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India
SMART UTILITY
Week 2024

Session : Energy Positive Smart Buildings and Campuses

Pioneering Sustainability at Nalanda University: Development of
the World's Largest Triple Net-Zero Self-Sustainable Campus

Presented By

Manoj Kumar, Executive Engineer (Electrical & IT), Nalanda University, Rajgir

Supporting Ministries



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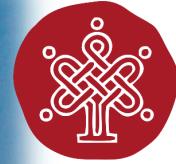
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@indiasmartgridforum



World Largest Net-Zero, Green & Sustainable Campus: A Role Model for the habitats, Campuses, and Future University



"Let Noble Thoughts Come To Me From All Directions"

॥आ नो भद्राः क्रतवो यन्तु विश्वतोः॥



Net-Zero Journey Towards Shunyata

Revival of ancient glory of Nalanda with amalgamation of the traditional concept & modern technology; An exemplary and model campus promoting sustainable future and environmentally-friendly habitats.

- Nalanda Net-Zero campus is modelled after ancient Indian indigenous energy models on 455 Acre sustainable campus with over 200 Buildings / structures with hybrid concept featuring renewable energy sources and its integration with various innovative technologies paired with demand optimization techniques.
- Some of the most important aspects -
 - Reduce Green House Gases
 - Sustainable water management
 - Integrated waste management
 - Reduce energy consumption
 - Reduce dependence on Fossil Fuel
 - Protect our environment for future generation.

Pillars of Net-Zero, Self Sustainable & Eco-Friendly Campus

Net-Zero Carbon Emission

Net-Positive Water

Net-Positive Energy

Net-Zero Waste





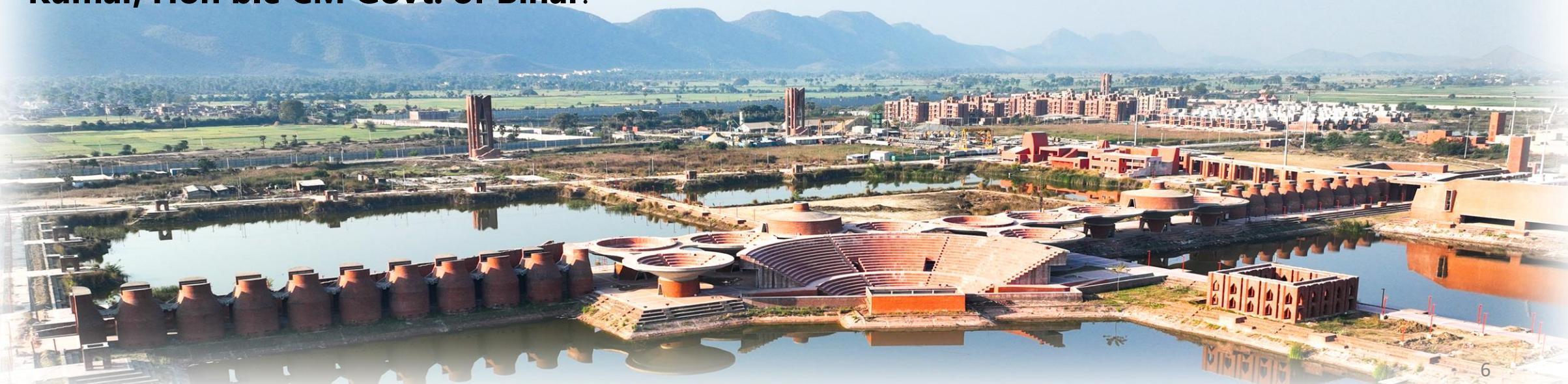
The Mandate:

- **The Nalanda Logo** - The central idea of Nalanda University Logo articulates deep respect for Nature & Sustainability based on the ancient sustainable concept of harmony and peace:
 - 1) Man Living In Harmony With Man
 - 2) Man Living In Harmony With Nature
 - 3) And Man Living As Part Of Nature



BACKGROUND AND CONTEXT

The **Nalanda University**, ancient seat of higher learning, the idea was mooted by former Hon'ble President of India, **Dr. A P J Abdul Kalam**, in March 2006. This new international avant-garde university was established through an Act of the Indian Parliament with a mandate to promote **regional peace and cooperation**. The reestablishment of the Sustainable University garnered support from **17 countries**. The university now occupies a **sprawling 455-acre sustainable, green, and largest net-zero, eco-friendly campus** nestled at the picturesque foothills of Rajgir. The campus land given under the dynamic leadership of **Shri Nitish Kumar, Hon'ble CM Govt. of Bihar**.



