

PLANNING FOR GREEN MODULES FOR NEW URBAN SPACES: ECONOMIC DIMENSION

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Kolkata, September, 2012



CITIES & TOWNS IN EASTERN INDIA: FUTURE OUTLOOK

- Population: Expected to remain high
 - Natural Increase
 - Migrant workforce – Formal and Informal Sectors
- Population Density: Expected to increase outside the Core Areas
 - Limited availability of space in the core area
 - Relatively high property prices within the core area
- Major challenge for City Developers
 - Raise the overall quality of urban services delivery system
 - Bridge the gap in infrastructure for the urban service delivery in those parts of the city where the population is expected to increase
- Sustainability – an additional “burden?”



***CLIMATE CHANGE:
UNPRECEDENTED CHALLENGE
FOR THE ENTIRE MANKIND***

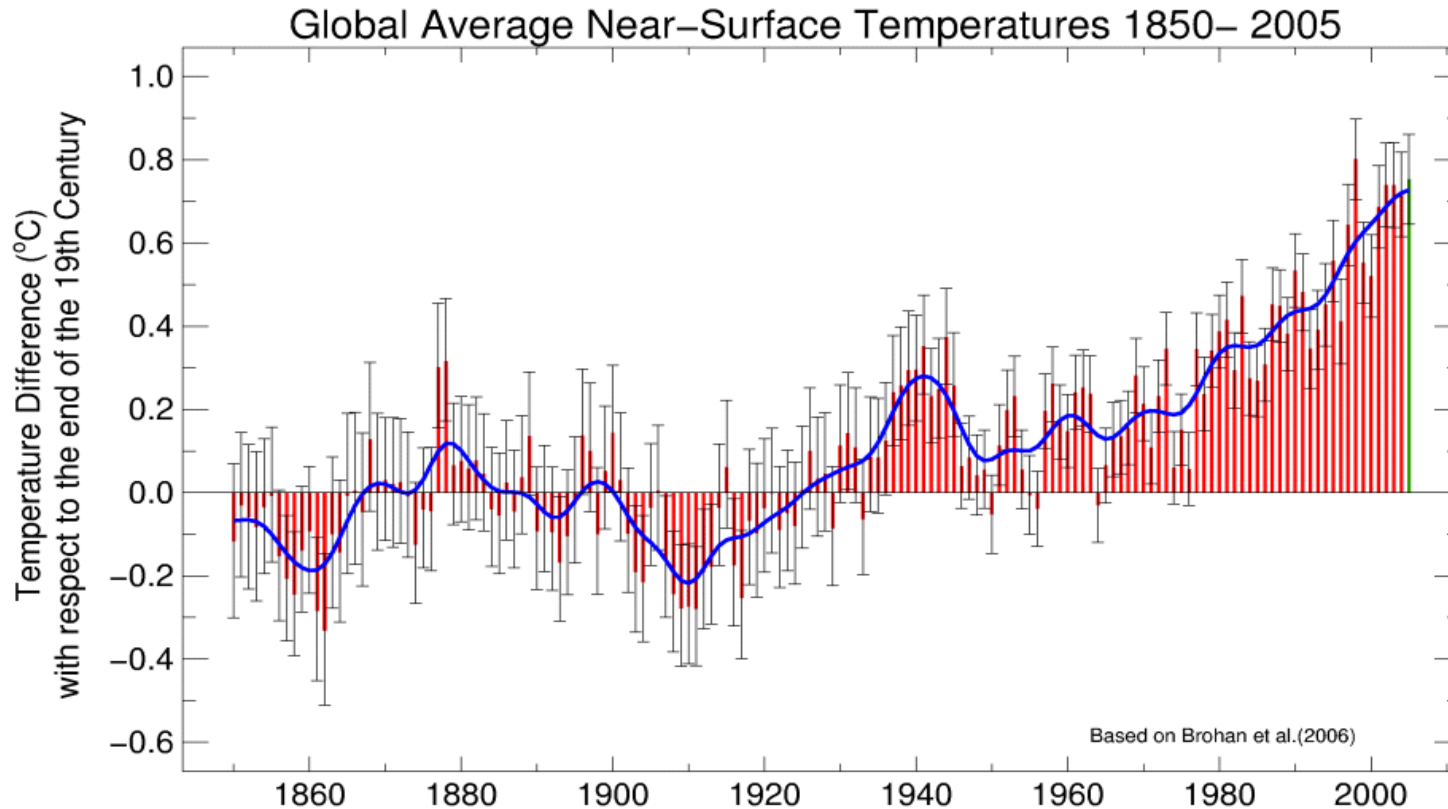


OBSERVED CLIMATE CHANGE – GLOBAL SCALE

- 1995-2006 - Warmest years in the instrumental record of global surface temperature since 1850
- Rate of Global Average Sea Level :
 - In the last century - 1.8 mm/yr
 - 1993 to 2003 - 3.1 mm/yr
- Precipitation between 1900 – 2005 :
 - Increase in eastern parts of North and South America, northern Europe and northern and central Asia
 - Decrease in the Mediterranean, Southern Africa and parts of Southern Asia



GLOBAL TEMPERATURE TRENDS



Met Office

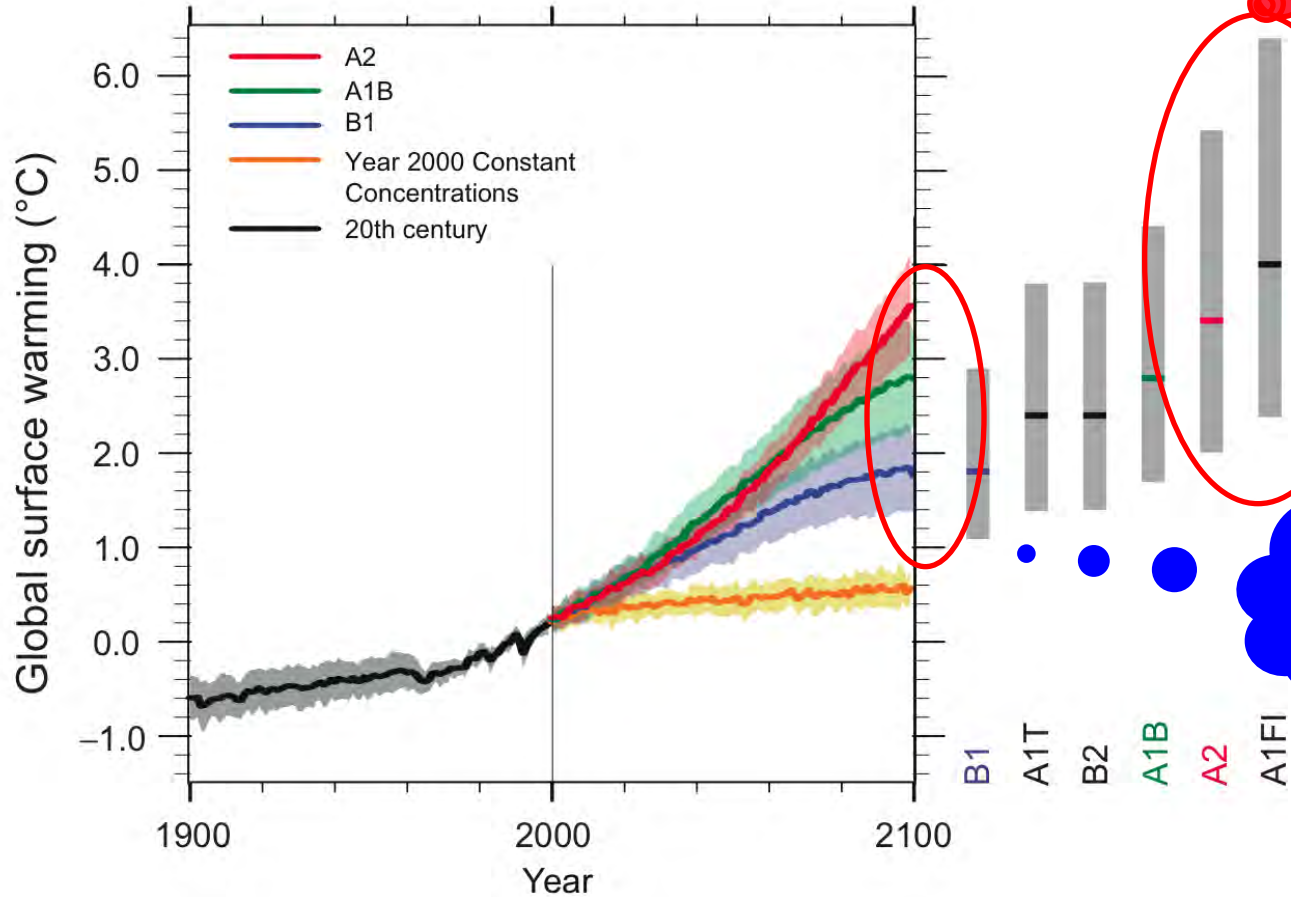
Hadley Centre for Climate Prediction and Research

