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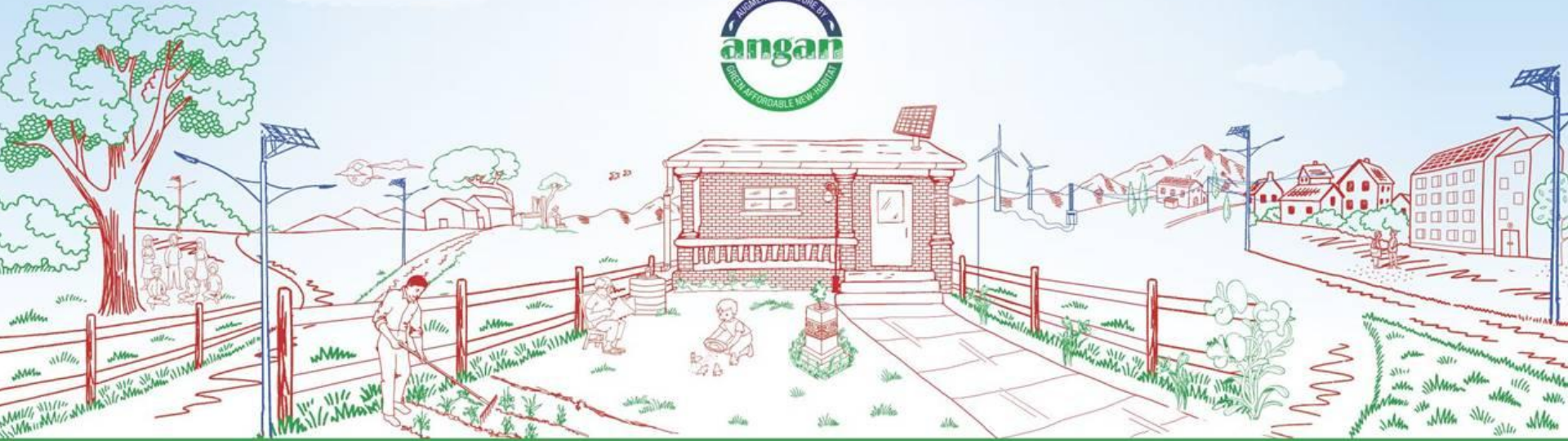
ANGAN

Augmenting Nature by Green Affordable New-habitat

A Courtyard for Revolutionary Change in Building Energy Efficiency

An International Conference on Building Energy Efficiency

9th-11th September, 2019 | Hotel The LaLIT, New Delhi





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THIS PRESENTATION WAS SHARED BY

Prof. Hina Zia

Dean, Faculty of Architecture and Ekistics, Jamia Millia Islamia, New Delhi

FOR THE SESSION:

“Climate Resilience in Buildings”

DURING ANGAN 2019

Knowledge Partner



Event Partner





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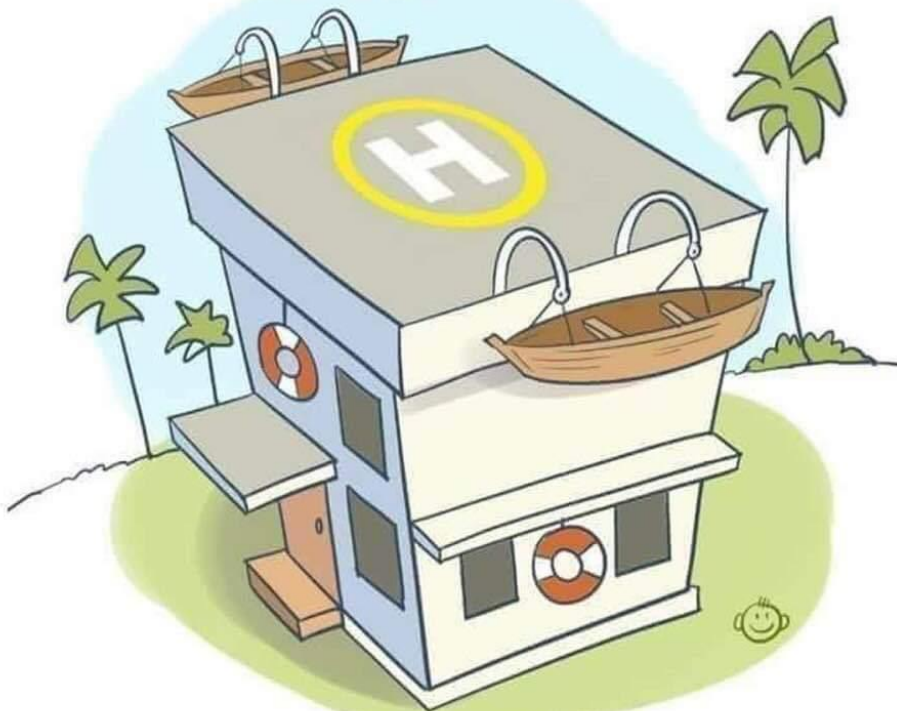
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Climate resilient buildings: the new normal?