RELEVANCE

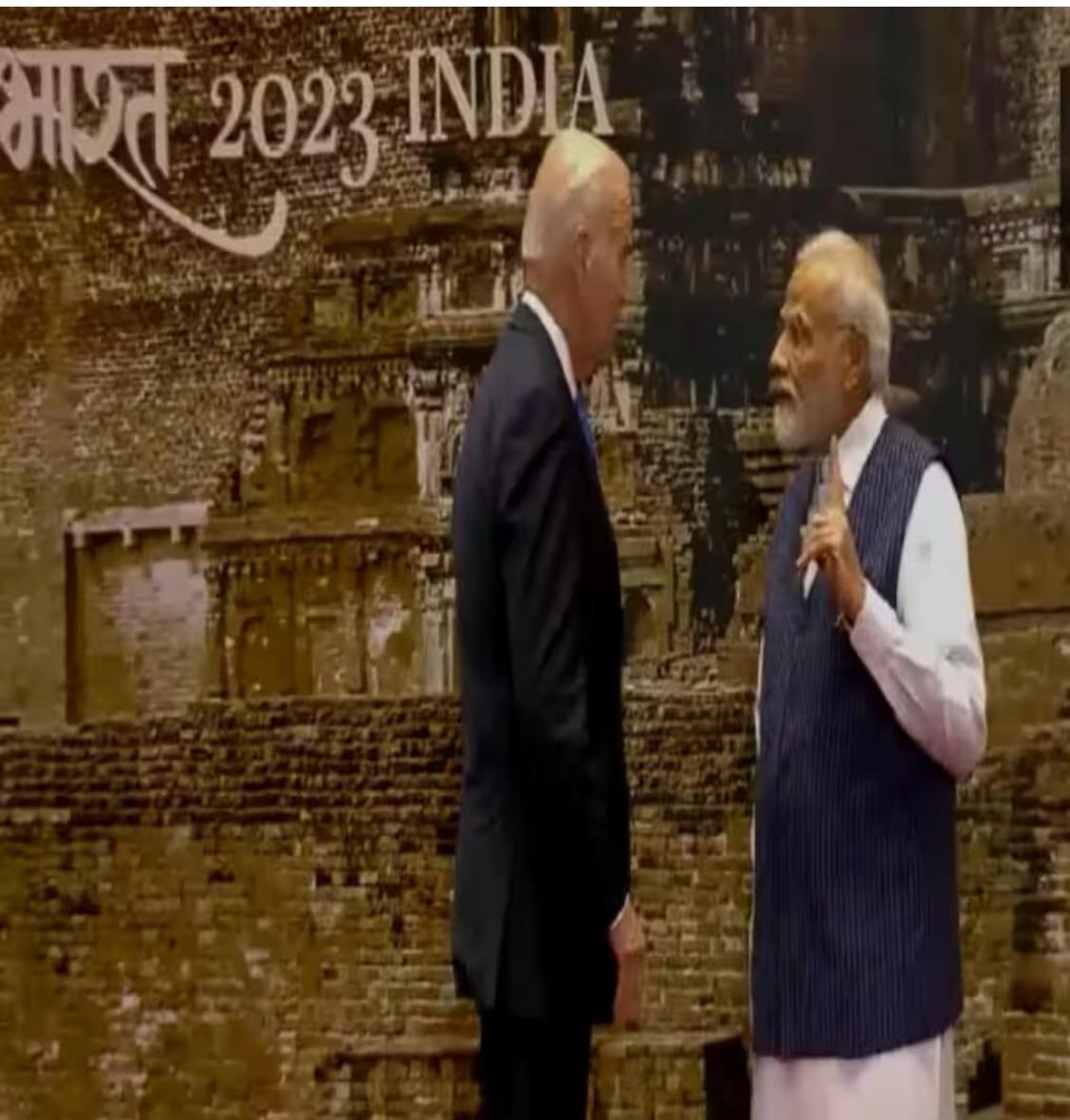
The pollution, temperature rise, carbon emission, the health of the livings, Ozone layer depletion Global warming, Loss of biodiversity and accommodation of the increasing population are the global challenges.

To address these, the world is still trying to balance and overcome with these burning challenges. The Prime Minister, Govt of Indian, Shri Modi Ji has emphasizes on :

"One Earth, One Family, One Future" during the G20 Summit and the enduring message of **"Panchamrit"** during COP26 continue to inspire us for our responsibilities towards nature and environment.

In this connection, he has highlighting the glory of ancient Nalanda University and its profound connection to the "Vedas" mantra, has set an unparalleled benchmark.



