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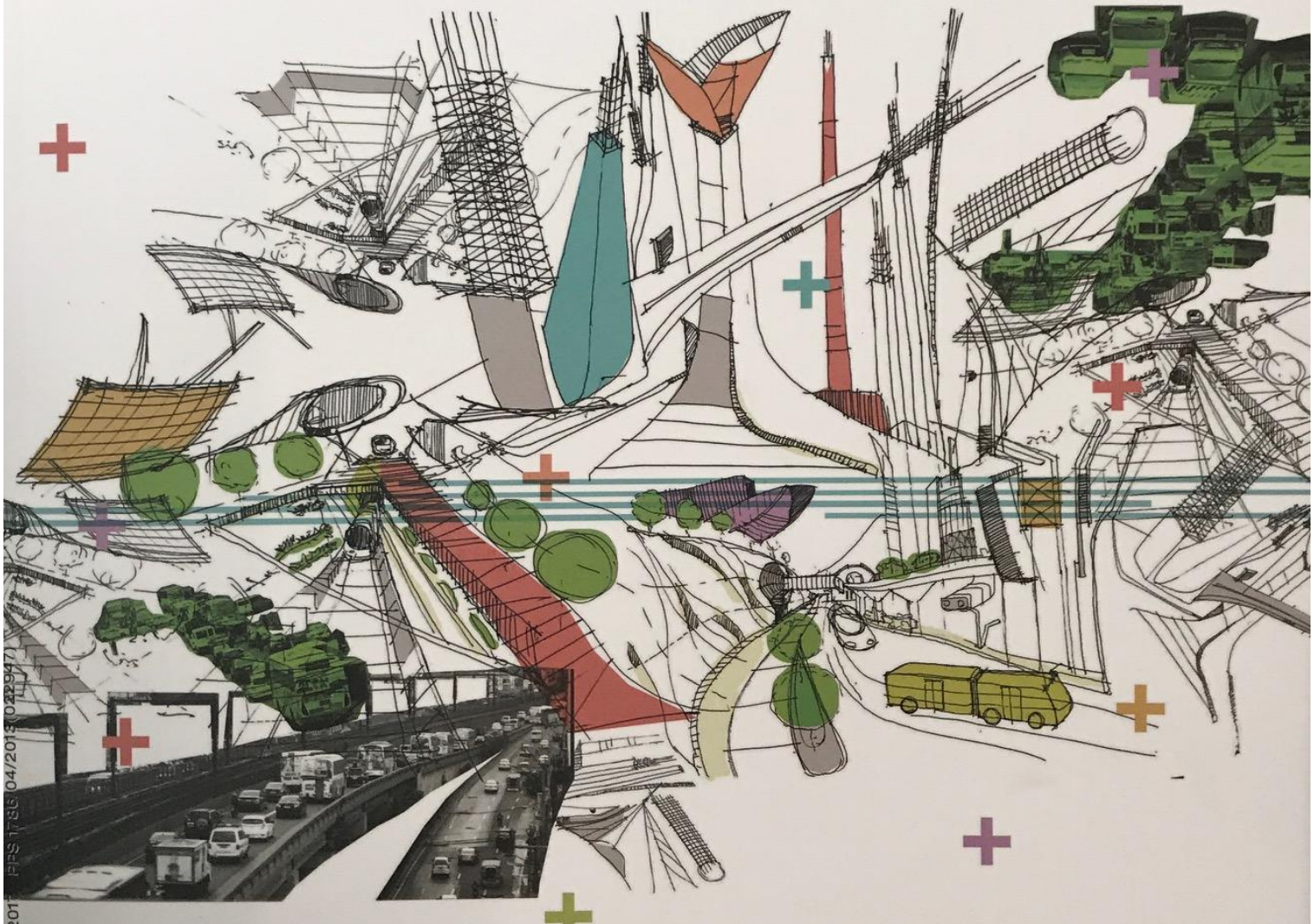

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YEAR-END ISSUE 2017

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INDIAN INSTITUTE OF TECHNOLOGY, JODHPUR