New House Plan



Source: Anon

Dr. Hina Zia
Professor and Dean
Faculty of Architecture and Ekistics
New Delhi, India

9th Sep, 2019
ANGAN Conference 2019

Why 'climate resilient buildings' discussion?



https://cdn.downtoearth.org.in/library/large/2018-08-23/o.42716000_1535013850_23.jpg

Hottest summer exposes 65% Indians to heat waves

by Disha Shetty | Aug 12, 2019

About two-thirds of India's population was exposed to high temperatures of over 40 degrees Celsius in May-June this year, up from 52.94% in 2018, satellite data show



Temperatures in the desert province of Rajasthan touched 50 degrees Celsius in many locations (Photo by Chris Ford)



Cyclone Vardah tears off pieces of the Hyatt Regency hotel in Chennai. Photo Credits: Twitter/@dailyonion



Source: www.thealternative.in

BOD needs to change!

- Buildings are designed to operate under conditions that happened several decades ago
- The conditions our buildings will experience in terms of temperature, precipitation, and other extreme events are not the typical conditions we assumed during design

Challenging: Readiness being a moving goalpost

- India has been ranked as the **sixth most climate change-vulnerable country** in the world in terms of facing extreme weather events by the Germanwatch Climate Risk Index 2018.
- The report noted that in 2016, **India had lost the maximum number of human lives (2,119) and over US \$21 billion worth of property to such events.** It states that countries like India are repeatedly hit by extreme weather and have no time to fully recover.

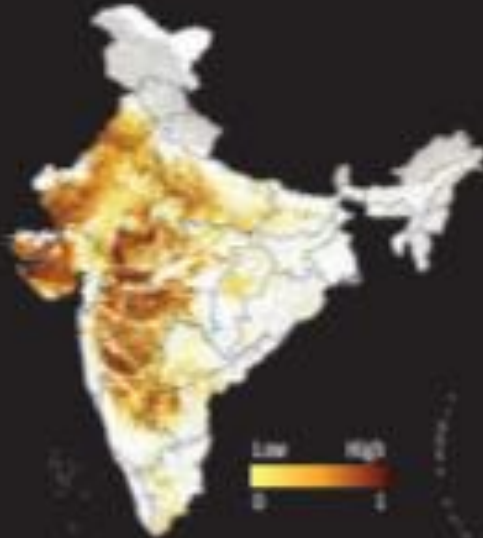
Source: <http://www.indiaenvironmentportal.org.in/files/file/coping-climate-change-volIII.pdf>

Alarm bells

India is home to 72 per cent of the 750 million people exposed to climate change hazards in South Asia

