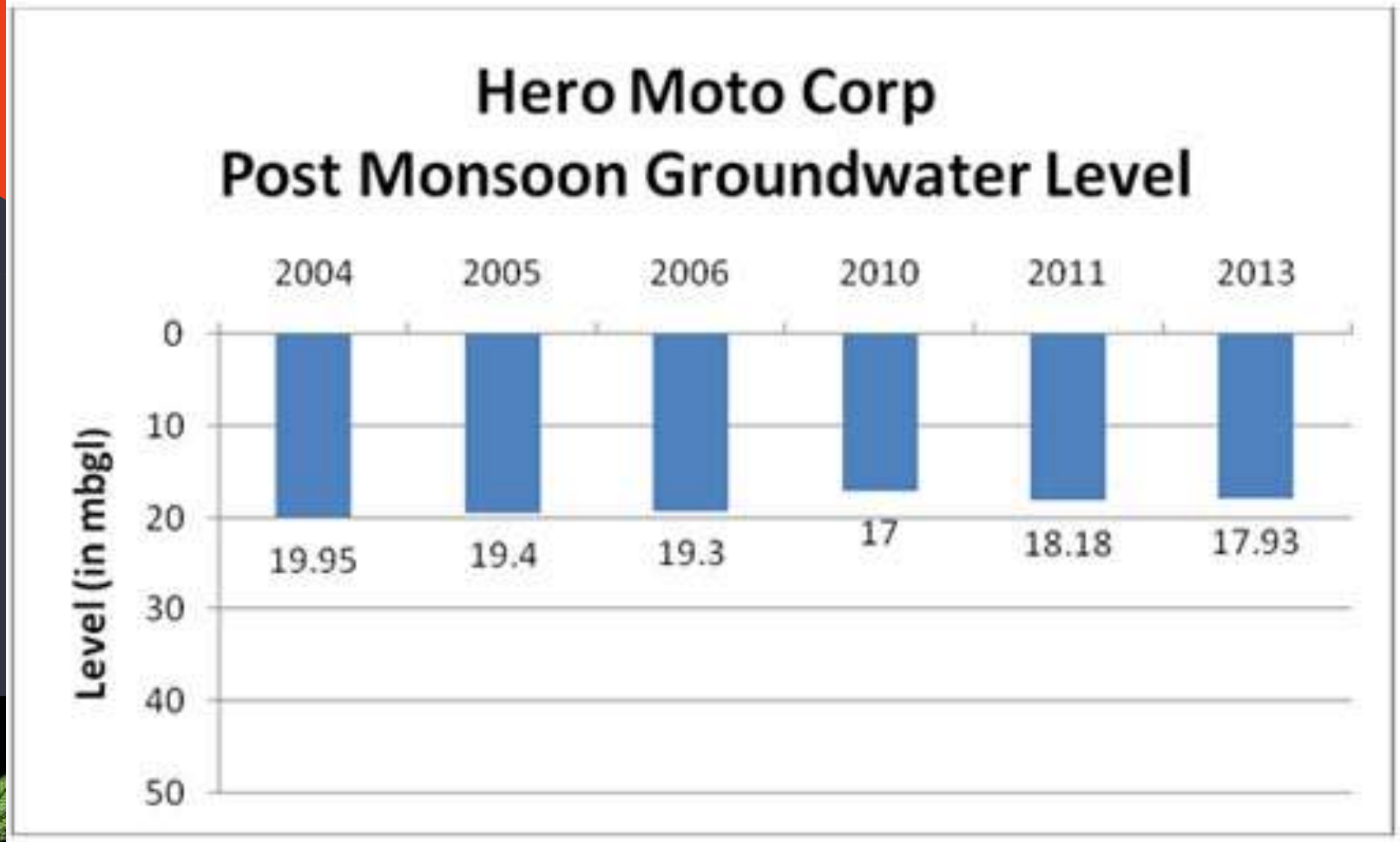
Source: CSE

Rainwater harvesting at Hero Honda Motocorp, Daruhera, Gurgaon

Source: CSE

Stabilises ground water

(Hero Honda Motocorp, Daruhera, Gurgaon)



Source: CSE

WATER

BOX 9: Types of faucets

Full turn faucet: Full turn faucets are the regular taps that use a valve action to release and restrict water flow. The water flow depends on the line pressure and diameter of the outlet rim.

