Ministry of New and Renewable Energy, GoI

The Energy and Resource Institute

GRIHA Council

presents

One day awareness program on

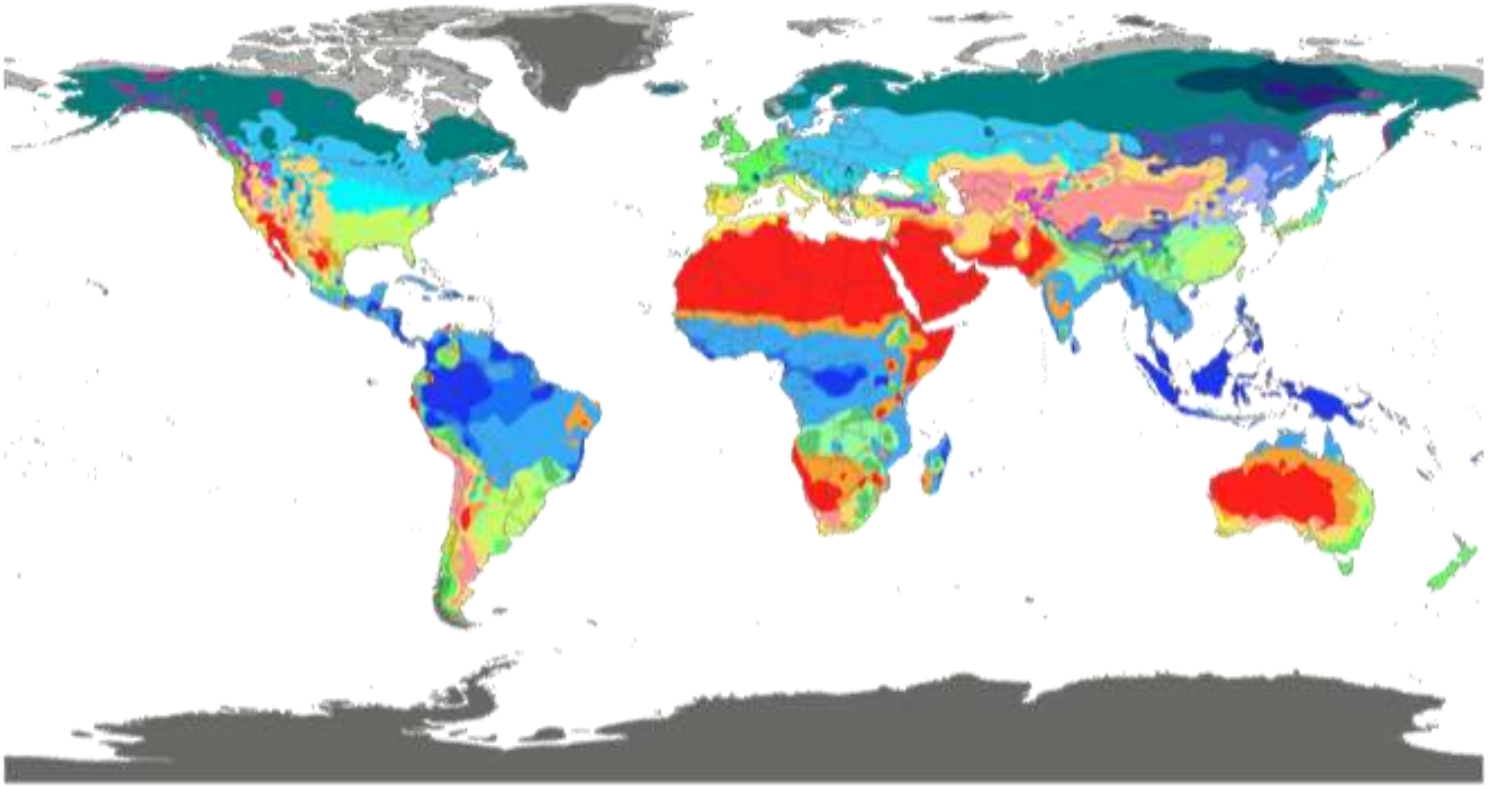
Role of glass in Green building ratings : The GRIHA way

- WHY GRIHA?