Drought

People affected:
231 million
Study period:
2000-2013



Flood

People affected:
328 million
Study period:
2000-2013



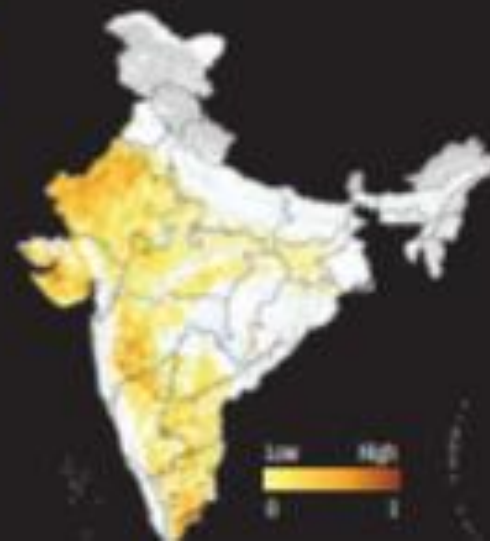
Extreme rainfall

People affected:
151 million
Study period:
1953-2013



Extreme temperature

People affected:
20 million
Study period:
2000-2013



Need for resilience: URGENT

Resilience is the capacity of a system to absorb disturbance and reorganize while undergoing change, so as to still remain essentially the same function, structure, identity, and feedbacks.”

Source: B. Walker et al, ‘Resilience, Adaptability and Transformability in Social-ecological Systems’, Ecology and Society 9 (2) p.

Key tasks at settlement scale

- **Paradigm shift** in approach to conventional planning-urban/rural/regional/state/national
 - Development models based on ecology
 - Need for new tools and techniques to bring in the angle of mitigation and resilience as well
 - Need for adoption of integrated systems approach
 - Understanding the ‘co-benefits approach’ for built environment (at all scales)
 - Regional plans/master plans/CDPs/CMPs to be redefined dynamically
 - Need to mainstream ‘Climate resilient buildings’

Climate Resilient Buildings

A structure (permanent or temporary) that is enclosed with exterior walls and a roof constructed on a plot of land that has the capacity to absorb disturbances, in particular climate change related impacts, and still retain its basic function and structure.



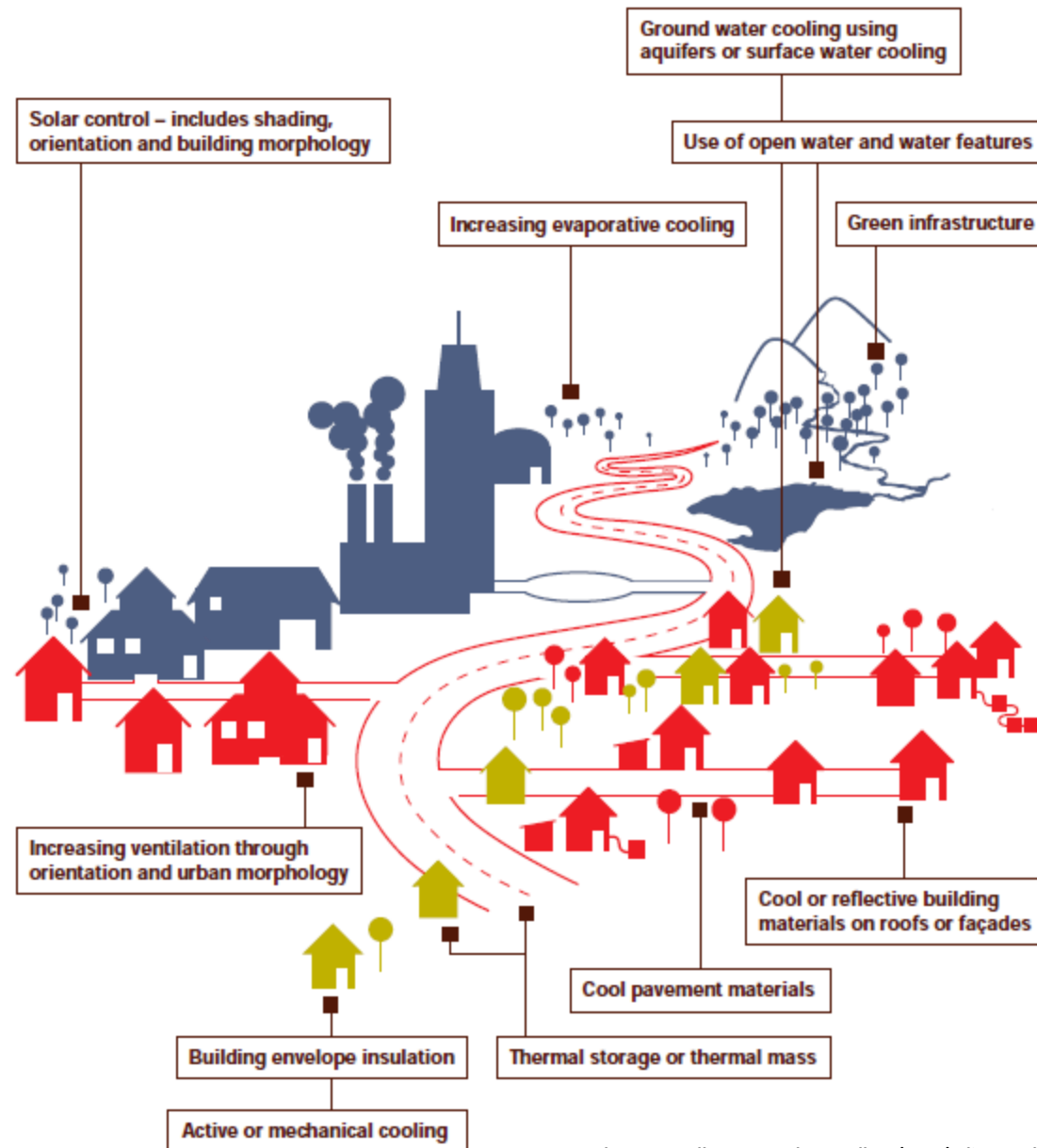
Same strategies for all risks and extreme events?

