



Bureau of Energy Efficiency



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Government of India
Ministry of Power



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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

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Manipal Academy of Higher Education

FOR THE SESSION:

*“Meeting Two Ends: Heritage and Indigenous
Construction Practices”*

DURING ANGAN 2019

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Augmenting Nature by Green Affordable New-habitat
 The International Building Energy Efficiency Conference
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Lessons from our Heritage

studies conducted in Barkur, West coast India

Dr Deepika Shetty



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(Approved to be a University under Section 3 of the UGC Act, 1956)

Meeting Two Ends: Heritage and Indigenous Construction Practices



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Four pillars of Sustainability

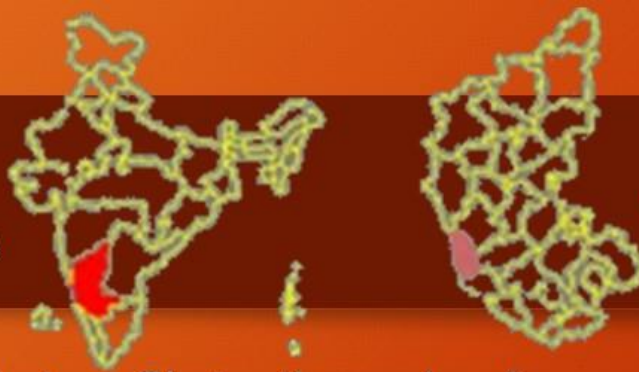
The process of designing a town involves identifying its role

- in physical zone of influence for **Ksetra**: regional context with respect to location, demography, background, landscape, environment
- In **Loka** (social paradigm): socio-cultural and economic aspects.
- Next would be **Desa** (the man-made conditions): detailed analysis of mapping the density land-use, history, social and public infrastructure.
- Leading to overall zoning criteria and then development guidelines for the same are developed in tune with **Kala** the times.



Kestra

INDIA



KARNATAKA

- The scarp edge of the Western Ghats, the peaks of which vary in altitude from 910 to 1830 metres Mean Sea Level (MSL),
- Western Ghats (world heritage site) in the west
- Five rivers flowing through namely Souparnika, Halady Chakra, Sita, Swarna and Udyavara River across the district
- 96Km of Coastline along Arabian Sea
- The breadth varies between 10 km. at the narrowest northern most tips and is about 40-45 km. at the broadest portion



UDUPI DISTRICT

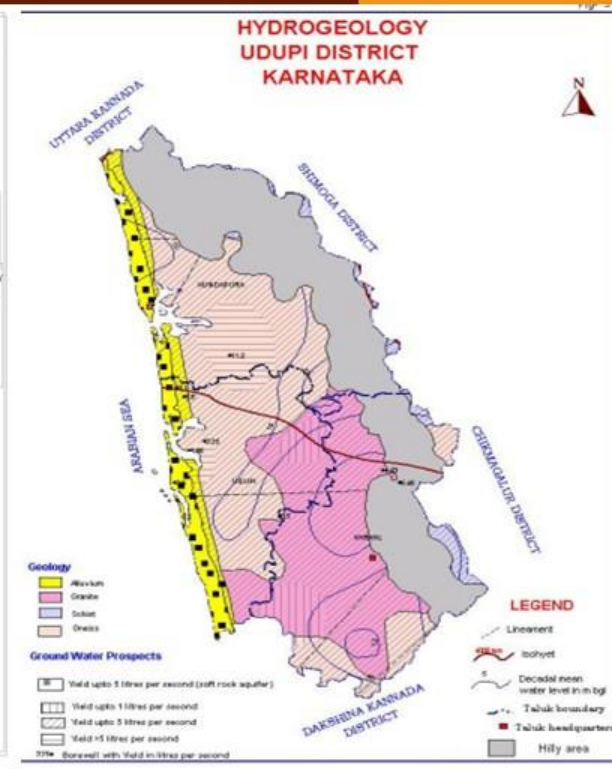
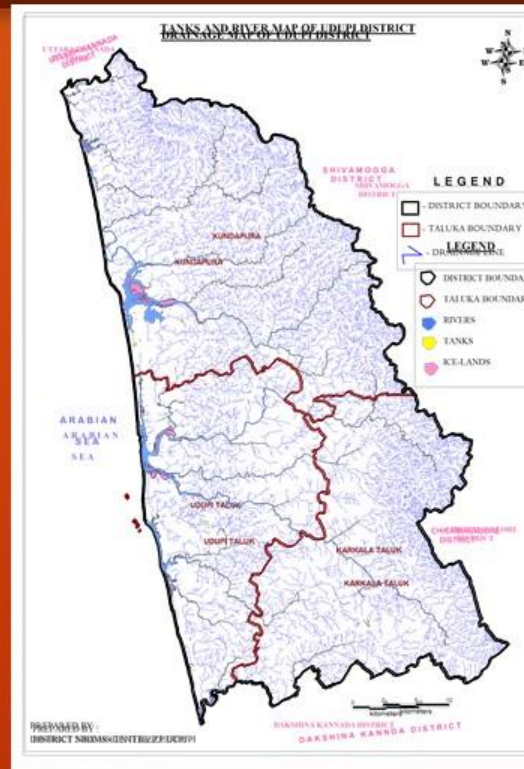