Flow restrictors: These are small control fixtures that deliver a precise volume of water in faucets, typically 5.6–8.3 litres per minute, irrespective of the varying line pressure. These offer a saving potential of 80 per cent.

Automatic faucet: These faucets are equipped with a proximity sensor and mechanism that opens its valve to allow water to flow in response to the presence of a hand or hands in close proximity. The faucet closes its valve again after a few seconds or when it no longer detects the presence of hands. These faucets can achieve a reduction of water use by 7-5 per cent.

Aerators: These are water-saving tools that add air to the water stream to make the flow feel stronger. These can be designed for a water-flow rate from 2–8 litres per minute, and offer a potential to reduce overall consumptions by up to 30 per cent.

A flow restrictor, an automatic faucet, and an aerator

CSE

Wall Mounted
Closet

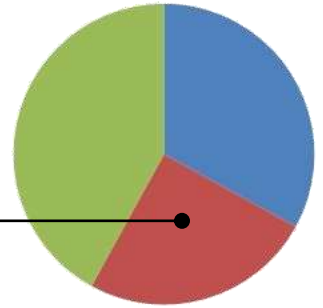
*Star rated WEO-I listed IAMPO certified warter efficient product.
**T&C Apply (Savings w.r.t standard 10L Flushing).

CSE

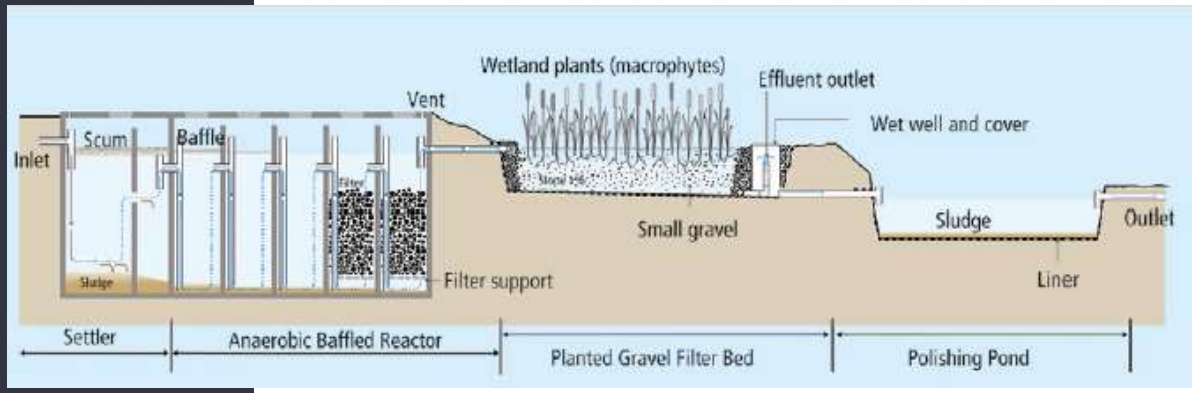
WATER Consumption – Passive Techniques

Waste Water Recycling

Capacities (Kilo Litres)



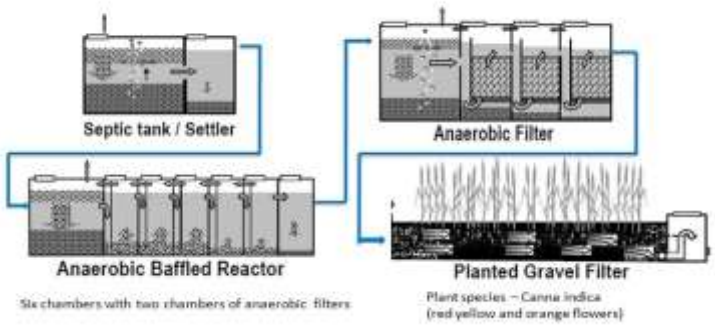
•Waste Water Recycling



DECENTRALISED WASTEWATER TREATMENT

Varunalaya, Delhi Jal Board, New Delhi

- System designed to treat 8000 lpd to cater to the horticultural requirement
- Treatment technology
  - Stage 1: wastewater goes through a two-chambered settler for removal of suspended solids
  - Stage 2: flow through an anaerobic baffled reactor (ABR), which is five chambered and reduces about 60-70% of the BOD and COD levels of the wastewater
  - Stage 3: Treated water further improved by passing through the planted gravel filter (PGF) bed
- The treated water is stored in a collection tank.
- Quality analysis result shows the efficiency of the system is about 80% in terms of BOD and COD removal.