What is intended?

- Better comfort conditions with less use of electricity/fossil fuels
- Retrofit of existing buildings which can withstand the damages caused by flooding (increased precipitation) & minimal economic losses
- Not building new buildings in vulnerable locations
- Access to safe quality of water (even if grid supply fails) and decentralised waste (liquid/solid) management
- If ambient air quality worsens (as is observed in Indian cities), how to maintain better indoor air quality?- avoiding health risks

Strategies to minimise heat

Mix of neighbourhood scale/building scale interventions apart from city planning efforts



Design Features for heat control

Increasing Temperatures & Heat Stress

For New Construction

- Solar control strategies like shading, orientation and building morphology to reduce external heat gains and maintain comfortable indoor conditions.
- Increase in vegetation around the house.
- Increase in ventilation through optimization of window design and size.
- Cool roof/Roof Garden
- Use of thermal storage through building materials like local stone and stabilized earth blocks.



<https://www.flickr.com/photos/sikdar/6326046738/in/album-72157627645106942/>

Design Features for heavy precipitation risks

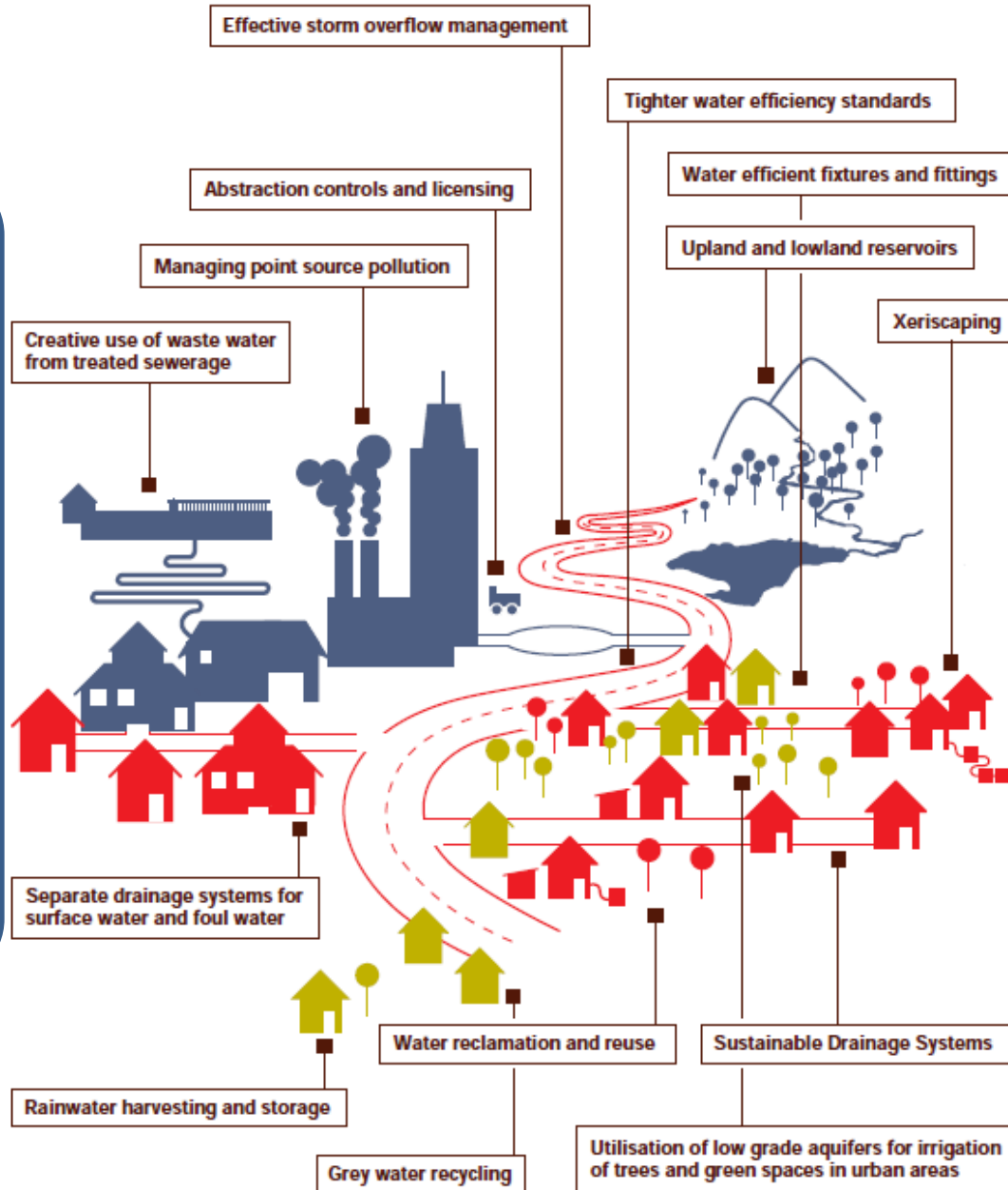
Floods & Heavy Precipitation

- Buildings with High Plinth.
- Raised floor level to prevent flood water entering inside the house.
- Basements for new construction should not be allowed in urban areas prone to flooding.
- Isolated RCC Foundations in hilly terrains with tie beams.
- Overhangs above openings.
- Bitumen based damp proof course at plinth level and water proofing on roofs.



Strategies for managing water resources and quality risks

Mix of neighbourhood scale/building scale interventions apart from city planning efforts