"The context is decisive"

werner erhard

Climates of world



THE UNIVERSITY OF MELBOURNE

Af	BWh	Csa	Cwa	Cfa	Dsa	Dwa	Dfa	ET		
Am	BWk	Csb	Cwb	Cfb	Dsb	Dwb	Dfb	EF		
Aw	BSh		Cwc	Cfc	Dsc	Dwc	Dfc			
	BSk				Dsd	Dwd	Dfd			

Contact : Murray C. Peel (mpeel@unimelb.edu.au) for further information

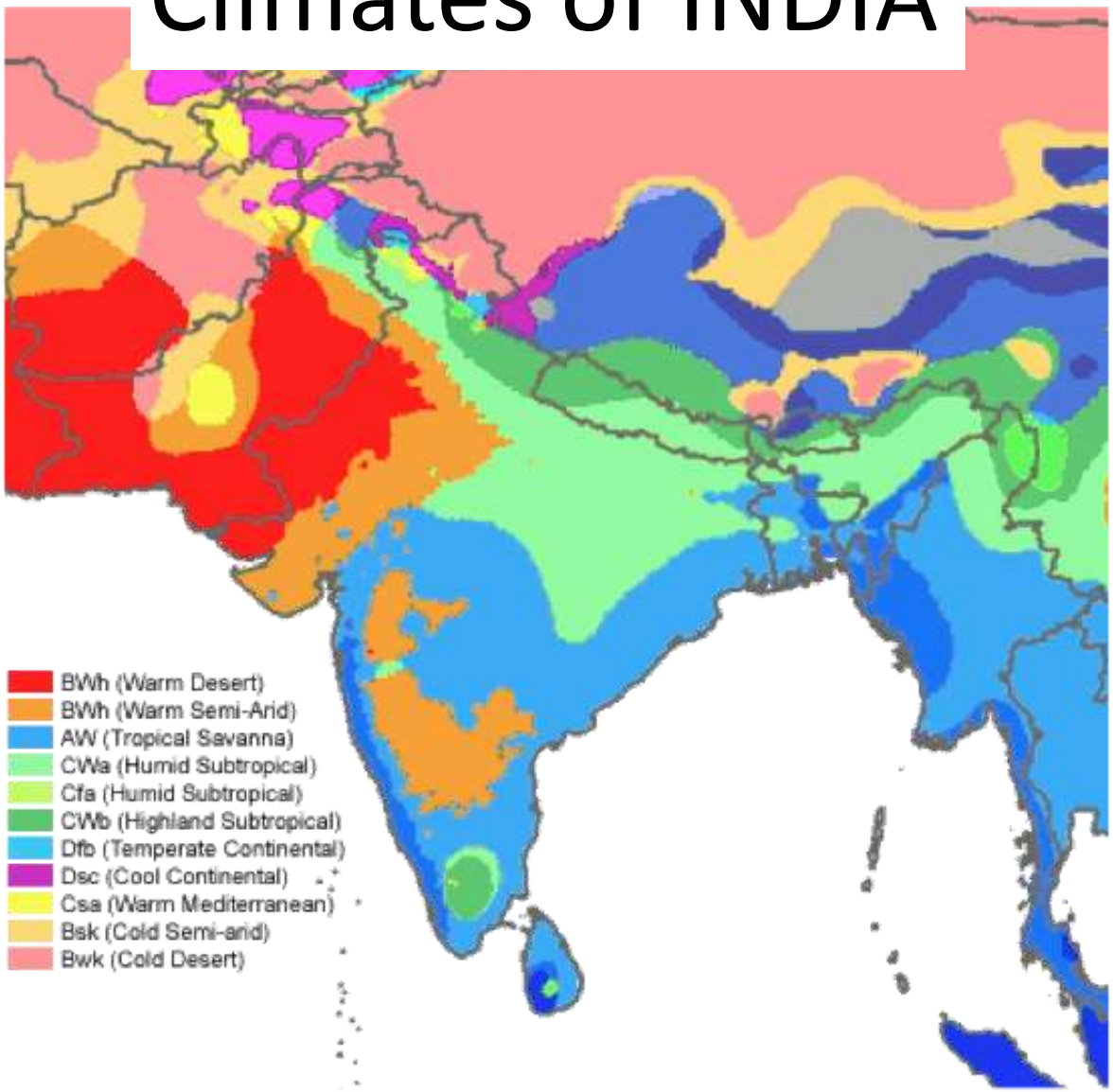
DATA SOURCE : GHCN v2.0 station data
Temperature (N = 4,844) and
Precipitation (N = 12,396)