AAETI

Waste Management

The campus will have multi point waste segregation

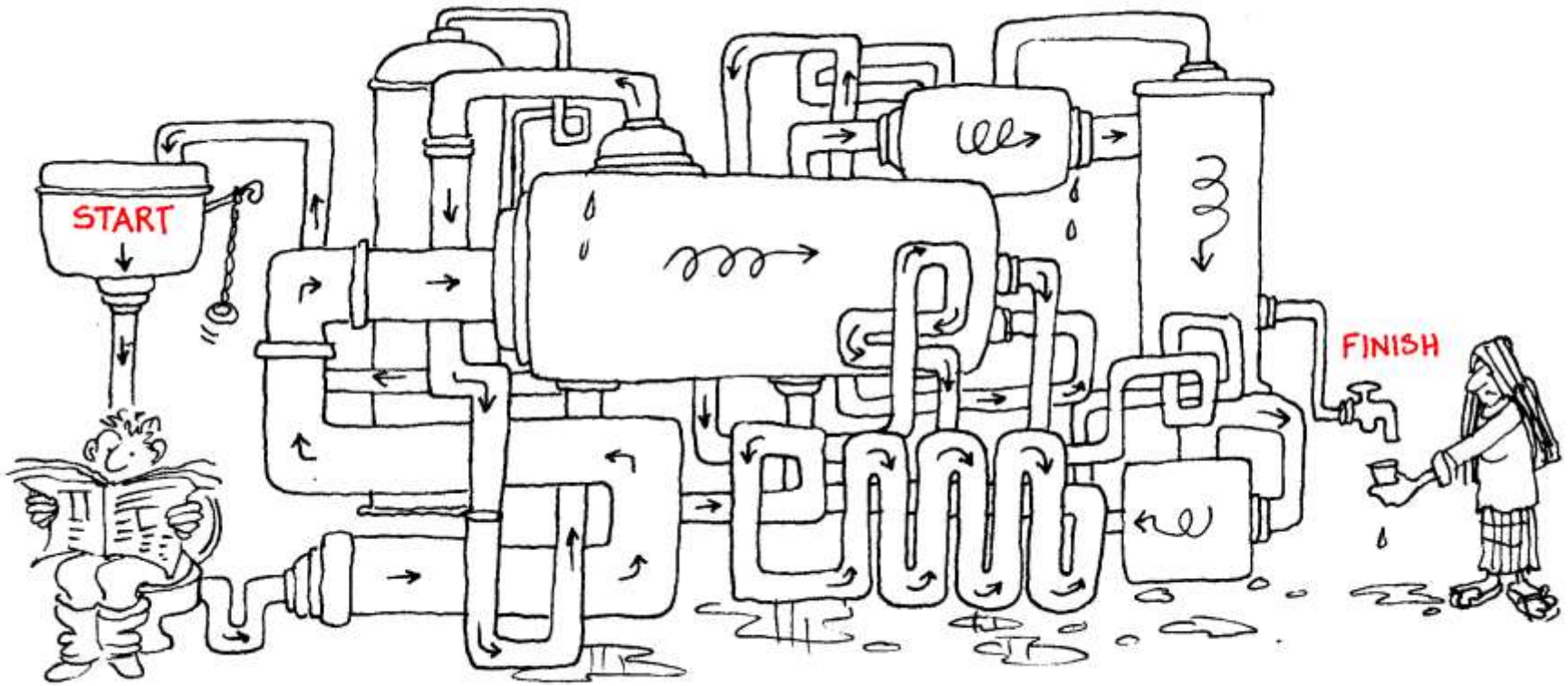
primary treatment

secondary treatment

tertiary treatment

CSE

A paradigm that must change, urgently



AAETI

AIR

Consumption

Conservation

Operations & Maintenance

CSE

AIR

Conservation

Initiatives, Communication

Initiatives : Policies, Action plans, Sustainability Framework, Reduction commitments, Fines, Clean Mobility Plan, Pedestrianization, Car Free day, green infrastructure.