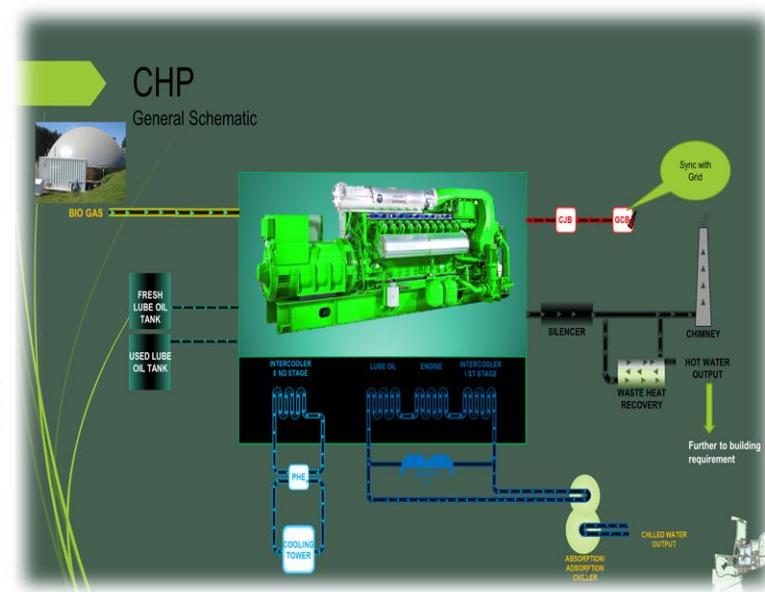
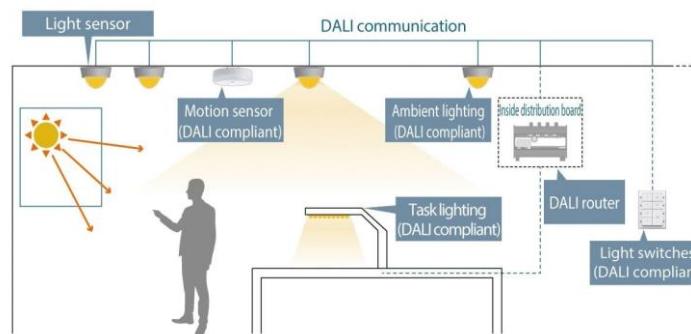
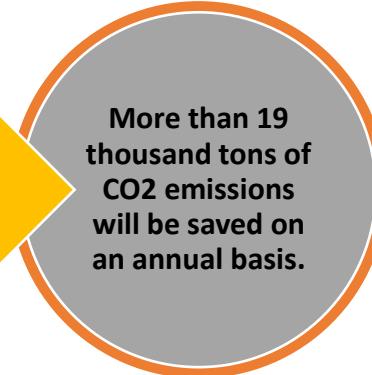
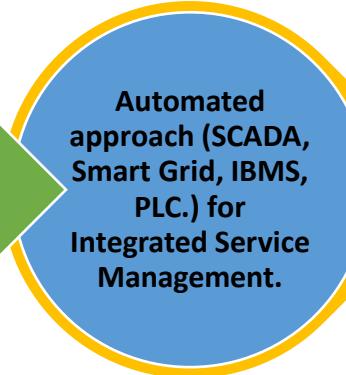
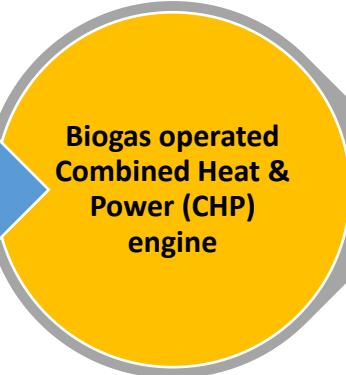
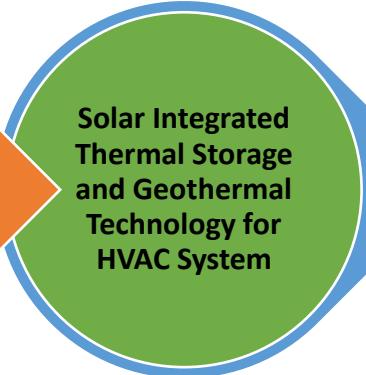
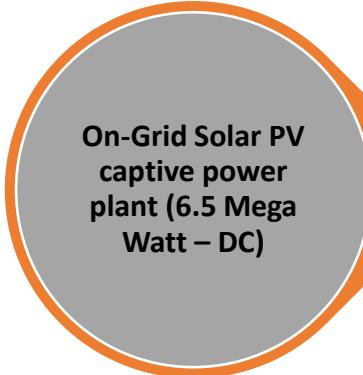


Net-Positive Energy : Renewable Sources



Solar hours – PV Solar System

Non – Solar hours – Biogas based CHP engine

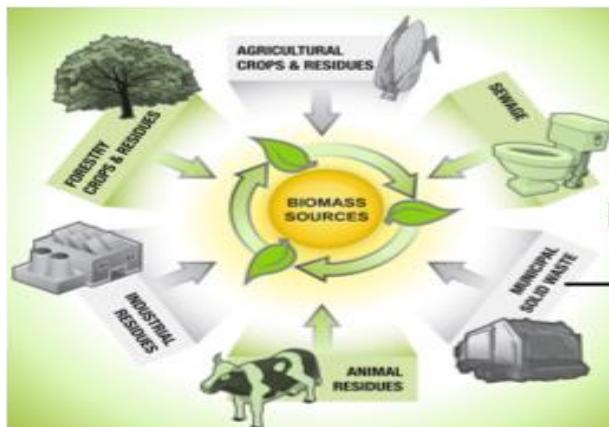


THE HYBRID MODEL WITH DEVAP APPROACH

DEVAP Approach

Desiccant Enhanced Evaporative Air-Conditioning

Bio Mass



P.V. Panel



ON-GRID Solar Initially 6.5MW of size and will be scale up to 10MW

Combined Heat & Power Engine=1.5MW

Electricity

Chemical Dehumidification

Lighting, Power, Pumping & Other Uses

Electricity

Evaporative Cooling



Heat



A

A.H.U

Cooling Tower



Chiller



Cool Air



B

Tempered Air



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Technical Guidance Through USAID PACE-D Program and Now MAITRE)