PERIOD OF RECORD : All available

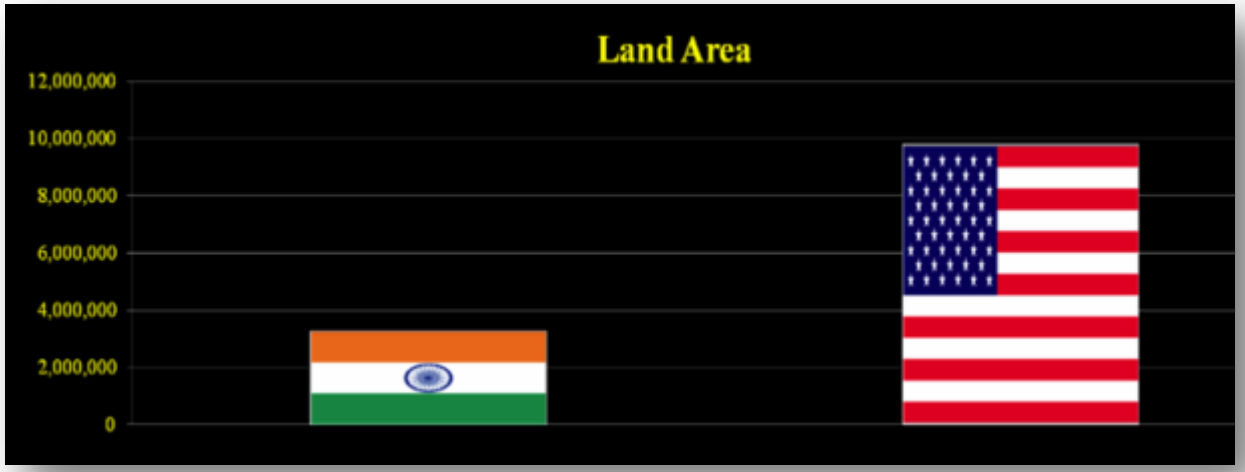
MIN LENGTH : ≥30 for each month.