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Kestra Climate, Drainage and Geography

The area experiences an average temperature of 26.5°C . Udupi district gets highest annual rainfall in Karnataka state, about 4000 mm. In this coastal district, bulk of the rainfall i.e. over 85% occurs during monsoon season. In the 3575 sqkm area of Udupi district the temporal variation of rainfall is confined to 3 to 4 months in an year. The rainfall increases from west to east with co-efficient of variability ranging from 18.7 to 18.9%. Average Annual Rainfall is 4136.3 mm.



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Loka Beliefs, Practices, Art, Paradigm



Meekikatte wooden idols of Bhoota worship



Yakshagana performers- dance drama



DurgaPooja decoration for Navratri



Ratha Utsava



Kala purpose in the time period and beyond

- Vedic times-Central Open space and its role in defining social, cultural and functional activity of the people (B.B.dutt, 1925, p. 32).
- Bhuddhist reference to towns as street system, boundary, institutions and capacity of 100-5000 families
- There was no distinction between village and town other than more population and elaborate facilities in some and due to economic prosperity more elaborate structures (Amita Ray, villages, towns and secular buildings in ancient India, Gram Sannivesa, and pg 27)
- The svatah pravrtta (inherent quality) of towns were Puskara- towns on river bank or sea shore, Durga -fortified towns, Mandira Temple towns, Pattanam-trade towns, Sadan, Sadma, Nivasa, Samparayika etc. while para pravrtta (external factors) for evolution of towns were Sthaniyam, Katakum or Pattam type where it was a seat of political and administrative powers like Udaipur, Chittorgarh, Patliputra etc.





Desa

Demography and infrastructure defines

Mana (importance)

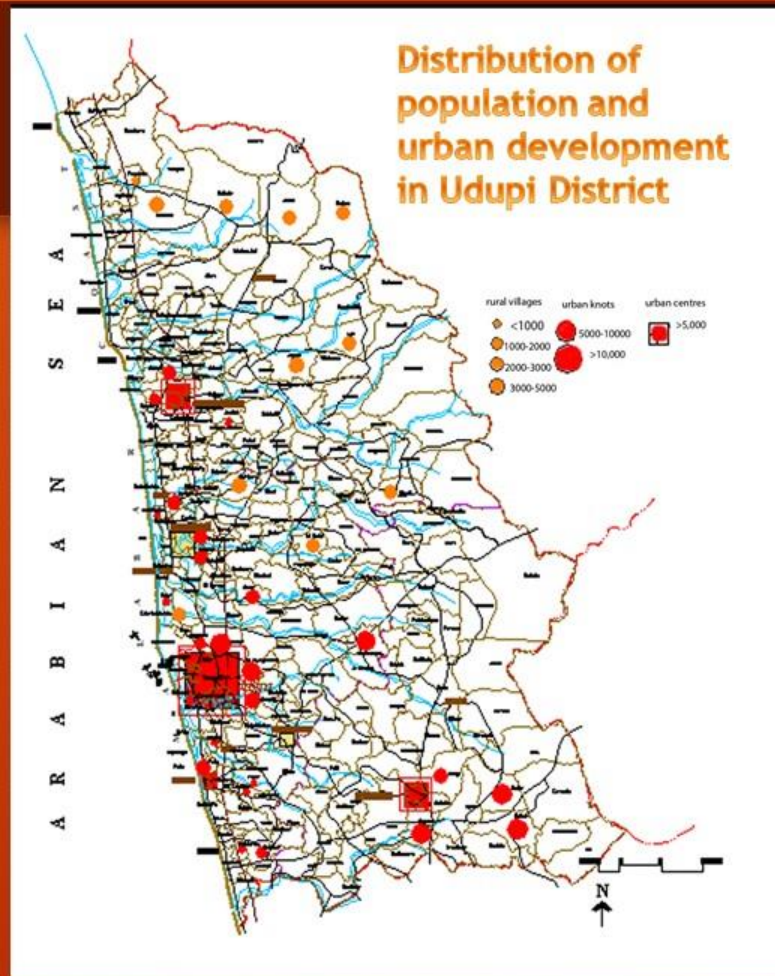
Sthithi (status)