- Nalanda University is fortunate to have unconditional technical support from USAID Team through Pace D program and later on through MAITREE.
- Starting from 2014 including planning, design, guidance during execution and system optimization, Madam Apurva Chaturvedi with her team including Mr. Tanmay Tathagat, EDS Global, have extended their expertise.
- USAID being technical partner in the Net-Zero and Sustainable Steering Committee, Nalanda University is a first and single educational institution in India who has secured maximum VGF support from MNRE, GOI
- Bihar state is the 1st state in India, wherein the Regulatory Body has provisioned the net-metering and net-banking for 5 MW captive power generation through hybrid model. This has been possible due to especial efforts of USAID Team and CERC Guidance.



The screenshot shows the USAID | INDIA website. At the top, there is a navigation bar with links for Home, PACE, PACE-D TA Program, Resources, Events, Contact Us, and Privacy Policy. To the right of the navigation bar is a search bar and a "Search" button. Below the navigation bar is a large graphic of two hands shaking. To the right of the handshake graphic is a "LATEST NEWS" section with three items: "RE to play pivotal role in transforming BRICS", "OIL commissions 54 MW wind power project", and "Arun Jaitley bats for greener technologies to". Below the news section is an "UPCOMING EVENTS" section with one item: "April 27 – 30, 2015 (Kolkata): Microfinance Technology Showcase and Partner Orientation". At the bottom of the page are sections for "RECENT HIGHLIGHTS" and "COMPONENTS".

Indigenous Palette of Concepts for Energy Optimization – Demand Side Management (DSM)

- Use of thick cavity walls to increase thermal resistance
- Use of integrated boxes of masonry for seismic stability
- **Use of Compressed Stabilized Earth Blocks (CSEB) blocks instead of common burnt clay bricks**
- Use of day light occupancy sensors
- **Building orientations for optimal capture of natural light but not heat.**
- Passive architectural design or the veranda concept to get the natural reflective light inside.
- **3 Layers of plantation – from boundary to buildings – woodland, orchard, herbal and aquatic resulted in purification of air, temperature and mosquito repellent.**
- DEVAP, DEWAT, Geo-Thermal, and Thermal Storage in place of conventional battery.



India SMART UTILITY Week 2024





Indigenous Palette of Concepts for Energy Optimization – Demand Side Management (DSM)



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Climate appropriate landscape design to reduce portable water demand