GREEN MOBILITY

Guru Nanak Dev University (GNDU), Amritsar

- **Restricted car policy** using RFID tag, which bars the no-tag vehicles from entering the campus
- **Public bike sharing program** to encourage residents to prefer cycling instead of using motorized vehicles
- **Hexi smart bicycles** available for staff and students at a nominal rent of Rs. 175 per month or a single trip of Rs. 5/half hour or a multiple single day trip at Rs.23
- **Docking stations** spread throughout the campus making connectivity easier
- **Cycles GPS monitored and used through an app**
- **E-rickshaws** also available at all gates of the campus and at hostels

AAETI

WASTE

Consumption

Conservation

Operations & Maintenance

CSE

SOLID WASTE

Consumption

Waste Generation

$$\text{Per Capita Waste Produced per day} = \frac{\text{Total Waste Produced (gms/day)}}{\text{Number of People}}$$

SOLID WASTE

Consumption

Waste Typologies

Solid Waste Management Rules 2016

Plastic Waste Management Rules 2016

Hazardous Waste Management Rules 2016

E-Waste Management Rules 2016

Bio-medical Waste Management Rules 2016

Construction & Demolition (C&D) Waste Management Rules 2016

VERMICOMPOSTING

Guru Nanak Dev University (GNDU), Amritsar

- **Vermi-compost units** -- important educational tool and demonstration site for teaching entrepreneurship and applied biological aspects

- **Campus plans to install a bio-gas plant** for utilization of organic waste

PIT-COMPOSTING

Decentralised Waste Management in Muzaffarpur, Bihar

- Three components of this system:
  - **80% waste segregation** at source
  - **Segregated transport of** waste
  - **Sale of compost after** treatment
- **City has four processing and MRF** centres, with:
  - 66 Composting pits at Chandwara processing centre
  - 40 Composting pits at Sikandarpur stadium processing centre
- Muzaffarpur has 3 MRF centres to sort plastics under its dry waste management efforts.

40 Composting pits at Sikandarpur stadium processing centre, Muzaffarpur, Bihar

66 Composting pits at Chandwara processing centre, Muzaffarpur, Bihar

PIT-COMPOSTING

Decentralised Waste Management in Alappuzha, Kerala

- Waste management model based on source segregation and household composting
- No Door to Door Collection, municipality has invested in making generator responsible (Ideal approach)

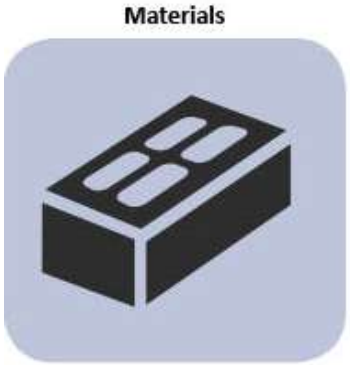
Aerobic Community composting units

Material Recovery Centre

Bailing of combustible plastic waste

Controlling food waste in AAETI

AAETI



Materials

Stones from the site are utilized in boundary wall construction

Recycled iron bars from construction are used for this gate, railings and similar elements

Temporary structures made up of rammed earth from the site.

CSE

CPWD's criteria for sustainable material selection – Sustainability Index

Materials for affordable housing

There is no perfect material which works for every situation or region. Factors such as climatic conditions, availability, longevity as well as built context can change the appropriateness of the material. There are multiple criteria's on which a material can be judged upon; no such list though can be exhaustive.

CPWD sustainability index is one such list in which each material can be evaluated on a set of criteria to determine if the use of material is sustainable.