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Source: Ravindranath, N.H., 2010



PREDICTED CLIMATE CHANGE



Development path with HIGH base emissions

Development path with LOW emissions



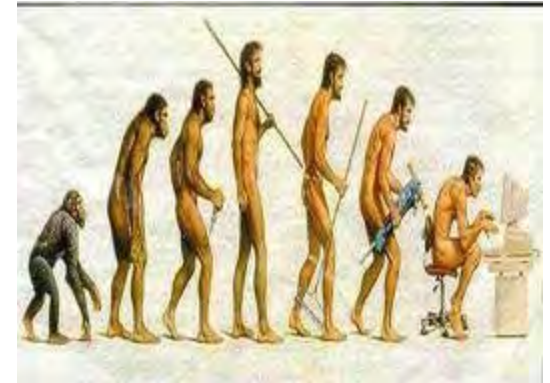
CLIMATE CHANGE IMPACTS - INDIA

- Sea level Rise – Threat to coastal agriculture and settlement
- Erratic monsoons – Threat to agriculture and food Security
 - Crop productivity projected to decrease even at 1-2^o C rise in temperature
 - South Asia: crop yields are projected to decline by 30% by 2050s
 - Increased sea and river water temperature is likely to affect fish breeding, migration and harvest of fish
- Water stress and decline in fresh water supply – Drought
- Increased frequency of floods, draughts, storms – Extreme Events



NEED OF THE HOUR: FOCUS OF POLICIES

- **Avoid Unsustainable Development Through Integrating Adaptation & Mitigation in the Development Process**
- National Action Plan on Climate Change
- National Habitat Mission
- State Action Plan on Climate Change



AVOID UNSUSTAINABLE URBANIZATION: THE IMPERATIVE

- Urbanization is a Reality
- Climate Change is a Reality
- Sustainable Development is the Goal of All Policies



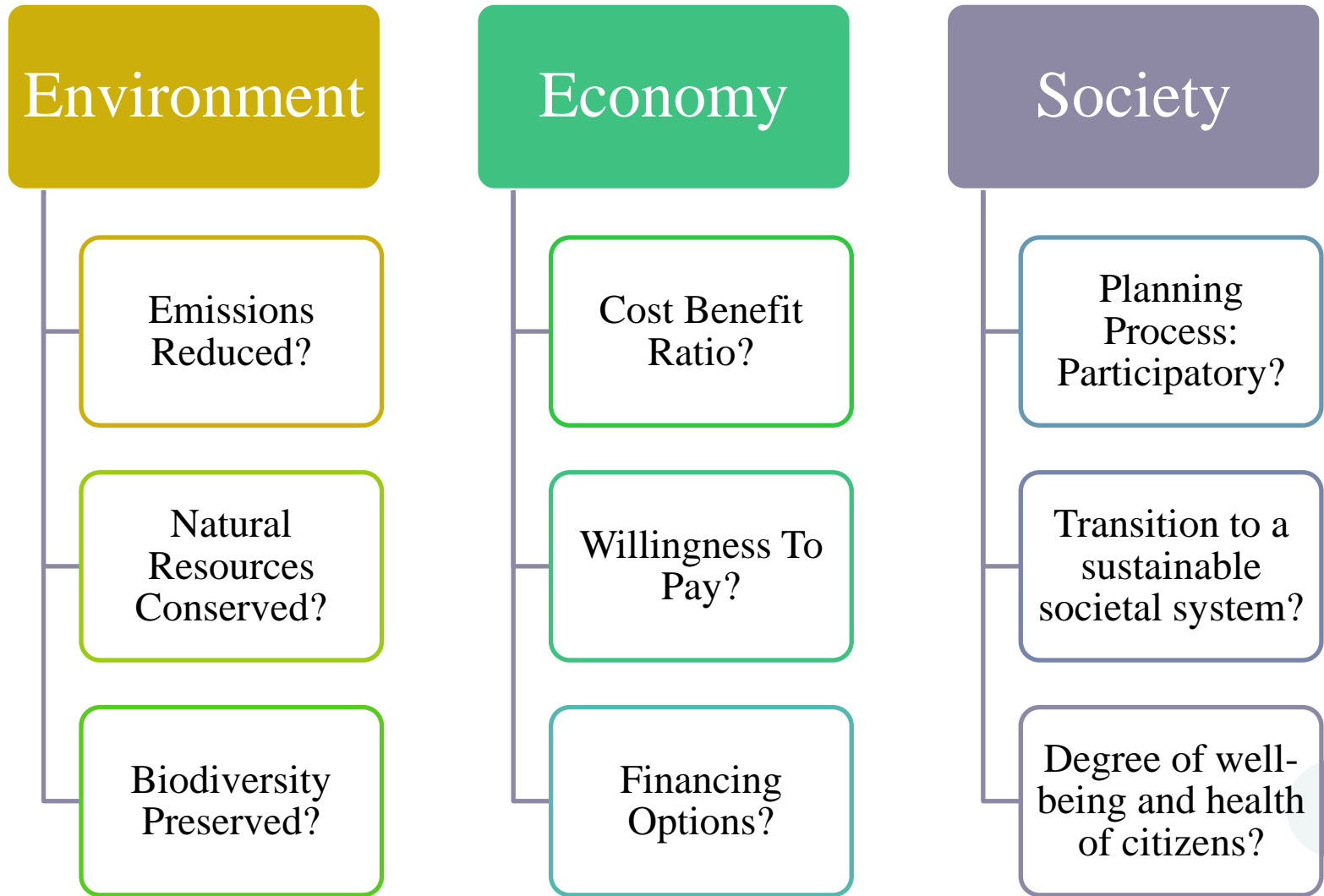
- **How to integrate urban development policy options, tools and techniques with climate responsible policy options in order to ensure Sustainable Urbanization in the Long run?**