Smart LED lighting, Day Lighting Auto Sensing Controls, DALI Technology

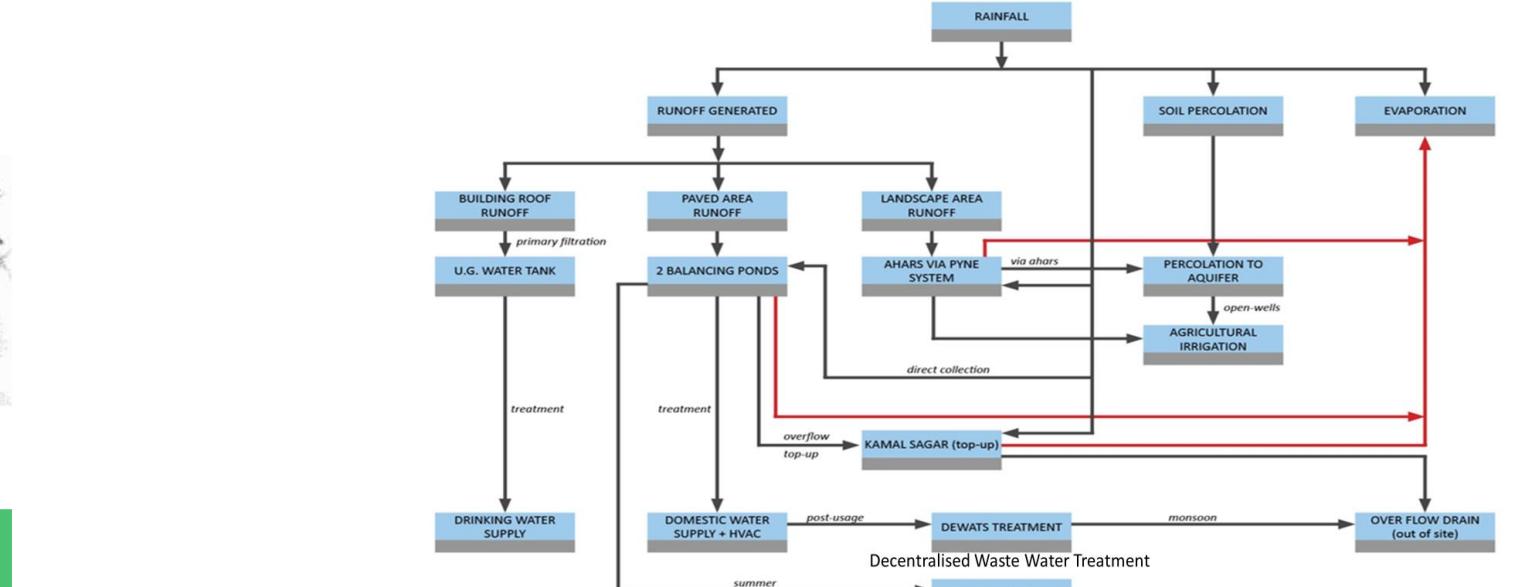
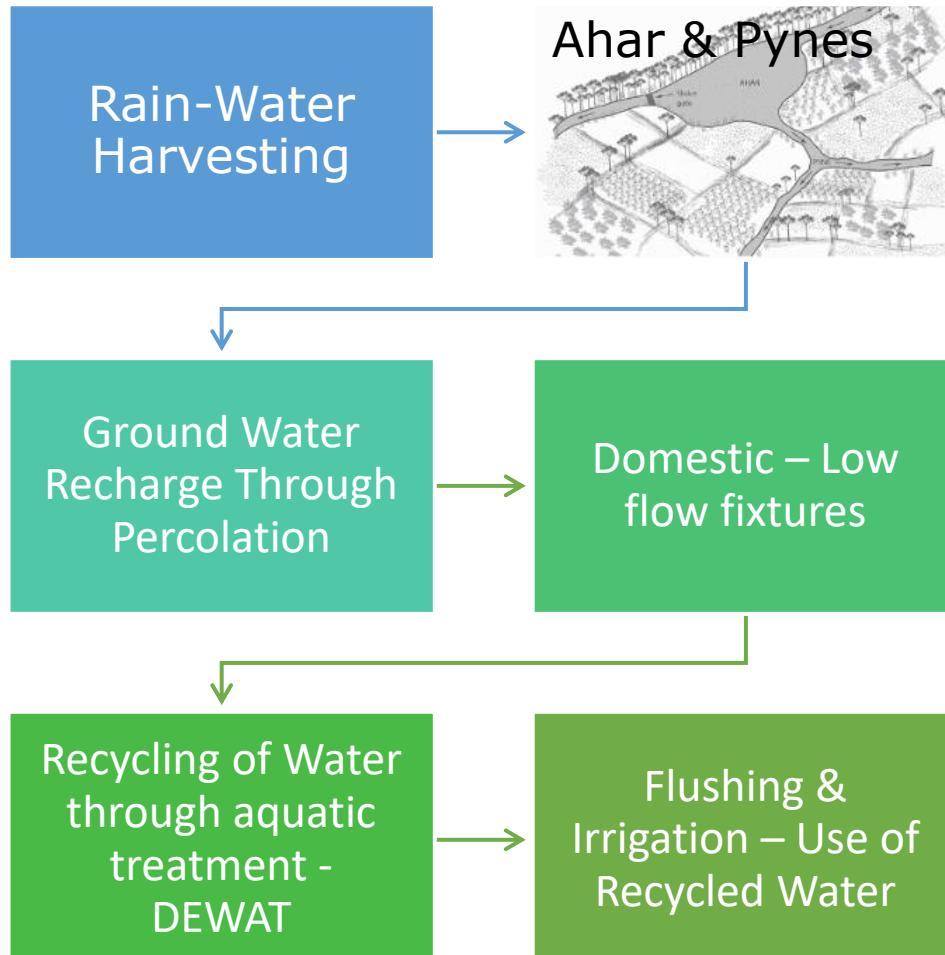
Biogas operated Combined Heat & Power (CHP) engine

Use of Desiccant Evaporative (DEVAP) technology for cooling/heating of the buildings