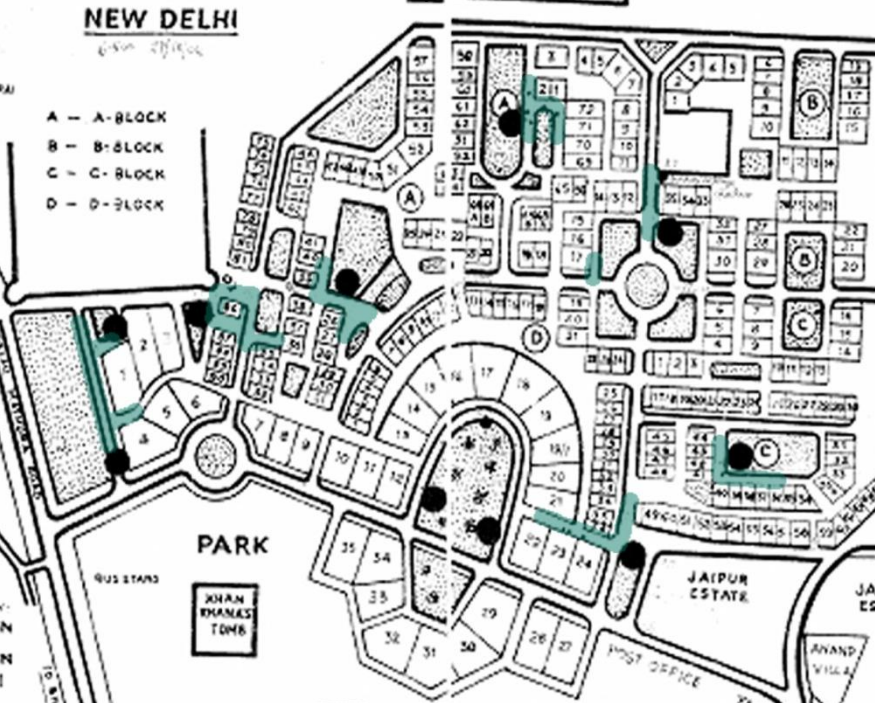
Source: Shaw, R., Colley, M., and Connell, R. (2007) Climate change adaptation by design: a guide for sustainable communities. TCPA, London