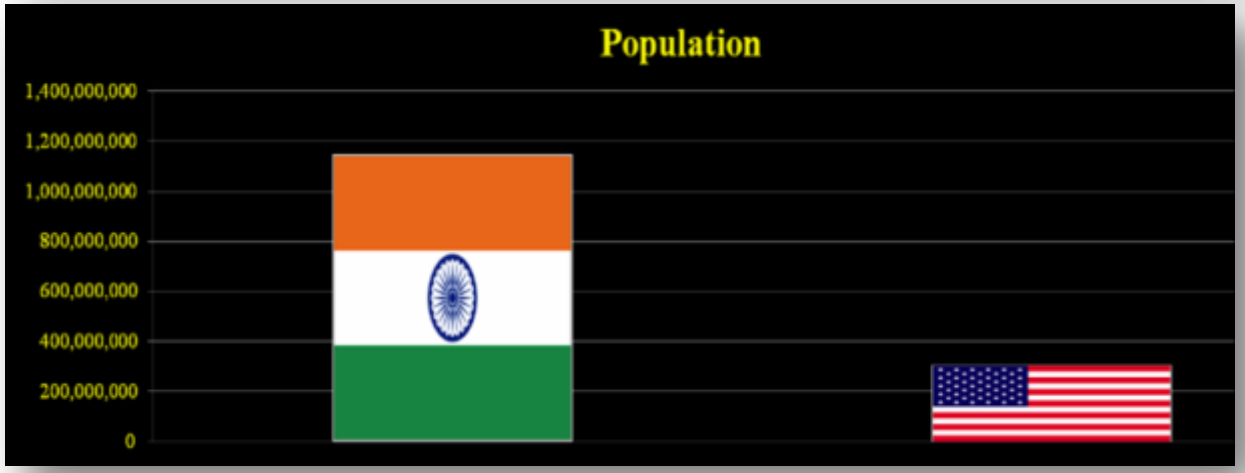
RESOLUTION : 0.1 degree lat/long

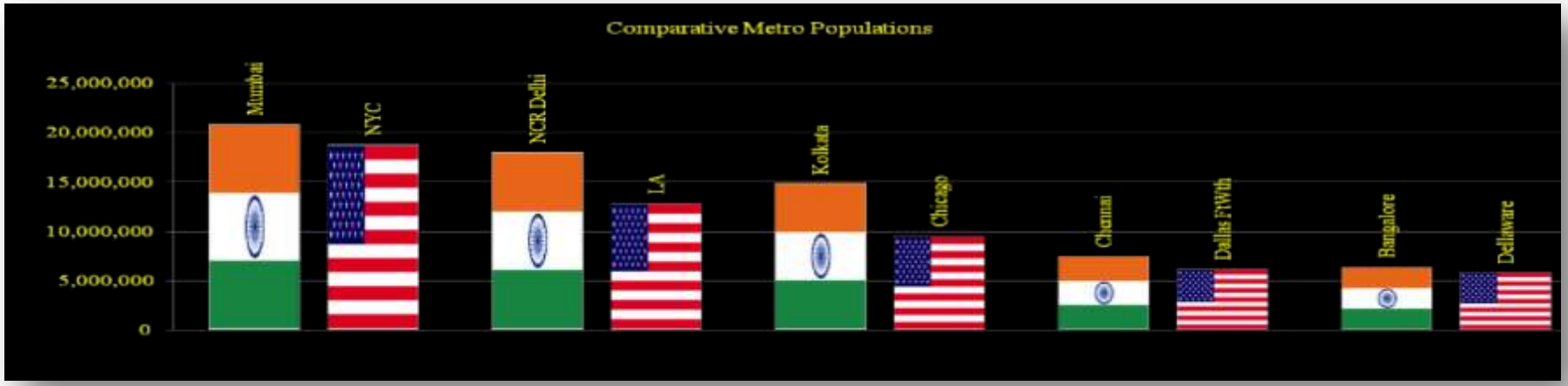
Climates of INDIA

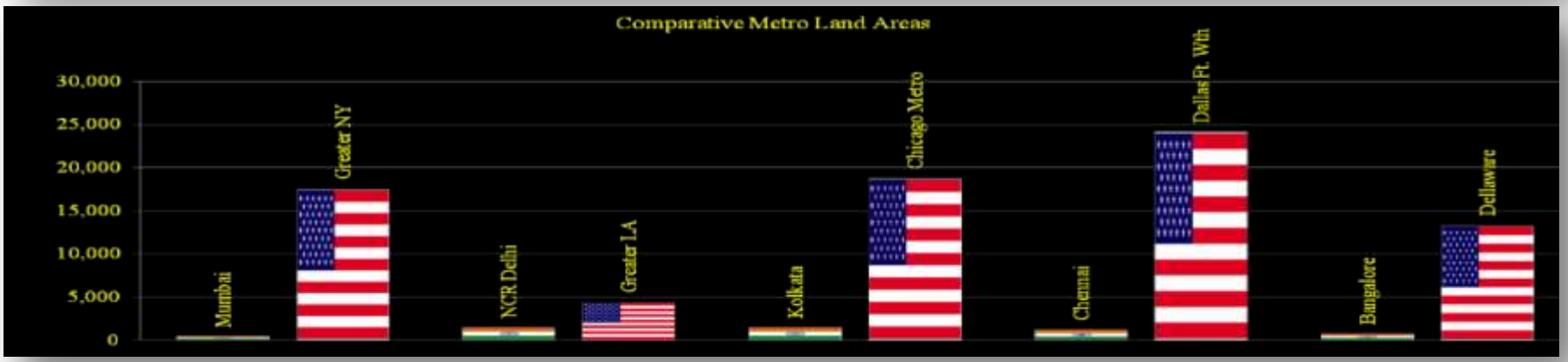


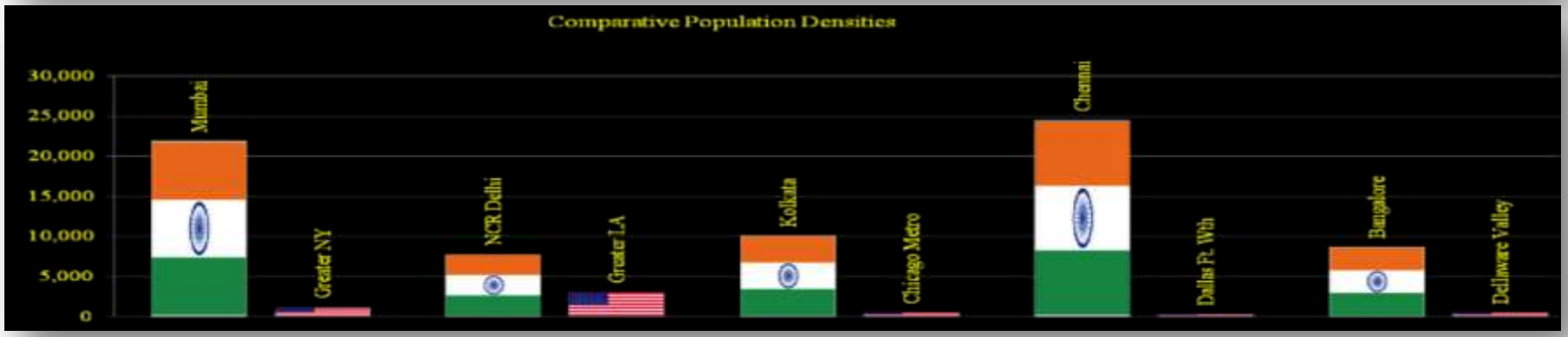
And the best codes???





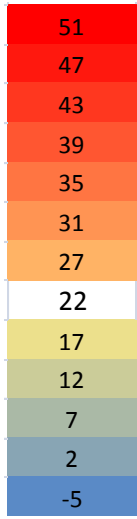

Comparative Metro Populations
25,000,000
20,000,000
15,000,000
10,000,000
5,000,000
0
Mumbai
NYC
NCR Delhi
LA
Kolkata
Chicago
Chennai
Dallas FtWth
Bangalore
Dellaware


Comparative Metro Land Areas
30,000
25,000
20,000
15,000
10,000
5,000
0
Mumbai
Greater NY
NCR Delhi
Greater LA
Kolkata
Chicago Metro
Chennai
Dallas Ft. Wth
Bangalore
Dellaware