Proposed parameters and their weightage for CPWD Sustainability Index of materials are as under:

S.No.	Proposed Parameter	Weightage
1	Recycled content	10
2	Embodied Energy	10
3	Rapidly Renewable	5
4	Locally Available Material	10
5	Functional Life Period	10
6	Capital Cost	10
7	Maintenance Cost	10
8	Construction Waste Management	5
9	Flyash Content	10
10	Reduced Weight	5
11	Reduced Time of Construction	5
12	Toxicity/Indoor Air Quality/Safety	10
	Total Points	**100**

Choosing an appropriate sustainable material for affordable housing will have to take many aspects into account. A material might be low-priced but harmful for the environment. It might be climatic responsive but energy intensive. It could be Renewable but have a high embodied energy. It is highly unlikely that there exists a material which fulfills all criteria's however there are two aspects which are absolutely essential for choosing a good material for affordable housing: Economical and Climatic responsive.

The hierarchy takes into account the aspects of manufacturing processes as well as the application and post occupancy phase of the materials life cycle.

CPWD: Indian Best Practice

Supreme Court Extension Project used **1.8 million Recycled C&D waste blocks**

CPWD Green Campuses - Design Experiences

Indira Paryavaran Bhawan

Net Zero Energy Building (NZEB)

Sustainable Site Planning

- Major orientation in N-S direction
- Optimised air movement and solar access due to porous block formation
- Use of low energy materials

Energy Efficient Features

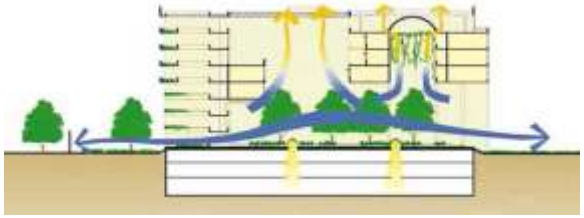
- Circulation spaces/ passages naturally ventilated
- Chilled beam based cooling system with condenser water cooling through ground pipes
- Openable windows to utilize favourable outdoor conditions

Water Efficient Features

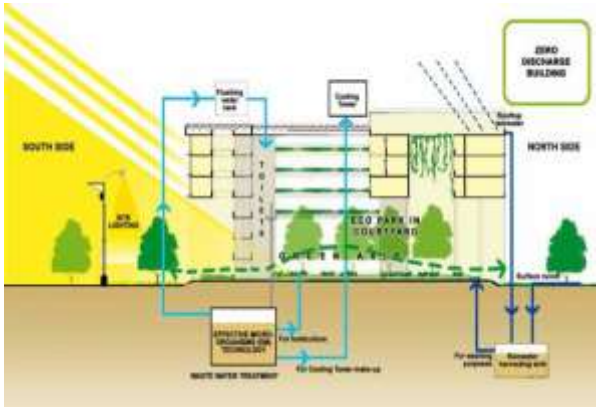
- Water recycling through an STP
- Low flow fixtures to reduce consumption by 64%
- Usage of sprinkler and drip irrigation

Renewable Energy Technologies

- Efficient rooftop solar PVs of 930 KWp
- Closed loop piping for condenser water heat rejection by geothermal mechanism



Optimised air circulation



Zero water discharge mechanism

Rooftop solar

Supreme Court Annexe Building

Renewable Energy Technologies

- Grid-connected solar rooftop with highly efficient solar PVs of 1400 kWp managing 40% of the peak consumption

Use of low energy materials

- Recycled C&D waste used as construction material

IIT Jodhpur

Sustainable Site Planning

- Buildings in series of compact urban clusters typical of desert settlements, instead of sprawl

Efficient Water Management

- Water prudent campus designed with a water demand of 85 lpcd

Rashtrapati Bhavan

Efficient Water management

- STP with capacity of 20 lakh lpd to meet water requirements for horticulture
- Sprinkler and drip irrigation system