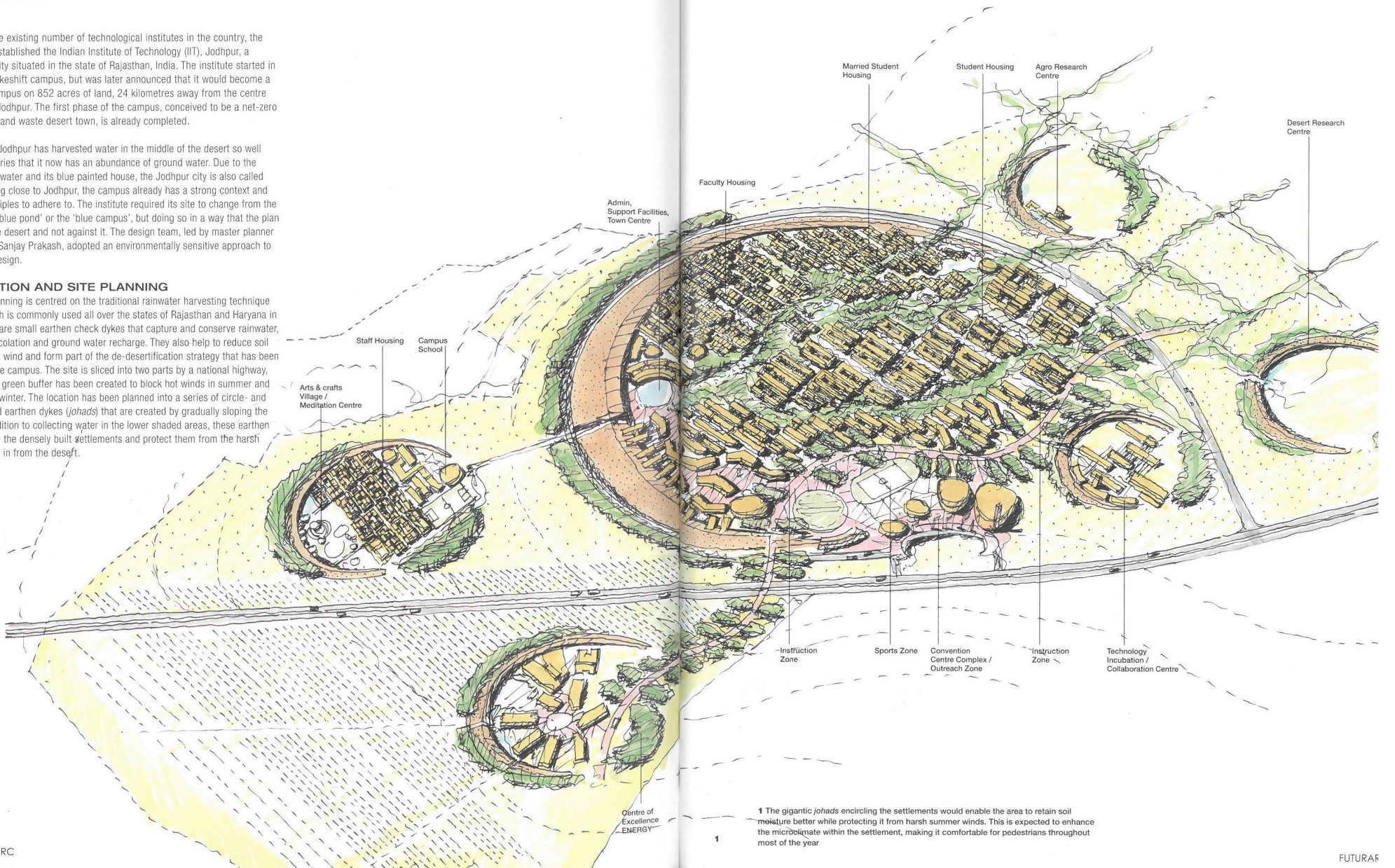
by **Bhawna Jaimini**

To expand the existing number of technological institutes in the country, the government established the Indian Institute of Technology (IIT), Jodhpur, a public university situated in the state of Rajasthan, India. The institute started in 2008 as a makeshift campus, but was later announced that it would become a permanent campus on 852 acres of land, 24 kilometres away from the centre of the city of Jodhpur. The first phase of the campus, conceived to be a net-zero energy, water and waste desert town, is already completed.

The city of Jodhpur has harvested water in the middle of the desert so well over the centuries that it now has an abundance of ground water. Due to the abundance of water and its blue painted house, the Jodhpur city is also called Blue City. Being close to Jodhpur, the campus already has a strong context and planning principles to adhere to. The institute required its site to change from the desert to the 'blue pond' or the 'blue campus', but doing so in a way that the plan works with the desert and not against it. The design team, led by master planner and architect Sanjay Prakash, adopted an environmentally sensitive approach to the campus design.