Decentralized Water Treatment (DEWAT) systems

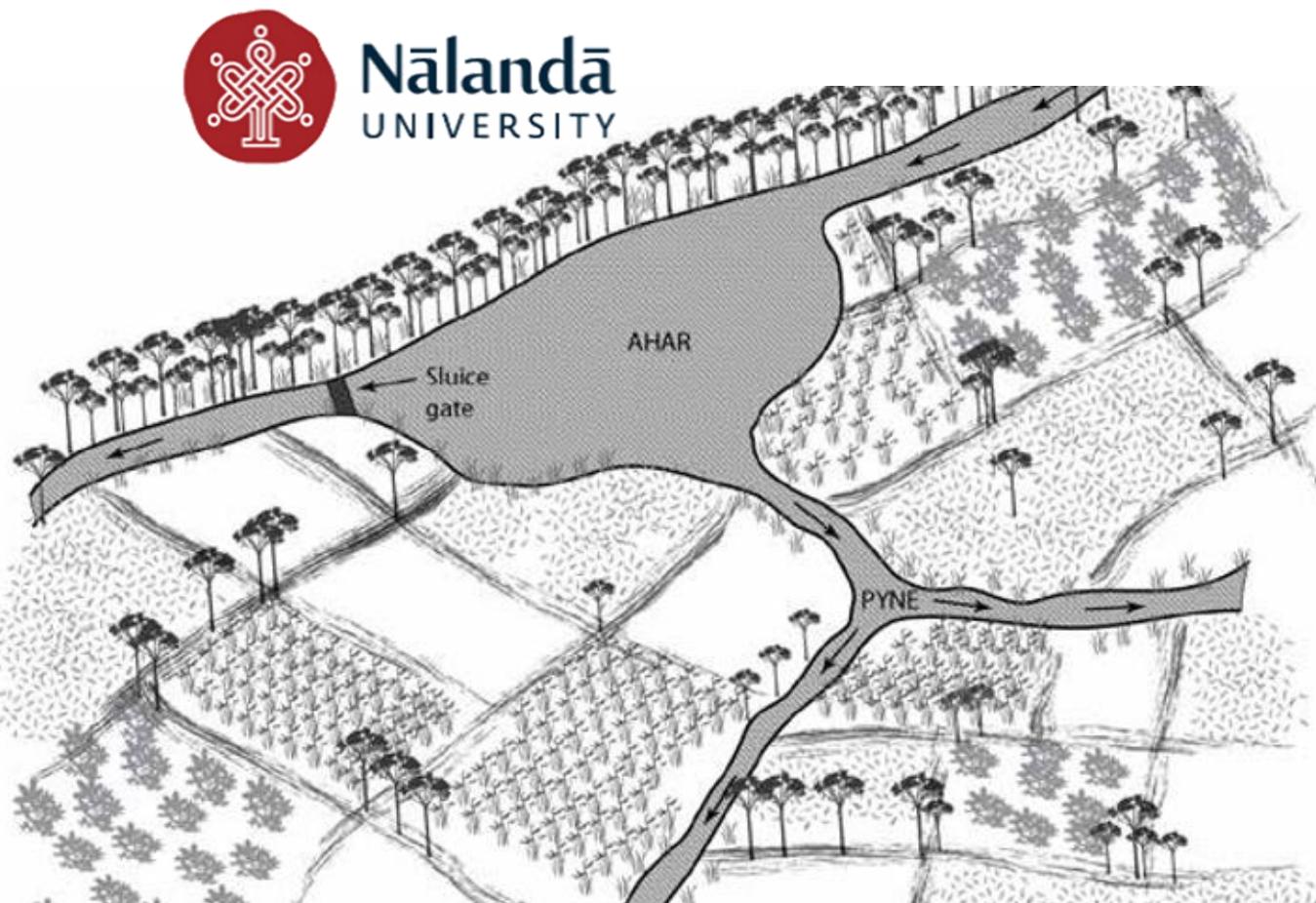
Strategies for efficient waste management system