Krama (order)



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Beach and river front development



Degraded forest cover



Barkur , town center



Thin forest with homestead



Agriculture , horticulture homestead





Design Thinking

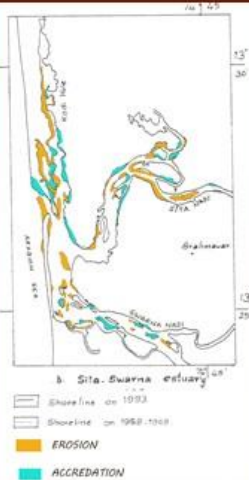
Each situation needs rethinking of urban development strategy as per the nature of development in the region. Increasing the size and density of a town may not always be the solution. Coming with alternative growth pattern may be the demand of the times for sustainable growth defined as

- **Bindu:** the central concept of development
- **Nabhi:** the anchor holding everything in place with sub-centres and networks
- **Cakra:** the system that revolves as a cycle of creation and destruction in a sustainable and self sufficient manner



Location and contextual parameters of space types

Desa- geographical context

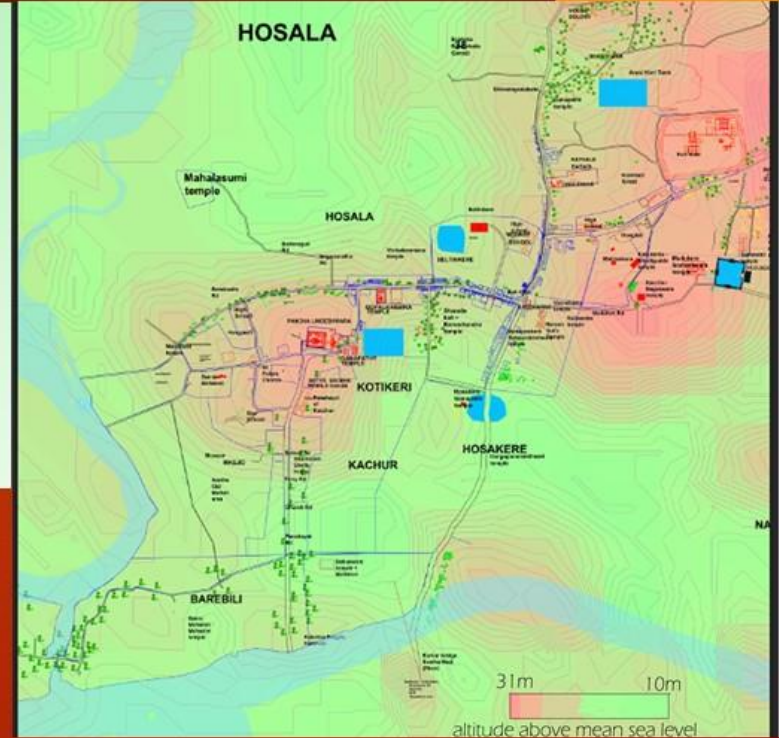


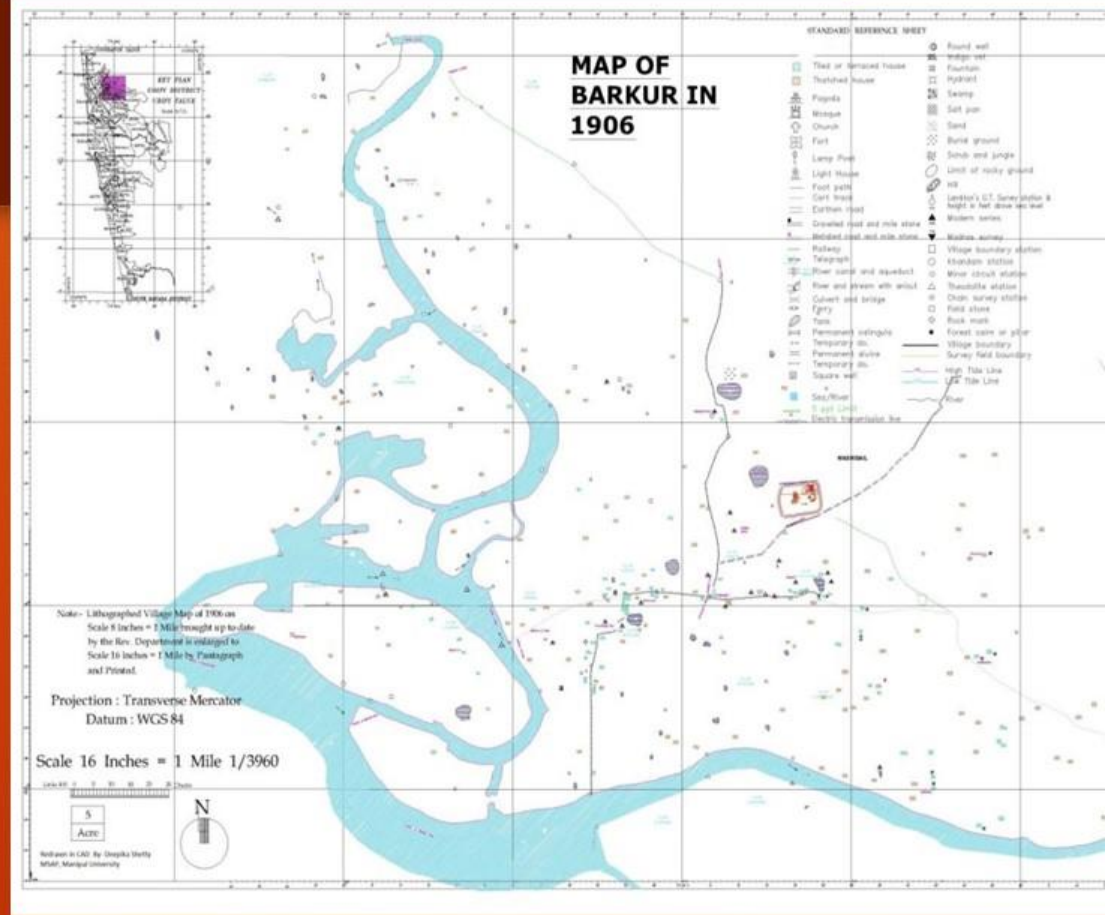
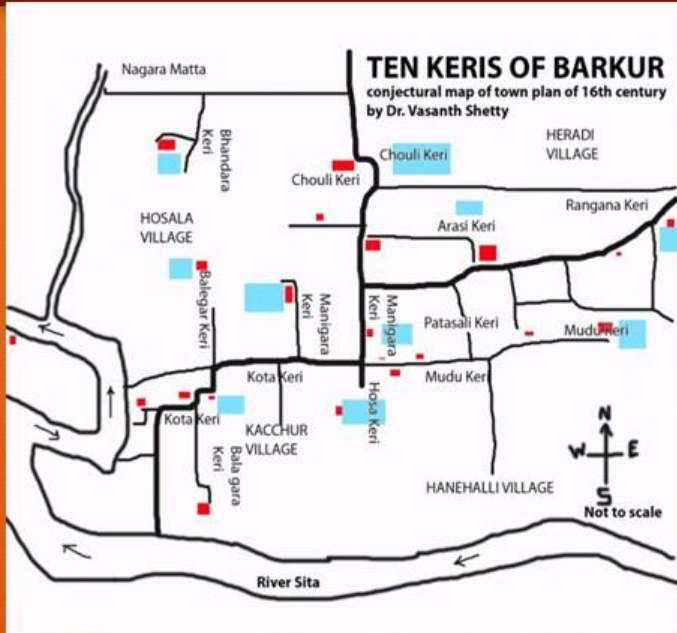
- flood plain/ pediplain
- denudational hill
- dissected pediment
- ridge type structural hills

