



भारतीय प्रबंध संस्थान बंगलूर
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Frugal Smart Solutions for Pan City Development

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Frugal Smart City: Basic Principles

1. It is an Optimum City
2. Seeks to Minimize usage of resources, not focus on maximizing provisioning of services
3. Believes in Recycling; seeks to minimize wastage
4. Seeks seamless and integrated systems
5. Believes in all round development of all sectors – not lop sided development
6. Believes in affordable, sustainable development
7. Shifts the focus to citizen engagement and citizen centric planning and development

Smart City: Areas of Interventions

1. Citizen engagement & Governance
2. Mobility and Transport: Seamless
3. Decongestion: Dispersed development
4. Energy management: Energy efficiency, smart usage
5. Water management: RWH, Minimize usage
6. Storm water management
7. Sewage management: Decentralized treatment
8. Solid waste management: reduced generation, recycling
9. Smart buildings
10. Health: Minimize visits
11. Education: Minimize school distance
12. Environment
13. Safety and security





Best Practices in Frugal Solutions



Integration of Land Use and Bus System, Curitiba, Brazil

- Promotion of linear growth along the structural axes of transportation
- High-rise residential as well as commercial buildings allowed close to the structural axis
- Density reduced with increase in distance from the axis
- The roads in each of the structural axes are divided into three:
 - central street for public transport and local access with parking.
 - On both sides of the central street there are one way streets for travelling away or into the down town area.
- An express bus system covers the entire municipality area through exclusive traffic lanes



Vélib': Bike-Sharing in Paris

- Users pay a daily or annual fee for using the bicycles
- Employees assigned to do the maintenance of these bicycles
- Economic ,convenient and eco-friendly
- Helped in reducing the traffic congestion in Paris



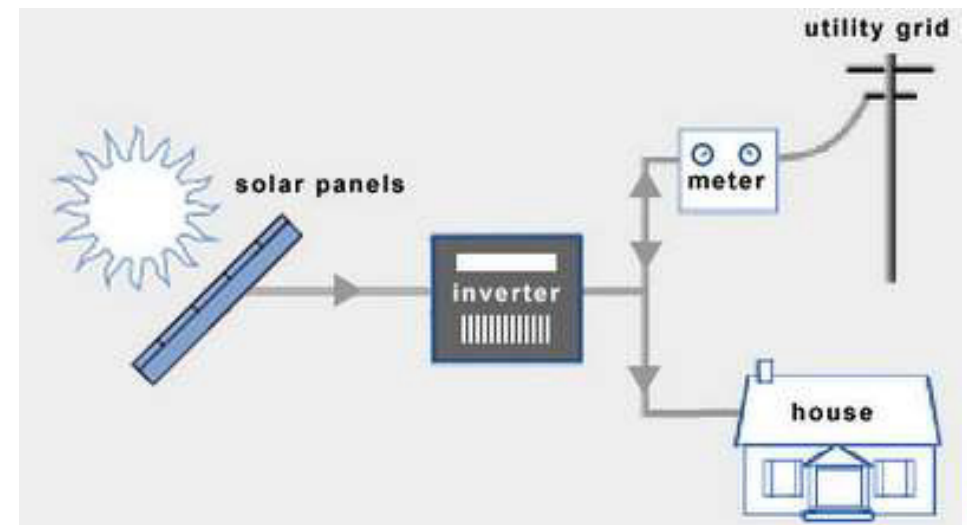
Low Impact Development (LID)

- LID promotes storm water management through site design
 - Promotes the use of natural systems for infiltration, and for reuse of rainwater which reduces the storm water runoff volume and intensity.
 - Helps in managing the rainwater at source itself
- Explores the potentials of components of the urban environment such as open spaces, rooftops, streetscapes, parking lots, sidewalks, medians, etc.
- Some of the techniques used in LID :
 - Redirecting waterspouts to vegetation, rain barrels or cisterns;
 - Bio retention with the help of grass strips, bioswales, rain gardens, tree box filters, etc.
 - Use of water detention basins , green roofs ,permeable pavers, etc.



Grid-connected SPV (Solar Photovoltaic) Rooftop systems

- Solar panels are installed on roof tops and the electricity generated is used for self-consumption with net metering or fed into the grid
- Advantages :
 - Savings in transmission / distribution losses
 - Reduced gestation time
 - Saving of land since the solar panels are installed on roof tops
 - Higher self-consumption of solar energy
- Reduces the dependency on the grid power to a large extent with more reliability



Flood management: Singapore

- Singapore's Bishan -Ang Mo Kio Park was upgraded in such a way that it helps in flood prevention through natural landscape.
 - Concrete drainage channels running through the park was converted into meandering natural river which functions as flood plains.
 - This helped in creating new spaces for recreation and in bringing back a natural ecosystem
 - Safety measures like warning systems with water level sensors, warning lights, audio announcements, etc. are also there to inform people when the water level increases.