INTEGRATED WATER MANAGEMENT

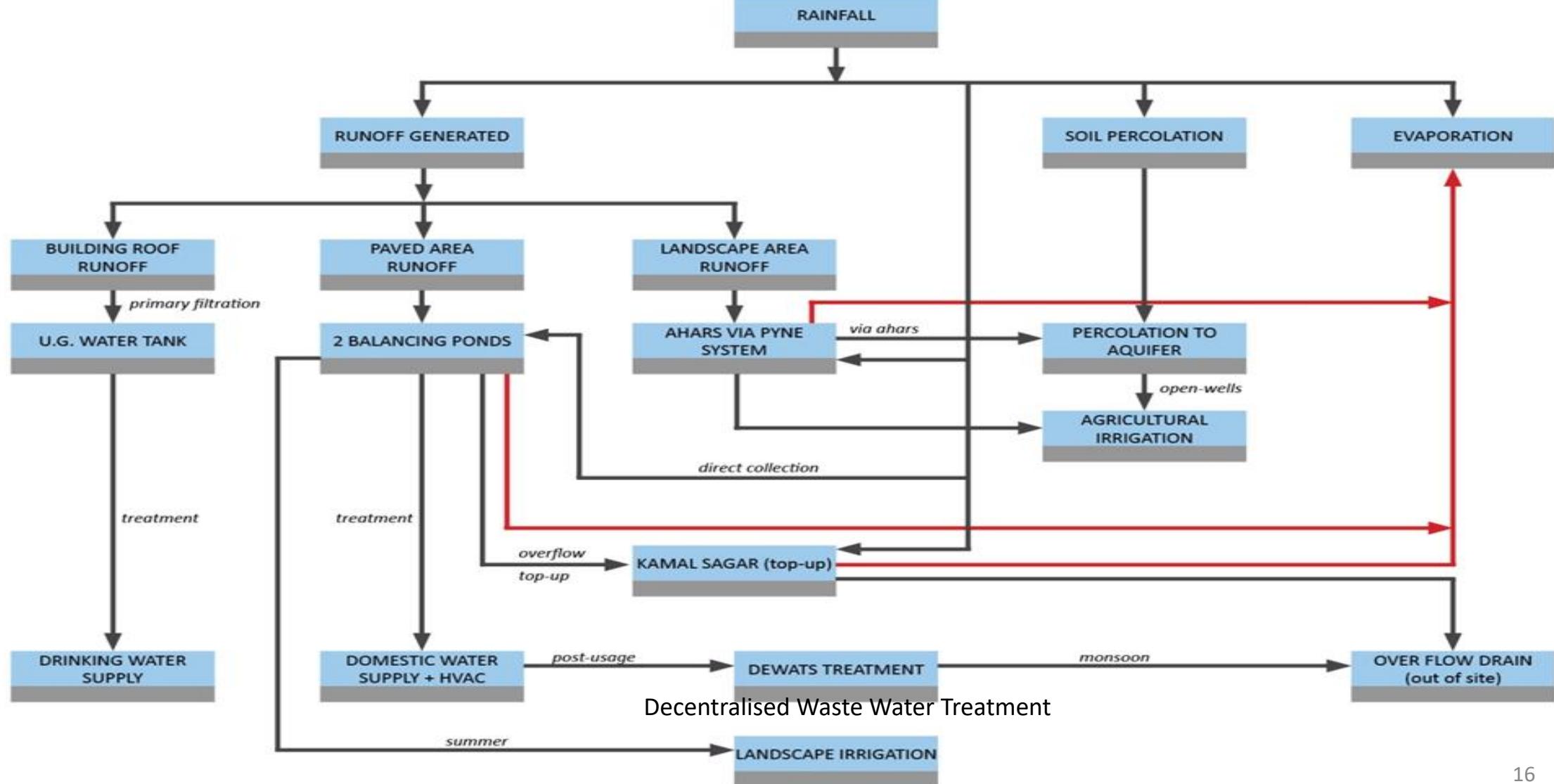


INTEGRATED WATER MANAGEMENT

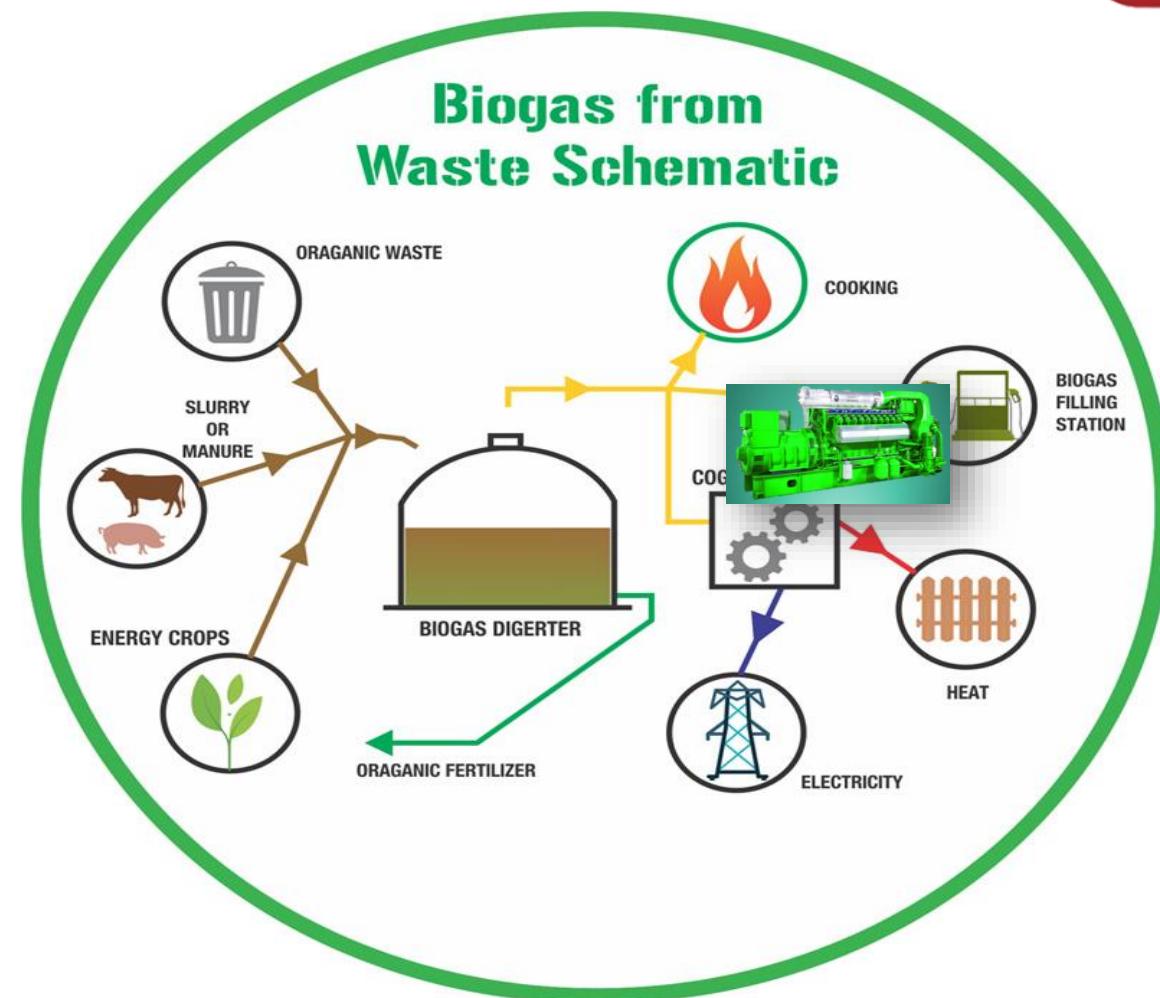
- The ancient Ahar-Pynes System is emulated for Water Management and to develop an indigenous water network within the campus.
- 40 Hectares(100 Acres) of Water Bodies** constructed inside the Campus to enable rainwater harvesting .
- Water cycle on site is designed to be resident against flooding and drought both.
- Rainwater runoff generated from rooftop is being stored in underground tanks for drinking purpose.
- Total Rainwater generated is directed to Kamal Sagar (the Central lake Waterbody) and its balancing tanks via Ahars & Pynes.
- Rainwater assimilated in Ahars are used in irrigation and experimental agriculture.
- Wastewater from domestic use are treated via Decentralized Waste Treatment System (DeWATS) and used for irrigation of landscape.
- Indigenous design mandated construction of the waterbodies first, in order to hold rainwater to use later for construction of the buildings.