Geomorphology

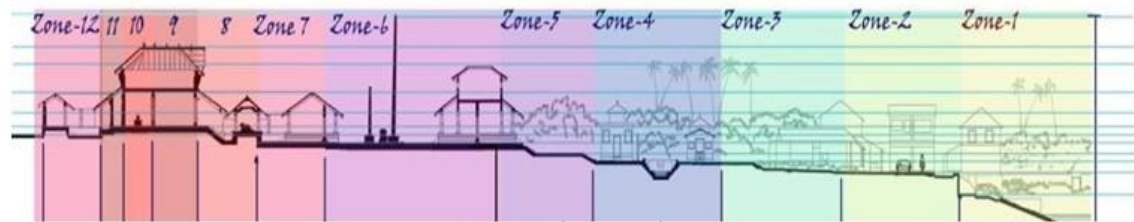
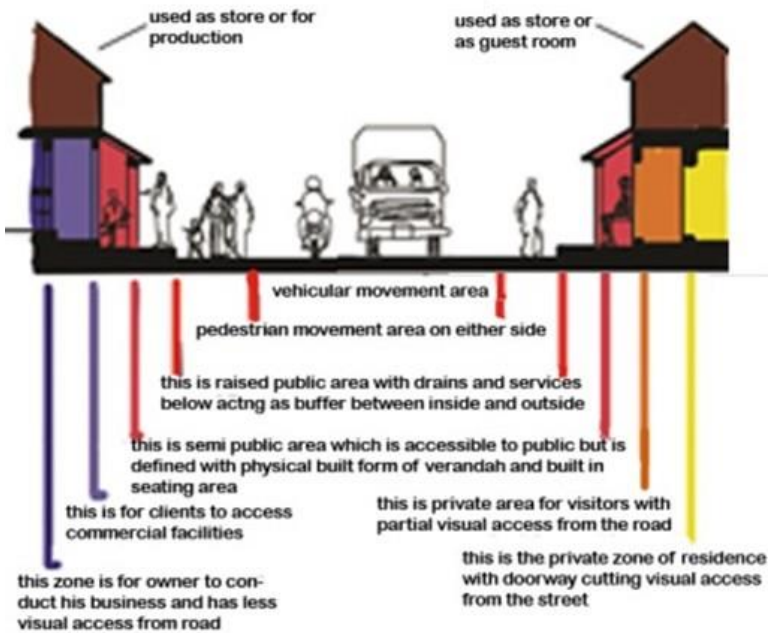