- Reappraisal of priorities – Assessment of Vulnerability and Adaptation/Mitigation Potentials
- Aim at Sustainable Transitions



3 PILLARS OF SUSTAINABLE CITY



GREEN MODULE - RELEVANCE OF ADDITIONAL OPEN SPACE

- Conventional Habitat Design

- 65% Built Up Area
- 35% Open Space



- Green Modules

- 57% Built Up Area
- 43% Open Space



- Additional Open Space

- 8% of the total land available for Development
- Assuming a total land of 500 Acres, the additional open space recommended is 215 Acres



ADDITIONAL OPEN SPACE: COST

- Additional 8% open space implies Loss of Revenue (Profit)
- Assumptions:
 - FAR = 2.0
 - Residential : Commercial: 50:50
 - Cost of Construction
 - Rs. 1200.00/ Sq. Ft. – Residential
 - Rs. 1700.00/ Sq. Ft. – Commercial
 - Selling Price
 - Rs. 2200.00/ Sq. Ft. – Residential
 - Rs. 3500.00/ Sq. Ft. – Commercial
- Total Profit Foregone : 465.00 Crores (Loss)



BENEFITS: ADDITIONAL OPEN SPACE

- Hedonic Pricing: Property Value increases when properties are located closer to the nature (open space)
- Assumption
 - Only 15% of the total available floor space is located near (within 500 meters) this additional open space
 - Incremental Growth Rate in Notional Rent: 5%
- Present Value (Incremental Annual Property Tax) @ 6%: Rs. 450.00 Crores



BENEFITS: ADDITIONAL OPEN SPACE

- Carbon Sequestration
 - Additional open land is just left as a grassland
- Annual Carbon Sequestration: 94 TCO₂/Year (Roy, J. (2009): CDM and Policy Issues for Indian Power Sector, Jadavpur University)
- Equivalent to setting up 9 x 100 KW Solar Grid Power System
 - Initial cost: Rs.27.00 Crores (Roy, J; et. al. (2009): CRLI @ Raj Bhavan, Jadavpur University)
 - O&M Cost: Rs. 0.27 Crores/ Year (assumption)
 - Life = 10 years (assumption)
- PV(Cost Avoided) for equivalent CO₂ Abatement: Rs. 256.00 Crores



BENEFITS: ADDITIONAL OPEN SPACE

- Health Benefits
- Annual Per Capita Cost of treating Lifestyle Diseases (Diabetes, Type II): Rs. 1890.00 (PwC, 2007)
- Probability of preventing T2D by regular exercise (brisk walking, running, etc.): 58% (Tuomilheto, J; et. al. (2001))
- Assumption: 30% population uses this additional open space for exercising
- PV of Annual Savings in Treatment Cost: Rs. 33.51 Crores
- Similar Benefits can be calculated for Cardio Vascular Diseases, Obesity, etc.