Integrating RWH at

Neighbourhood/buildings scale

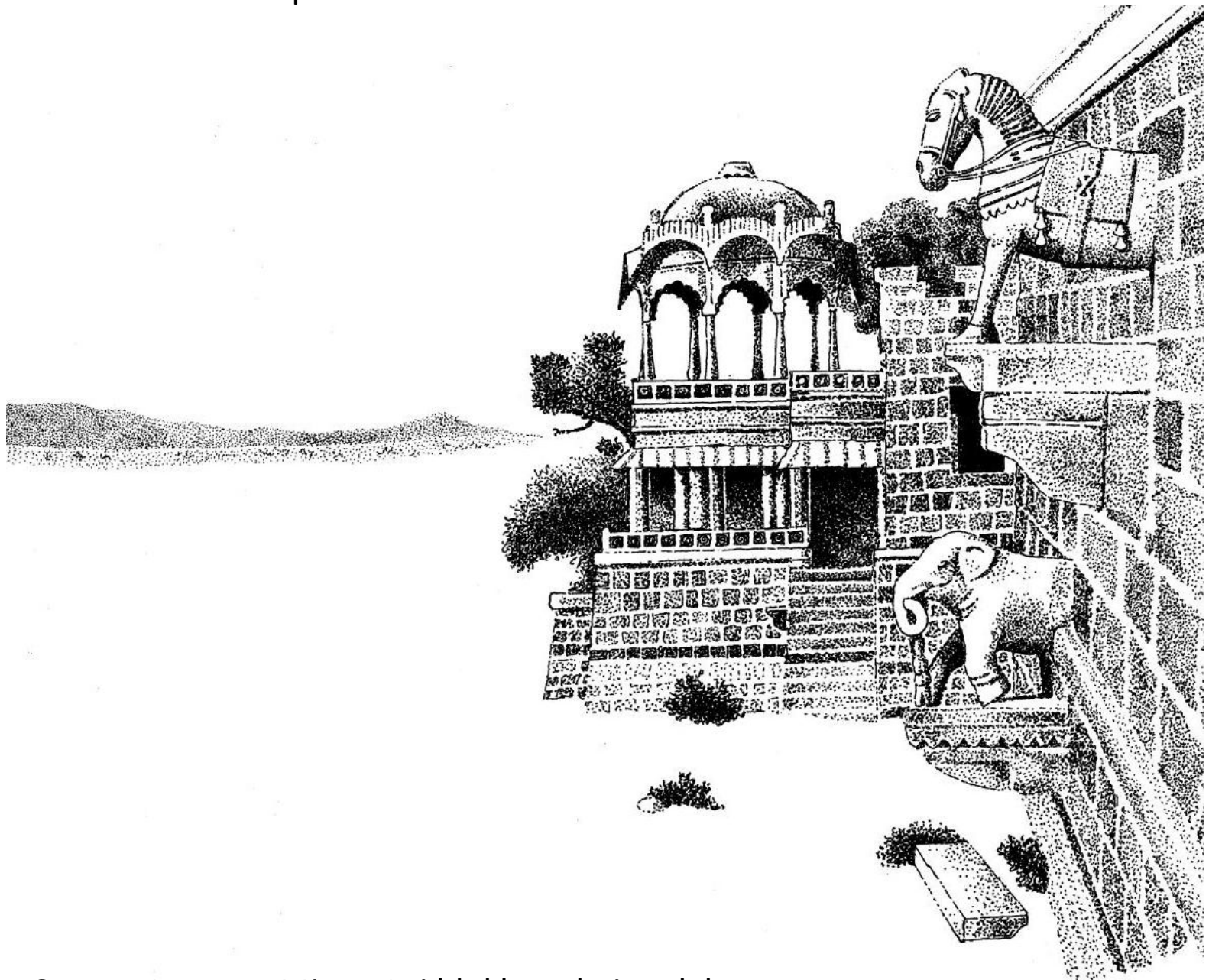
WATER LOGGING PROBLEM
SOLVED THROUGH
LOCATING RECHARGE
STRUCTURE WHERE WATER
TENDS TO COLLECT
NATURALLY