ORIENTATION AND SITE PLANNING

The site planning is centred on the traditional rainwater harvesting technique of *johad*, which is commonly used all over the states of Rajasthan and Haryana in India. *Johads* are small earthen check dykes that capture and conserve rainwater, improving percolation and ground water recharge. They also help to reduce soil erosion due to wind and form part of the de-desertification strategy that has been adopted for the campus. The site is sliced into two parts by a national highway, along which a green buffer has been created to block hot winds in summer and cold winds in winter. The location has been planned into a series of circle- and ellipse-shaped earthen dykes (*johads*) that are created by gradually sloping the ground. In addition to collecting water in the lower shaded areas, these earthen dykes encircle the densely built settlements and protect them from the harsh winds blowing in from the desert.



1 The gigantic *johads* encircling the settlements would enable the area to retain soil moisture better while protecting it from harsh summer winds. This is expected to enhance the microclimate within the settlement, making it comfortable for pedestrians throughout most of the year

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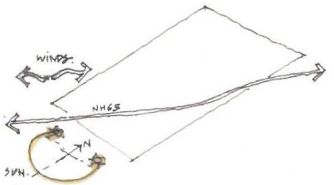
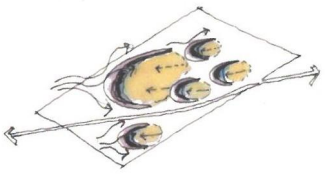
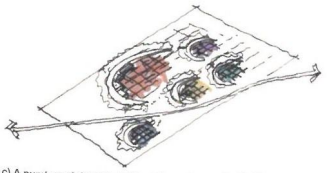


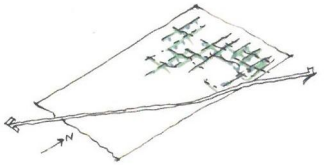
a) The site is cut into two by the NH65. The scorching sun beats down on it from the south-east and west. The hot and cold winds run diagonally from the southwest-northeast direction.



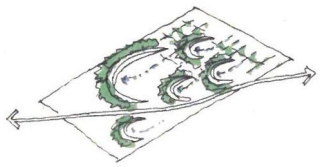
b) Create a series of ellipse-shaped earthen dykes (*johads*)by gradually sloping the ground. The *johads* help to deflect the wind and collect water in lower shaded areas.



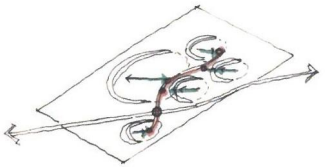
c) A number of densely built settlements, each with its own character, arise in phases.



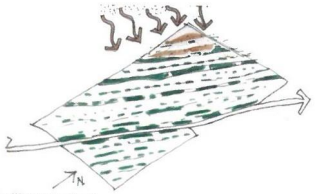
d) In the northern part, there is an existing grid of trees and natural field lines that can be used to run a series of drainage channels for water management.



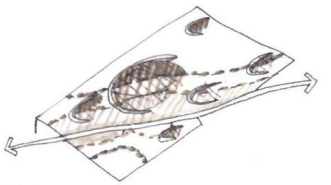
e) The poly-nuclear settlements that are protected by the dykes/ *johads* are open towards the north to receive water from the grid of drainage channels. Rows of trees are planted on the dykes to strengthen the roots, act as windbreaks and offer shade.



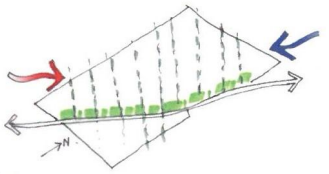
f) A central axis for electrically operated public transport system connects the settlements. Diagonal axes connect the settlements to the public transport halts.



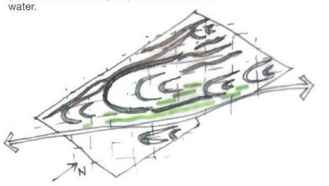
Desertification mitigation measures:
Through a series of ridges and furrows perpendicular to the direction of desert creep.



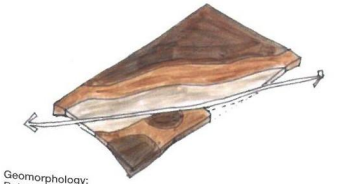
Johads:
For subterranean structures and possible 'johad-strategy' (derived from soil depths) to protect from wind and conserve water.



Green buffers:
Along the highway to block hot summer winds from the south-west and cold winter winds from the north.



Landscape pattern:
The juxtaposition of the various landscape infrastructures gives rise to the overall landscape.