GREEN TRANSPORTATION: SHORT DISTANCE

- Assumptions:

- Road length: 2.00 Km
- Number of Diesel 4Stroke Auto Rickshaws: 25
- Average number of passenger trips: 15/day (CDP, KMA)

- Number of Cycle Rickshaws (replacing auto Rickshaws): 50 (approximate)

- Other modes of travel for covering 2 kms:

- Cycling
- Walking

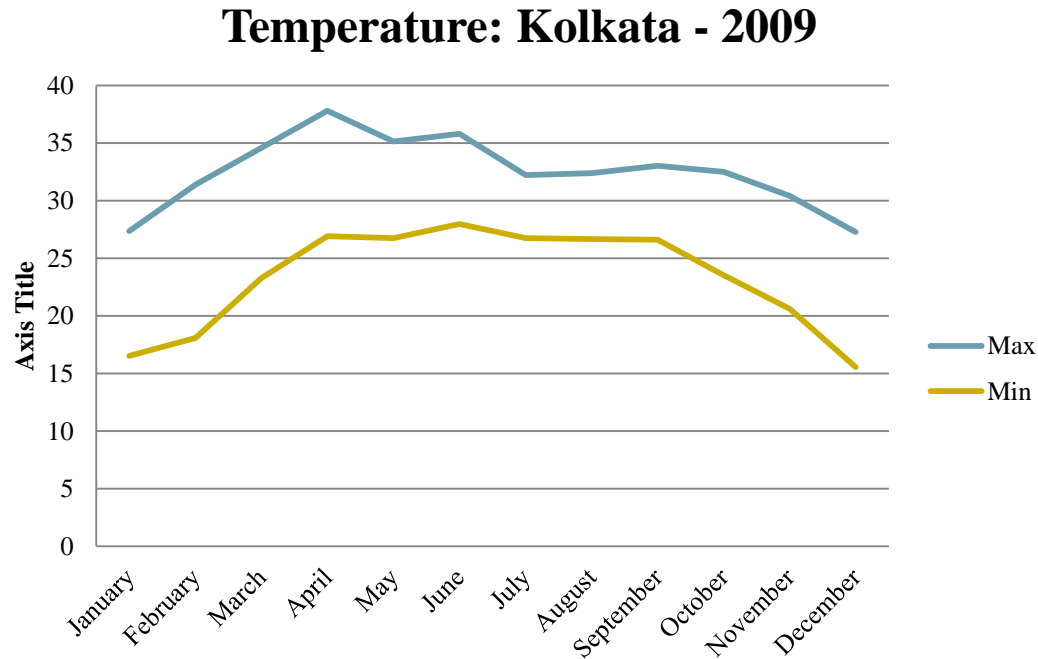


IMPACT: GREEN TRANSPORTATION

- Replacing Auto Rickshaws by Cycle Rickshaw will mean:
 - Reduction in import of Crude Oil by USD 20000.00/ year
 - Reduction in CO2 Emission by 18MT/Year (= setting up approximately 2 x100 KW Solar Grid Systems with an initial investment of Rs. 6.00 Crores)
 - Generating Employment Opportunity for 50 Adults
 - Encouraging people to walk and reduce lifestyle diseases



TEMPERATURE TREND: ALIPORE WEATHER STATION

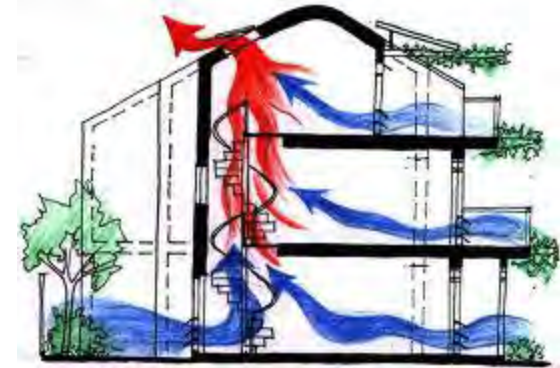


Source: Roy, et al (2010): Extreme Events, Water Resources, Status of Human Health, Livelihood: An Adaptation Framework for Kolkata Urban Agglomeration, Report Submitted to NATCOM II