Geology





Nabhi



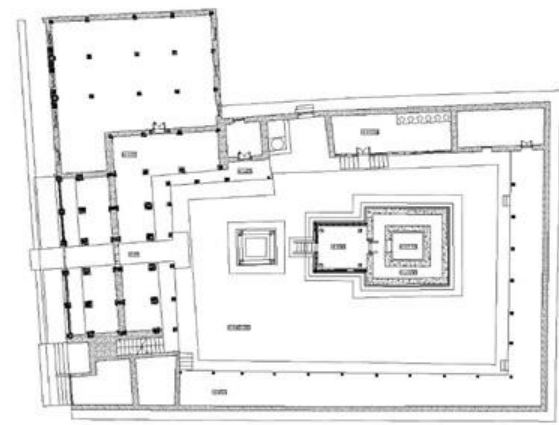
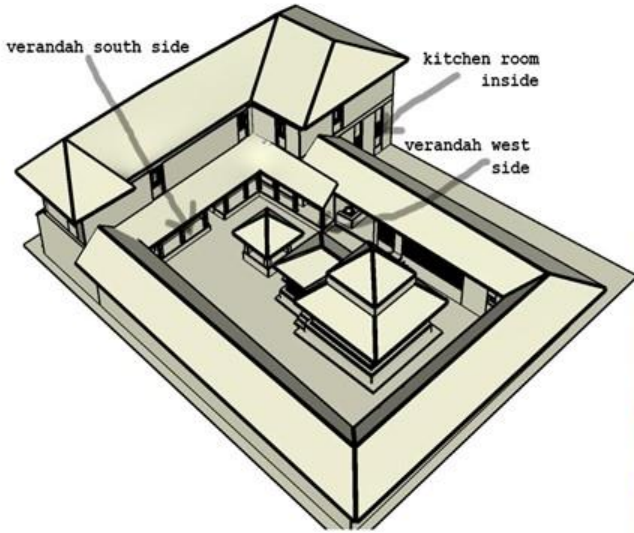
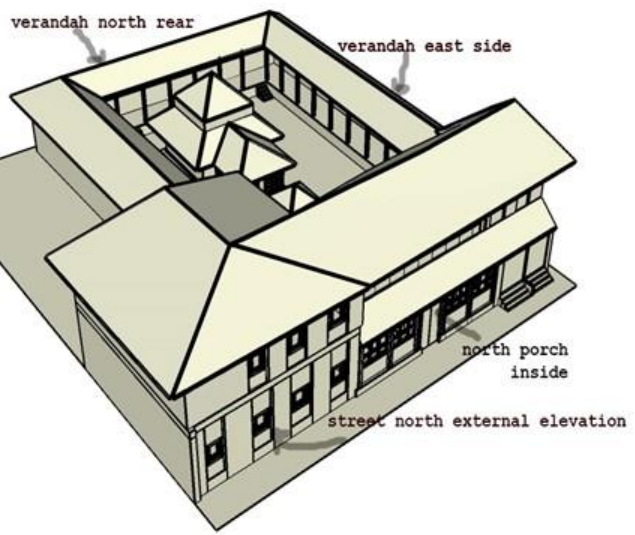
Plan of the temple with the 12 zones marked and the conceptual diagram left

Cakra





Court house in Barkur



Cakra

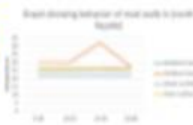
THERMOGRAPH READING

Real images of Temple house



The thickness of the masonry walls, acts to keep off the heat or alternatively, radiated thermal heat loss and work as insulator against heat. Testing of masonry.

8h 30

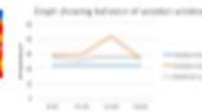


10h 20



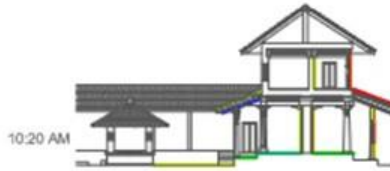
Mud walls absorb radiates their energy if heat, and it radiates back into the room again, as it has low conductivity. The radiation does not radiate to the space if it is covered by mud, and hence acts as an insulator during outdoor temperature.

18h



The masonry masonry has low thermal conductivity, but as it is covered by mud, it acts as an insulator during outdoor temperature. The masonry surface that is in direct contact with the sun is exposed but is higher to the degree of the masonry temperature is higher, radiating heat, and hence the masonry is better insulator during outdoor temperature.

SECTION CUTTING THROUGH THE NORTHERN (FRONT SIDE) BUILT FORM W.R T THE COURTYARD AT THE CENTER OF TEMPLE HOUSE, AT VARIOUS TIME IN A DAY.



ANALYSIS

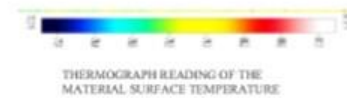
The mud walls on the outer surface (north facade) subjected to morning outdoor temperature 30°C, retains high heat value ,without conducting to the inner surface.

During the scorching afternoon sun, at an outward temperature 40°C, the outer surface further heats up and slowly conducts the heat inward surface.