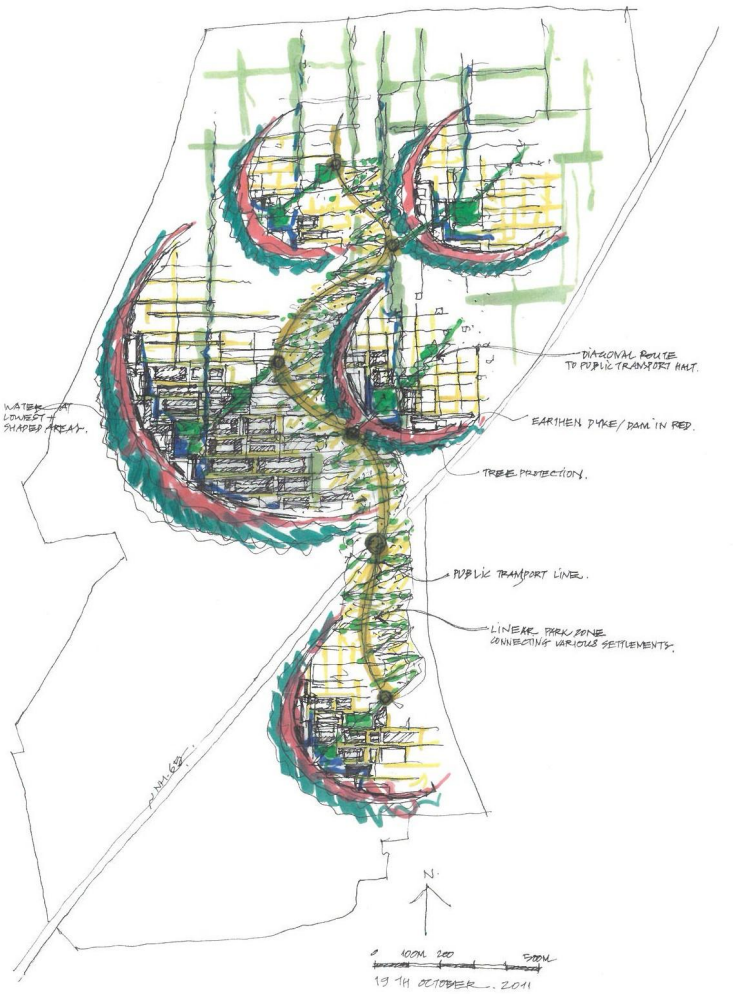
Geomorphology:
Determine layers of bedrock across the site that vary in depth—lower towards the west and higher towards the east. This dictates the extent of subterranean structures.

Overall master plan:
Building zones are identified as a result of the landscape structure placed over the site.

2

3

2 Conceptual development of the master plan **3** Passive design strategies of the master plan
4 A sketch of the new *johads*



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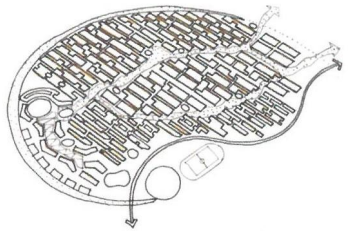
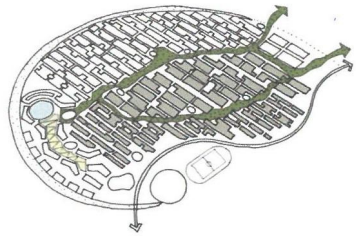
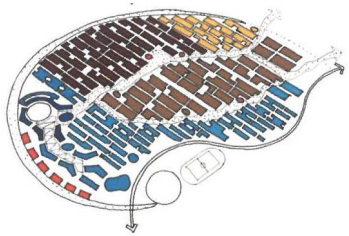


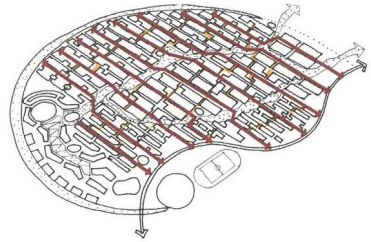
1. Basic orientation
The basic orientation of the streets is in the east-west direction. Thus buildings have façades that are favourably oriented to the north or the south. East- and west-facing façades, which are generally hot, are kept to a minimum.
The orientation of the streets also prevent the south-west desert winds from blowing hot, dusty air through the campus.



2. Compact basic form
The overall massing of the master plan is compact. Buildings huddle close together to create protection from the harsh environment. Large, hot and windswept open spaces between the buildings are avoided. In this way:
a. Land resources are maximised
b. Shade and protection are created
c. Walking or cycling distances between complexes are kept to a minimum
d. Interlocking indoor and outdoor spaces are formed



3. Buildings in clusters
The buildings of the master plan are placed in distinct clusters, which break the scale of the development into a smaller, relatable scale. Each cluster has its own distinct character. For example, the clusters containing the faculty housing are more intimate and cosy, while the cluster around the wetland, where the amenities are positioned, is more public and has a sense of grandeur. The campus has a variety of spaces, which makes it like a small desert town.