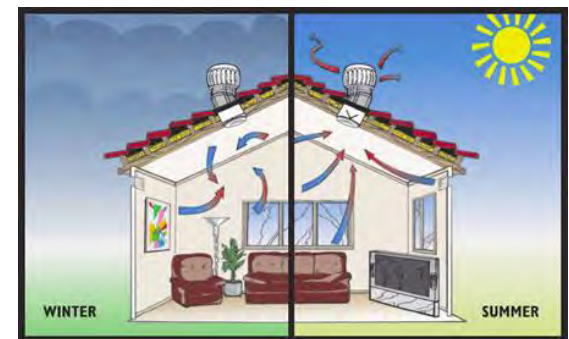
PASSIVE VENTILATION: COSTS & BENEFITS

- Air Conditioner Usage
 - 20% of the Residential Floor Space
 - 50% of the Commercial/Institutional Floor Space
- Specification of Air-conditioner: 1.5 Ton (BEE 5* rated)
- Average Area Considered: 150 Sq. Ft. (BEE)
- Hours of Operation
 - Residential: 8 Hours (BEE Guidelines)
 - Commercial: 10 Hours (BEE Guidelines)



PASSIVE VENTILATION: COSTS & BENEFITS

- Reduction in Indoor Temperature: 2 Deg. C
- Incremental Cost: Negligible
- Benefits:
 - Reduction of AC operating time by 1 Hour per day
 - Saving in Electricity Cost: Rs. 1.22 Lakhs/Day (BEE)
 - CO2 Emission avoided: 46.47 TCO2/Day (MOSPI, 2006)
 - Feel Good Factor: Conducive to walking, cycling and increased productivity
 - Better photosynthesis and plant growth
 - Reduced water evaporation



GREEN ROOF

- 500 Acres of Land
- 25% of the Built Up Area: Green Roof
- Cost of Construction
 - Standard Roof: Rs. 60/Sq. Ft. (LBG Estimate)
 - Green Roof: Rs. 150/Sq. Ft. (LBG Estimate)
- Incremental Cost of Construction: Rs. 46.86 Crores
- Assuming O&M Charges as 10% and inflation rate as 10% p.a.
 - PV of Cost (30 Years) = Rs. 299.00 Crores



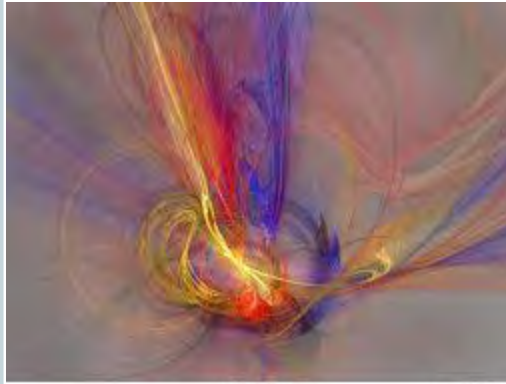
GREEN ROOF

- Carbon Sequestration
 - Annual Carbon Sequestration: 177.33 TCO₂
 - Equivalent to setting up 20x100 KW Solar Grid System
 - PV of Cost Avoided: Rs. 500 Crores
- Other Benefits
 - Wasted Roof Top can be used in an economically meaningful manner
 - Additional income opportunities (horticulture, agriculture)
 - Thermal Insulation leading to reduction in air-conditioner usage and saving energy (Co-benefit, additional GHG reduction can be avoided)



Green roofs have a long tradition, as this farmhouse in a historical park in Iceland shows. David Beattie and his colleagues hope to revive the tradition in Pennsylvania to make roofs that are both beautiful and energy efficient.





"Paradigm Shift" August 2002



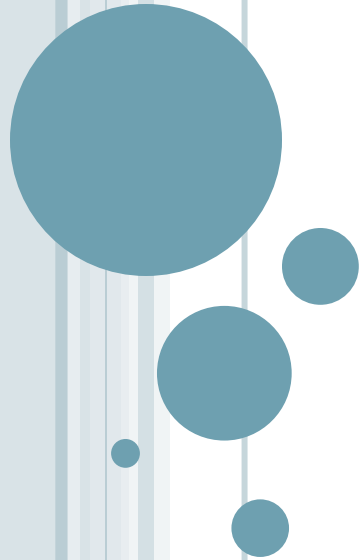
LET US HAVE A PARADIGM SHIFT

***LET US RESPECT THE GOAL OF
SUSTAINABLE DEVELOPMENT***





THANK YOU!
LET US PAUSE TO THINK & DREAM!



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