Nizamuddin East, Delhi



Source: VANDANA MENON ARCHITECTS

Learn from the rich past!



Source: Anupam Misra, Aaj bh khare hain talab

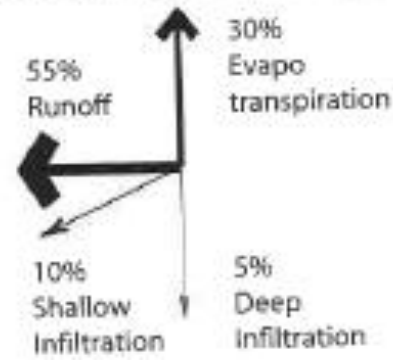
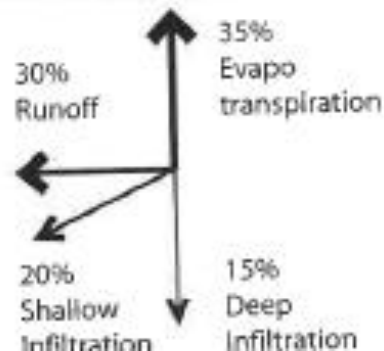
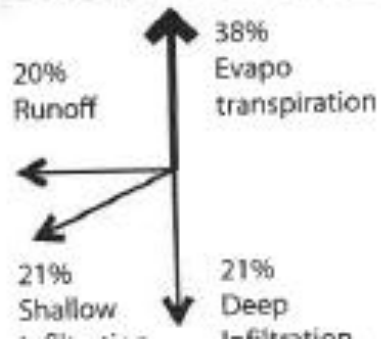
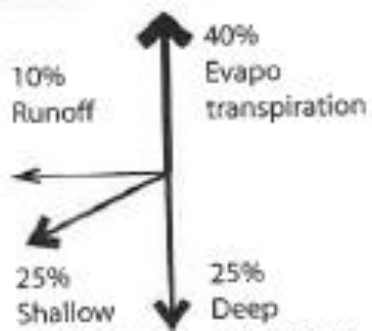
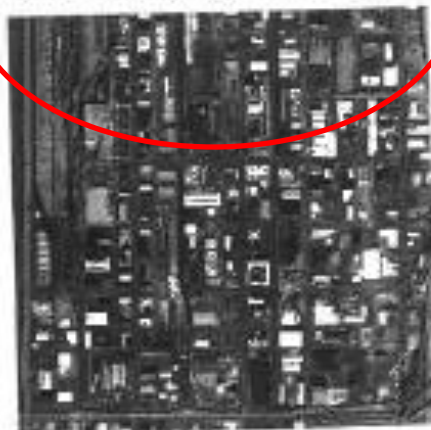
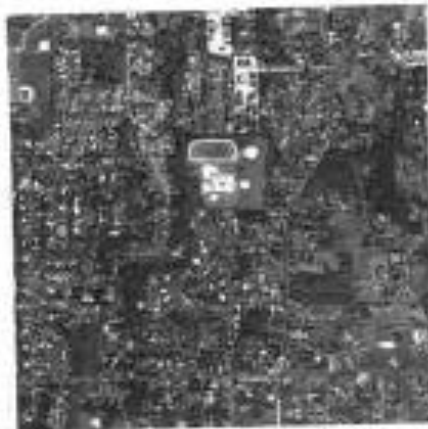
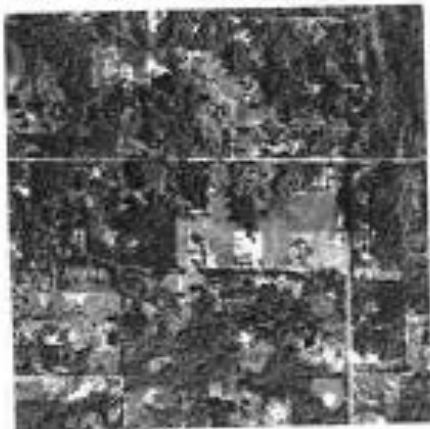