4. Narrow and shaded streets
Streets are narrow to create shade and protection. The main streets run in the east-west direction. They are linked through a series of fine-grained pedestrian streets that run in the north-south direction.

5

The northern part of the site had an existing grid of trees and natural field, which has been retained to run a series of drainage channels for water management. The poly-nuclear settlements, which are protected by the earthen dykes on the southwest, are open towards the north to receive water from the grid of drainage channels that supply water to the rows of trees planted on the dykes. The trees will further help by acting as windbreaks and providing shade to the settlements.

CLUSTER DESIGN AND BUILT FORM

The poly-nuclear settlements surrounded by gigantic *johads* are further divided into distinct clusters to make the scale more human and relatable. The buildings in each cluster are huddled close together, where large, hot and windswept spaces are avoided between buildings. Courtyards are also planned to break the mass of the buildings and create informal interactive spaces. This helps in maximising land usage; creating shade and protection from the harsh weather; avoiding large distances between different complexes that would require motorised transits; and having interconnecting indoor and outdoor spaces.

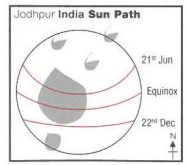
The main streets between the clusters are oriented towards the east-west direction, which allows the building façades to be oriented towards the north or south. The main streets are further linked with fine-grained pedestrian streets that run in the north-south direction. East-west facing façades that accumulate heat are kept to a minimum. The streets are also kept narrow in width, a planning feature of Jodhpur and other desert towns in India. Densely packed low-rise structures, mostly two- or three-storey buildings that are constructed around narrow alleys, keep the streets shaded at all times of the day, promoting walkability and use of bicycles and other means of non-motorised transport.

A FUTURE LIVING LABORATORY

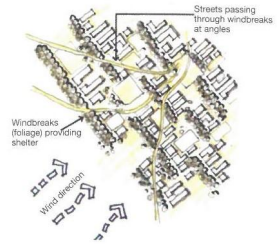
According to Prakash, "The campus is planned like a living organism with a metabolism of biodiversity; food; water and waste; solid waste; mobility; and renewable energy to create a complex dynamic life-like system. This near-zero emission campus can grow flexibly in phases." The campus, conceived as a meta-system, shall be actively studied and monitored using an advanced information and communications technology (ICT) network, partly to generate intelligent control instructions that increase efficiency and partly to mine data. In that sense, it is a settlement that is evolving through trials and tests—a living laboratory. Prakash explained further, "The ideas for this smart, intelligent eco-campus encompass the ideals of social, economic and environmental sustainability, and integrate aspects of landscape and biodiversity; food; water and waste; solid waste; mobility; energy; and ICT to create an intricate life-like system of campus metabolism."

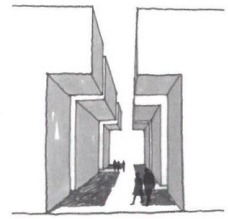
PROJECT DATA

Project Name
Indian Institute of Technology, Jodhpur Master Plan
Location
Jodhpur, India
Status
Phase I Completed
Expected Completion
2030
Site Area
3,448,280.4 square metres
Gross Floor Area
803,029 square metres
Number of Buildings
Approximately 250 buildings
Building Height
Less than 15 metres
Client/Owner
IIT Jodhpur
Master Planning Firms
SHiFt; BDP; EDS; InDe
Principal Master Planner
Sanjay Prakash
Main Contractors
Nagarjuna Construction Co Limited (NCC); TATA Projects Ltd
Mechanical & Electrical Engineer
Sterling India Consulting Engineers
Images/Photos
SHiFt; BDP; EDS; InDe



5 Passive design strategies for a sustainable community
6 & 7 Design aspects of the streets and building silhouette





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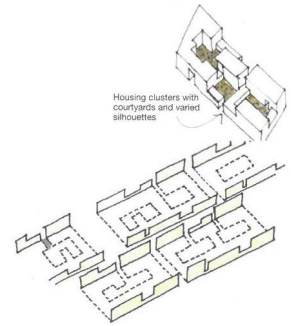

7 Interesting silhouette
The basic height of the buildings is three levels (ground level + two). However, by occasionally stepping the heights up or down, an interes and playful campus silhouette is created.