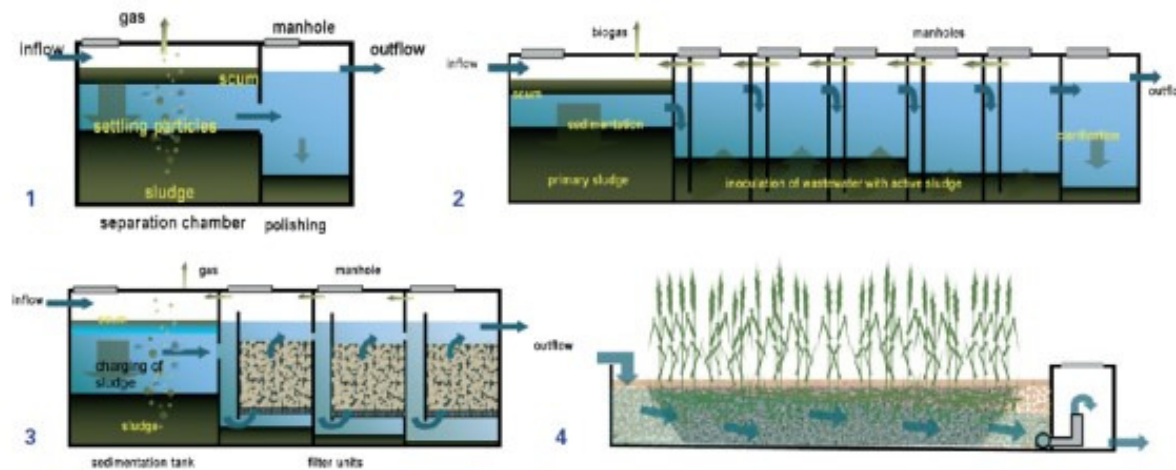
Image by D. Tunas for GAF



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DEWATS (Decentralized Wastewater Treatment Systems)

- Technical approach to treat waste water in a decentralized manner.
- Functions in four stages :
 - Primary treatment with the help of sedimentation and floatation
 - Secondary anaerobic treatment using baffled reactors or anaerobic filters
 - Tertiary aerobic treatment using sub-surface flow filters and
 - Aerobic treatment in polishing ponds
- low maintenance with no power requirement.
- This system can be used for treating organic waste water from domestic as well as industrial sources with a treatment capacity of 1-1000 m³ per day.



Condominial Sewerage Systems in Brasilia, Brazil

- Condominial sewerage systems were developed in Brazil during 1980s to tackle the issues associated with expansion of sewage treatment services to peri-urban neighborhoods.
- It demands more community participation in planning and maintenance and helps in achieving substantial cost savings.
- Service is provided to group of dwellings or neighbourhoods which helps in reduction in length of networks.
- There is a closer relationship between the users and service providers, making it a social unit with collective decision making and community activities



Solid waste management, Japan

- Emphasis given on recycling technologies:
 - Able to turn a major part of the waste into resources and dispose only the remaining
- Efficient waste collection and transportation
 - Helps in providing good quality service to residents
 - Helps in reducing the overall cost of solid waste management
- Japan has safe and efficient waste incineration plants capable of high efficiency power generation without causing pollution
- 3R policy which promotes Reduce, Reuse and Recycle initiatives
- The wet waste is used to generate electricity and fuel
- The non-recyclable waste is sent to landfills under three categories
 - Controlled landfill
 - Inert landfill, and
 - Isolated landfill.



Green buildings

- Practice of creating structures and using processes that are environmentally responsible and resource-efficient
 - From siting to design, construction, operation, maintenance, renovation and deconstruction
- Impact of the building on the environment and human health is reduced.
- Incorporate many sustainable materials for construction which are either recycled or made from renewable sources
- Some of the features of Green buildings :
 - Efficient use of energy, water, and other resources
 - Reduction and sustainable management of waste
 - Reduction of pollution and environmental degradation, etc.



Proposal

- **Establish Resource Centers for Each sector with focus on low cost technology**
- **They come up with technology, manuals, capacity building, etc.**
- **Organize state wide programmes on low cost technologies**

Thank you

Parking management

- Traffic congestion is caused by vehicles looking for parking
- Real-time data on parking space availability & route using ICT
- Reservation of parking slots using web based applications
- Fee based service



PARK & RIDE scheme: Singapore

- Helps in parking the car on the way and to make the remaining travel by public transport.
- Faster, cheaper and convenient
- Parking sites Availability search using smart phones too
- These parking spaces are cheaper compared to the ones in the city centre
- Reduces the congestion in the city



Advanced Metering Infrastructure (AMI)

- AMI: The whole infrastructure and applications which enable real-time gathering as well as transfer of utility usage information related to energy, water and gas
- AMI include remote meter reading to get error free data, problem identification in the network, energy audit, load profiling, etc
- Helps in two way communication with the customers
- Components of AMI includes, smart meters, communication networks, Meter Data Acquisition System and Meter Data Management System.
- Enhanced monitoring mechanism

Local energy generation, Yokohama, Japan

- Under the Yokohama Smart City project, in a four storey building with 24 apartments, Household Energy Management System (HEMS) have been installed where the major source of power was 'ENE-FARM'
 - ENE –FARM is a residential fuel generation system.
 - It utilizes a Polymer Electrolyte Fuel Cell (PEFC) to generate electricity from gas and it is also efficient in heating up water.
- The HEMS is an integrated control system which can predict the demand and supply of energy for the next day in the building including the electricity demand, hot water requirement and the solar electricity generation
- With the help of this system, almost 60% of the electricity demand and 90% of hot water demand can be covered

Green building: The Solaire, New York

- 27 storey residential tower with 293 units
- Building construction utilized recycled materials wherever possible and almost 60 percentage of the building is constructed using recycled materials
- Green roof :Almost 75 percentage of the roof is covered with plants, helping in reducing heating and cooling loads in the building
- Waste water is recycled and utilized in toilets, cooling towers and for irrigating the landscape
- Water-efficient fixtures and toilets help in conserving water
- Use of energy saving methods helped in reducing the energy demand by 35 percent
- Storm water management with the help of water retention layer at site, collection of storm water runoff in basement storage tanks, green roof, etc



Seamless Multimodal transport: Copenhagen, Denmark

- Physical and online integration among various modes of transport including cycling
- Real time information through digital signs and text messages
- Online journey planner
- Text ticketing facility
- One ticket can be used in bus, train and metro with transfer between modes made free