Natural Ground Cover

10% - 20% Impervious Surface

35% - 50% Impervious Surface

75% - 100% Impervious Surface



Introduce Green Infrastructure at neighbourhood/building scale



Potential benefits of urban forests

Urban issue	Potential benefits of urban forests
Food security	Provide food, clean water and woodfuel
Urban poverty	Create jobs and increase income
Soil and landscape degradation	Improve soil conditions and prevent erosion
Reduced biodiversity	Preserve and increase biodiversity
Air and noise pollution	Remove air pollutants and buffer noise
Greenhouse gas emissions	Sequester carbon and mitigate climate change, improve local climate and build resilience
Extreme weather events	Mitigate local climate and build resilience
Energy shortage	Save energy through shading/cooling, and grow woodfuel
Heat island effect	Cool the built environment through shade and evapotranspiration
Limited accessible green space	Provide more accessible natural and green space
Public health	Improve the physical and mental health of residents
Flooding	Mitigate stormwater runoff and reduce flooding
Limited recreational opportunities	Provide opportunities for recreation and environmental education
Exposure	Provide shelter
Limited water resources	Enable infiltration and the reuse of wastewater
Lack of community and social cohesion	Provide distinctive places for formal and informal outdoor interaction

Resilience strategies at neighbourhood and building scale

- Strategic flood risk assessment and a sequential approach to development in the floodplain
- Replace impermeable surfaces by SUDS
- Provide storage spaces such as infiltration ponds in parks/greenspaces
- Use of green open space and green roofs
- Widen drains
- Remove 'pinchpoints' so that heavy rainfall can drain away
- Green roofs to reduce runoff and ease pressure on drainage systems
- Flood resilient measures, (raising floor levels, electrical fittings), overhangs to prevent infiltration around doors and windows
- Raising damp-proof courses.
- Flood resilient materials, e.g., concrete, vinyl and ceramic tiles, metal doors and cabinets

How ?

- Codes and bye-laws
- Implementation and enforcement
- Ecosystem for Innovation
- Sustainable practices: a norm

Sustainable practices: a norm

- *“The solutions are largely the same, but the motivation is one of life-safety, rather than simply doing the right thing”*. Sustainability needs to be mainstreamed becoming a way of building rather than an option.