Efficient Energy management

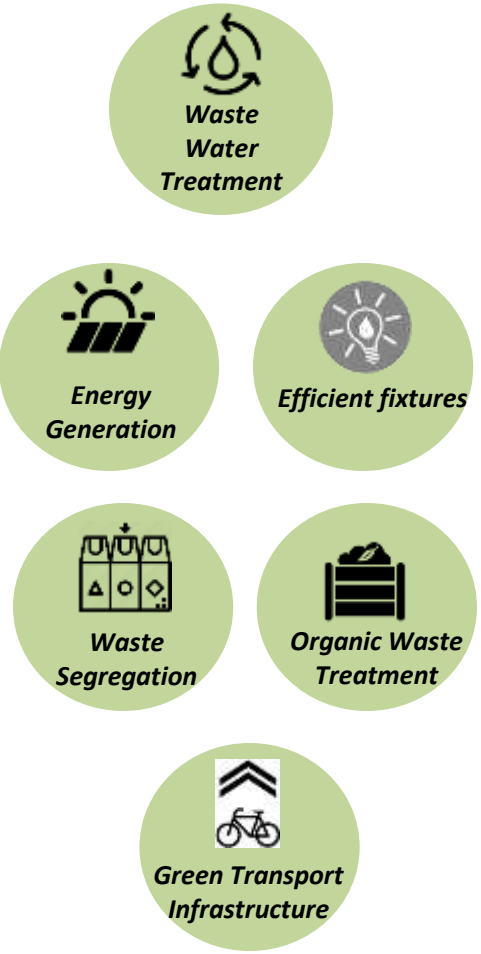
- Installation of around 1,200 LED bulbs in different locations in the RB Estate
- A solarisation project – capacity 1.036 MW
- Careful adjustment of time for switching on and off the street lights

Solid Waste management practices

- Segregation of waste for disposal
- Vermi-composting of bio-degradable matter
- Installation of green waste re-processor to process green garbage for compositing

Eco-friendly internal mobility

- 100 yellow bicycles for internal circulation
- Battery-Operated vehicles (BOVs)



CPWD Green Campuses - Operations and Green Retrofits

National CPWD Academy, Ghaziabad

National CPWD Academy, Ghaziabad

Population
Varies with training schedule

Green Team
Green Committee

Area
36 Acres

Climatic Zone
Composite

Mix of Passive and Active Design

csi

GREEN CAMPAIGNS

राष्ट्रीय सी.पी.डब्ल्यू.डी. अकादमी,
कमला नेहरू नगर, हापुड़ रोड,
गाजियाबाद (उ०प्र०)-201002
फोन सं.:0120-2710806
ई-मेल:ee6-trg.cpwd@nic.in,
eetrg6@gmail.com

National CPWD Academy
Kamla Nehru Nagar, Hapur Road,
Ghaziabad (UP)-201002
Ph no.:- 0120-2710806
Email id:- ee6-trg.cpwd@nic.in,
eetrg6@gmail.com

फाइल संख्या:एन.सी.ए./का.अकि.(प्रशि.-V)/सीएसई/एमओयू/ वैगपा/2018-19/178 दिनांक: 12/12/2018

Office Memorandum

I am directed to convey the approval of ADG(Trg.) for forming the Green Committee under the MoU signed between CSE & CPWD (Copy Enclosed) as below:

A. Advisory Board consists of the following officers:-

1.	Sh. Karam Veer Singh, ADG (Trg.), National CPWD Academy, Ghaziabad	Chairman
2.	Sh. M. K. Sharma CE(Trg.), National CPWD Academy, Ghaziabad	Member
3.	Sh. Rajesh Jain, CE (Trg.) (Elect.), National CPWD Academy, Ghaziabad	Member
4.	Sh. Piyush Dave, CA(Trg.), National CPWD Academy, Ghaziabad	Member
5.	Sh. Rajesh Kaushal, CA, Spl. DG, DR, New Delhi	Member