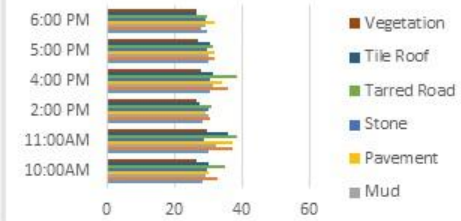
The inner courtyard has a heating effect on the flooring exposed to sky. The granite flooring heats up during the afternoon . But the inner flooring is cooler due to the shading of roof and 2nd storey. The side roofs which act as chajias provide added shading to keep the inner surfaces cooler.

The tile roof and wooden windows and columns retains more heat, in terms of material performance, but are provided to counter the high humidity by increasing the air circulation.

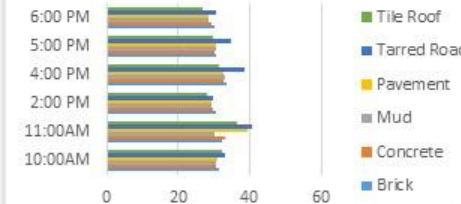
Granite flooring over mud foundation remains cooler due to added effect of shading. But granite as a material heats up quickly and loses heat quickly. Hence it is suitable as flooring where heat gain is minimal (inner rooms)



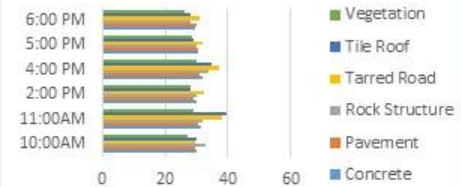
THERMOGRAPH READING OF THE MATERIAL SURFACE TEMPERATURE



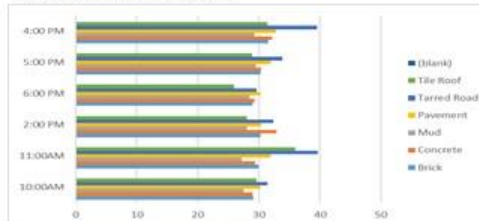
EAST FACE



WEST FACE



NORTH FACE



SOUTH FACE



Ticalwara road	39%
kalikamba-08	31%
veerabadra-07	11%
Mudukere	19%
Somnatheshwara temple-07	23%
Chavikerepanchalige shwara temple-07	23%
water tanks-07	23%
church-06	25%
mandarthi	43%
mudukere	30%
panchayat	10%
Bennekudra	23%
basrakatte	46%

Kacchur	13%
Ugga shana-06	10%
santhe-06	10%
fort kote-06	10%
Somasana gude-06	13%
in efronti nature 04	15%
church road	8%

Mangarathere	8%
Somnatheshwara temple-04	8%
Mudukere	8%
Venugopaltesha temple-04	9%
Babuswami/ Maladevi temple-04	9%
Matamma temple-04	8%

Hosakere ganapati Temple-04	4%
ranganakere-05	1%
Jannanrana Koodle-06	4%
Bandarikere Matta-04	1%
Brahma basrakata Gardi-04	3%

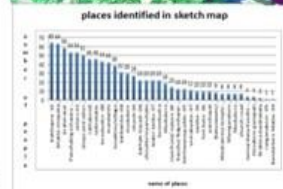
Operative model of Perception of Barkur

Barkur has a distinct centre of Ratha-beedi running E-W defined at two ends with the nodes of Kalchapra and Panchalingeshwara temple.

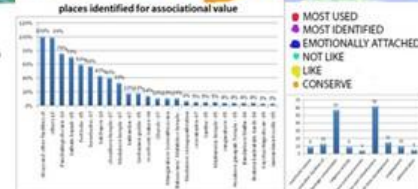
From the central axis there are two branches of road running N-S one towards Brahmavar and the other the Panchayat road. Hence the old routes continue to dominate the morphology of Barkur.



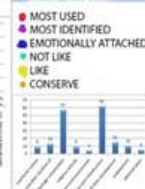
Inferential model of Perception of Barkur



Sketch Map Conclusion overall



Association, Use and Concern - conclusion overall





Thank you



Namaskar is the meeting of mind and soul in harmony



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