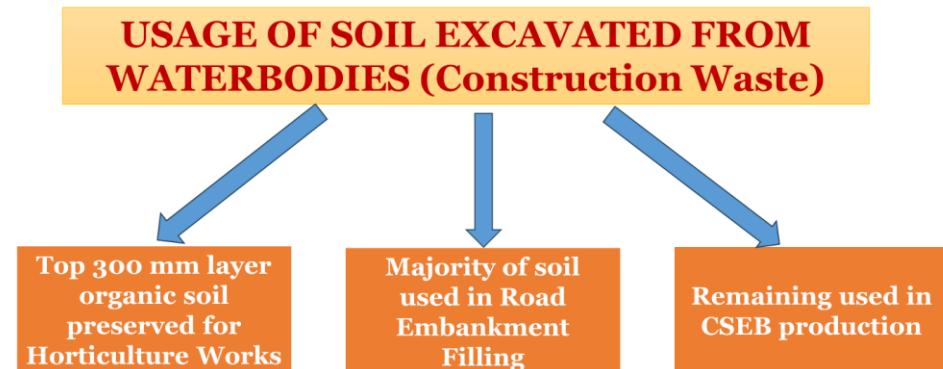
INTEGRATED WATER MANAGEMENT SCHEME



NET ZERO WASTE MANAGEMENT



- ✓ **Recycling of all type of wastes:** Organic waste will be profitably utilized either for energy or as compost. The policy will actively discourage use of non-disposable, non-degradable materials within the campus. The approach also emphasizes construction-waste minimization or elimination.
- ✓ **Decentralized Wastewater Treatment (DEWAT) Systems** are installed in adequate numbers for treating the sewage during operational phase and the treated water will be totally reused for land irrigation.
- ✓ The wastes collected from within the campus and from the neighbouring villages are to be used to generate biogas to produce electricity with the help of the Combined Heat & Power Engine (CHP).
- ✓ The heat energy generated by CHP will be used for heating the water to meet hot water demand and thereby reducing energy cost.



NET-ZERO GREEN HOUSE GAS EMISSION

- Use of Compressed Stabilized Earth Blocks (CSEB) as the main building materials.
- These unburnt bricks (CSEB) manufactured at site with soil excavated from the waterbodies which have less carbon footprint in comparison to the common burnt clay bricks.
- CSEB consume 11 times less energy than the common burnt clay bricks
- Use of soil from the site itself as against procuring from off-site to manufacture compressed stabilized earth blocks reduces GHG emission due to transportation.
- Use of integrated boxes of masonry to achieve seismic stability causing less use of concrete & steel resulting in lower GHG Emission.
- Use of thick cavity walls to increase thermal resistance resulting in reduced energy demand.



KEY TAKEAWAYS / RECOMMENDATIONS

Regulatory Related Recommendations:

- The changes and amendments in net-metering for renewable energy based captive consumer are being recommended herein –
 - A. The capping value limited and generally it is fixed upto 1MW in regulations which need to be allowed upto sanctioned demand of the captive consumer.
 - B. Hybrid model should be opted, Net-Metering facilities are mainly notified for the Solar PV generations which should be allowed for all possible renewable energy generations with the combination of all together or part thereof.
 - C. The net-metering should be amended with net-banking.
 - D. Peak hours settlement at least with effective and weightage generated unit wrt peak hours charge should be extended to the captive consumers.

E. Policy Related Recommendations:

- The amendment in the govt policies are also required – the captive consumer should be allowed to opt the open exchange power trading platform for the export of excess energy generation, As the VGF schemes restricts for captive consumer and the scheme is framed for the PSU generators
- All the campuses like educational institutions, Govt offices, districts and subdistricts level govt campuses should have the optimal energy to meet zero and nearly zero goals (export-import =0) as a mandatory requirements.
- New campuses / habitats NOC and sanctions should be given with the target to follow and achieve the net-zero goals.
- The carbon credit and trading benefits are recommended to increase more.

THANK YOU

*For discussions/suggestions/queries email: **isuw@isuw.in**
visit: www.isuw.in*

Links/References (If any)





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