B. Green Committee consists of the following officials:-

1.	Sh. C. M. Tiwari, SE(Civil)	Ghaziabad Central Circle
2.	Sh. Satyendra Kumar, EE(Trg.)	National CPWD Academy – Nodal Officer
3.	Sh. Anil Kumar, EE(HQ),	National CPWD Academy
4.	Sh. Ashish Sinha, EE(Civil)	Ghaziabad Central Division
5.	Sh. A. K. Nagpal, EE(Elect.)	Hindan Central Electrical Division
6.	Sh. T. R. Makroo, Dy. Arch.	National CPWD Academy
7.	Sh. Raj Kumar, AE(Trg.)	National CPWD Academy
8.	Sh. Sanjay Kumar Srivastava, AE(Civil)	Ghaziabad Central Division
9.	Sh. K. P. Dubey, AD(H)	CPWD Horticulture Division-V
10.	Sh. Biswanath Biswas, AE(Elect.)	Hindan Central Electrical Division
11.	Sh. V. K. Kapuriya, SO(H)	CPWD Horticulture Division-V
12.	Sh. Shankar Kumar, JE(Elect.)	Hindan Central Electrical Division
13.	Sh. S. K. Tyagi,	RWA, National CPWD Academy Campus
14.	Sh. Ved Pal,	RWA, National CPWD Academy Campus

The Green Committee will look closely all the matters related to the Green Campus initiative in this Academy under the guidance of the Advisory Board. All the members are requested to participate in the

Enclosure: Copy

Copy to:

EE(Trg.)-VI

Inter disciplinary participations and forward looking organogram (green committee)

ENERGY		LAND		AIR
 Energy Generation	*Harnessing/harvesting Natural Resources*	 Land use for self sufficiency	*Harnessing/harvesting Natural Resources*	 Indoor Air Quality
 Passive Design		 Tree Density		  Non Motorized Vehicles / Shared Mobility
 AC/ Non AC/ Mixed Mode	*Efficient Consumption*	 Pervious surfaces	*Efficient Consumption*	 Green Transport Infrastructure
 Efficient fixtures				
 Awareness Programmes		 Awareness Programmes		 Awareness Programmes
 Policy	*Operation/Maintenance and Policy*	 Green Gardening Strategies	*Operation/Maintenance and Policy*	 Policy

WATER

Harnessing/harvesting Natural Resources

Rainwater harvesting

Waste Water Treatment

Efficient Consumption

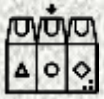
Water Efficient fixtures

Awareness Programmes

Operation/Maintenance and Policy

Policy

WASTE



Waste Segregation

Organic Waste Treatment

Plastic Free Campus

E-waste & paper recycling

Policy

Awareness Programmes

Operation/Maintenance and Policy

Efficient Consumption

COMMON

Aims/Goals

The assessment encourages campuses to set a goal for each of the category, this is important so as to have a clear vision on the basis of which concrete steps can be taken.

National CPWD Academy, Ghaziabad

Population

Varies with training schedule

Green Team

Green Committee

Area

36 Acres

Climatic Zone

Composite

LAND

Recreational areas and open spaces

Minimal hard pavements

ENERGY

Passive Design

Heavy use of thermal mass walls

Courtyard Planning

Energy Efficiency

LED lighting fixtures

BEE 5-star rated fan units

Energy Generation

Solar Street Lighting System and Solar Heaters

WATER

Waste Water Treatment

WTP has a capacity to treat 2.5MLD waste water

Rain Water Harvesting

4 Rain Water Harvesting pits

WASTE

Organic Waste Handling

Mechanical compost machine in process

On site vermicomposting initiated

Regular Cleaning Drives

AIR

Shared Mobility

Pick up and Drop services for staff and training participants from 3 metro stations.

Next steps

Waste – Enhance waste segregation by using color-coded bins.
Completely replace disposables used in events
Renewable Energy – Install rooftop Solar PV plant for energy requirements;

Energy and resource audit to identify further retrofitment for savings

Water -Use efficient water fixtures in buildings.
Awareness on responsible water use.

Other campuses: Multiplier effect

Ramakrishna Mission Vivekananda Centenary College, West Bengal

Population

812

Green Team

Green Campus Monitoring Committee

Area

60 Acres

Climatic Zone

Warm and Humid

LAND

Agro-forestry

Trees such as Jackfruit, Mango, Ramfal, Sapota, Banana, Papaya etc. planted.

Lower embodied energy of food- self sufficiency

ENERGY

Energy Efficiency

LED lighting fixtures

BEE 5-star rated fan units

Energy Generation

72 KW Solar PV

Caters to 33% demand

Savings 4,36,452 in 2018.

WATER

Rain Water Harvesting

RWH System capacity - 19114 kiloliters

20%

Harvested water meets 20% water demand

Usage

Horticultural practices

WASTE

Organic Waste Handling

Mechanical Compost Machine

On site vermicomposting

AIR

Guru Nanak Dev University, Amritsar

Population

12,200

Green Team

Go Green Club

Area

500 Acres

Climatic Zone

Composite

LAND

Plantation

20000 trees, shrubs and Climbers

Botanical garden spread over an area of **25 acres**

Green Gardening Practices

Mulching is used as a gardening practice

Land Permeability

Permeable Walkways have been provided

ENERGY

Design Interventions

N-S Oriented Building Blocks

Cavity Wall construction.

Shading Elements

Courtyard Planning

Energy Generation

Solar PV plant of 1480 KW

WATER

Waste Water Treatment

WTP has a capacity to treat 2.5MLD waste

Rain Water Harvesting

Rain water is Channelizing towards the lawn/open areas.

WASTE

Waste Segregation

Color Coded Bins are used for segregation at source of generation

Organic Waste Ha ing

On site Vermicompo sting

AIR

Policy

No Vehicle Policy

NMT/Shared Mobility

E-rickshaws

Campus Cycle System

Green Infrastructure Provisions

Shaded Walkways

Sh cle

School campus: Change makers

DAV INTERNATIONAL SCHOOL, AMRITSAR, PUNJAB

Land

2017: 20% green areas

2018: 40% green areas

Water

2017: Per capita per day consumption 26 litres

2018: 15 litres (dual flush system, water efficient fixtures)

Rain water harvesting:

2017: 20%

- 2018: 90%, storage and recharge, 7 new recharge pits, ground water level increased, has filter unit etc

- **Waste: 2017:** Compost 90 kg; E waste disposal
  - **2018**: 98 kg compost; E waste to auhtorised dealers

School campus: Change makers

Contd.. DAV INTERNATIONAL SCHOOL, AMRITSAR, PUNJAB

Energy

- **2017:** 103658 MJ;No solar
- **2018:** 45810 MJ; 50 per cent reduction in bill amount
- 21 Solar powered street lights, 50% replacement by efficient appliances (500 tubelights reduced; 74 hot cases of 4000W replaced by 2000W; 12 LED and CFL lights removed; Strict monitoring and time reduction of running time of the electric appliances - 15000 units saved; new classrooms had better day light)

Air and Mobility

2017: Motorised travel

2018: 42% students cycle to school and/ or commute by E rickshaws

Kendriya Vidyalaya, New Majri, Maharashtra:

2018: All electricity requirement met by solar

CPWD & CSE

PROMOTING GREEN EDUCATION: TRAININGS AND PROFESSIONAL PRACTISES


My Ability to Sustainability


Green Sense

UPCOMING TRAININGS

Course Duration: 3-6 September 2019

Venue: Anil Agarwal Environment Training Institute, Alwar, Rajasthan

TRAINING FOR GREEN CAMPUS

Course Duration: 15-18 October 2019

Venue: Anil Agarwal Environment Training Institute, Alwar, Rajasthan

For details, contact:

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PROMOTING GREEN EDUCATION: TRAININGS AND PROFESSIONAL

PROCESS

Assign responsibilities

- Secure management support
- Establish a team

Prepare an inventory

- Set boundaries for evaluation
- Identify sources that affect environmental quality

Develop a baseline scenario

- Select a base year
- Obtain appropriate data
- Ensure data quality

CSE

PROCESS

Set Targets

- Identify intervention/reduction areas
- Chalk out an action plan
- Set a target year and target level

Take Action

- Implement the action plan
- Monitor progress regularly and frequently

Report Results

- Report the change over baseline
- Disseminate information for sensitization

Taking the agenda forward

- Build flagship programme on Green Campus
- Partnership on knowledge centres and education
- Best practice demonstration to change the practice
- Course curriculum on green campus
- CPWD – Model Sustainability Centres
- Knowledge support 100 residential campus – 100 days; Retrofit plans and campus level resource inventory
- Build capacity for operation and maintenance
- Build campaign for awareness among residents
- Knowledge partnership with green campus committee

Thank you

Let’s begin the discussions…