Comparative Population Densities
30,000
25,000
20,000
15,000
10,000
5,000
0
Mumbai
Greater NY
NCR Delhi
Greater LA
Kolkata
Chicago Metro
Chennai
Dallas Ft. Wth
Bangalore
Dellaware Valley

Climate variation ……

Mumbai	max	37.1	39.6	41.7	42.2	41	37.1	34.8	33.5	36.4	37.9	37.4	39.8
	min	16.8	17.8	21	23.9	26.3	26	24.9	24.7	24.3	23.4	20.9	18.6
New York City	max	3	5	10	16	22	26	29	28	24	18	12	6
	min	−3	−2	2	7	12	17	21	20	16	10	5	0
Delhi	max	30	34.1	40.6	45.6	47.2	46.7	45	42	40.6	39.4	36.1	29.3
	min	5	8	10.7	18	23.9	24.3	24.5	22.8	22.5	15.1	9	6
Los Angeles	max	18.1	17.9	18	19.1	20.1	21.4	23.2	23.8	23.7	22.5	20.5	18.1
	min	9.3	10	10.9	12.1	14.1	15.8	17.6	17.9	17.3	15.2	11.8	9.3
Chennai	max	34.4	36.7	40.6	42.8	45	43.3	41.1	40	38.9	39.4	35.4	33
	min	20.9	22	23.8	26.4	27.9	27.5	26.3	25.7	25.5	24.5	23	21.9
Chicago	max	−0.3	2.1	8.2	15.1	21.2	26.6	29	27.8	24.1	17.1	9.2	1.8
	min	−7.7	−5.7	−0.6	5.4	10.9	16.7	19.7	19	14.2	7.6	1.4	−5.2
Bangalore	max	27.6	30.2	32.9	34.1	33.3	29.4	28.1	27.5	28.3	28	27	26.2
	min	15.3	17.2	19.6	21.8	21.5	20.2	19.8	19.6	19.7	19.4	17.7	16
Houston	max	17.2	19.1	22.8	26.4	30.2	33	34.3	34.7	32.1	27.8	22.5	17.9
	min	6.2	8.1	11.4	15.2	19.8	23.1	23.9	23.8	21	16.1	11.2	7
Kolkata	max	32.8	38.4	41.1	43.3	43.7	43.9	39.9	38.4	38.9	39	34.9	32.5
	min	13.8	16.9	21.7	25.1	26	26.5	26.1	26.1	25.8	23.9	19.6	14.5
Philadelphia	max	4.6	6.6	11.5	17.7	23.2	28.2	30.6	29.6	25.6	19.2	13.3	7.1
	min	−3.6	−2.4	1.3	6.7	12.2	17.7	20.7	19.9	15.7	9.1	4	−1.1



Buildings ……??????


VENIRE.
IHG
ZTEФИ
Your Efficient Enterprise
off your energy bill
DLF

Inception of GRIHA

- India’s first rated green building.
- Green building consultant – TERI (The Energy & Resource Institute)
- Project got LEED Platinum rating in 2001
- TERI GRIHA released in 2005

National and international endorsements

National rating system for green buildings in INDIA

–

MNRE: 2007

Innovative tool to measure greenness of buildings

–

UN: 2009

India's own green building rating system

–

UNFCC: 2015

Tool for implementing RE in building sector 'The Climate Reality Project' organization by **Mr. Al Gore : 2008**

"Common Carbon Metric" (kWhr/sq m/annum), for international building energy data

UNEP : 2010

Which rating ??????

Multiple buildings typology

Residential	Airport	Restaurant
Commercial	Industry	Sports complex
Office	School	Hospital
Institute	Museum	Hotel
Bank	Dhaba	Shopping complex

GRIHA variants

New construction

SVAGRIHA	GRIHA	GRIHA LD
Built-up area 100 – 2,499 m^2	Built-up area > 2,500 m^2	Site area > 50 hectare

For existing building

GRIHA Prakriti

Day Schools

GRIHA EB

Existing building

Coming soon

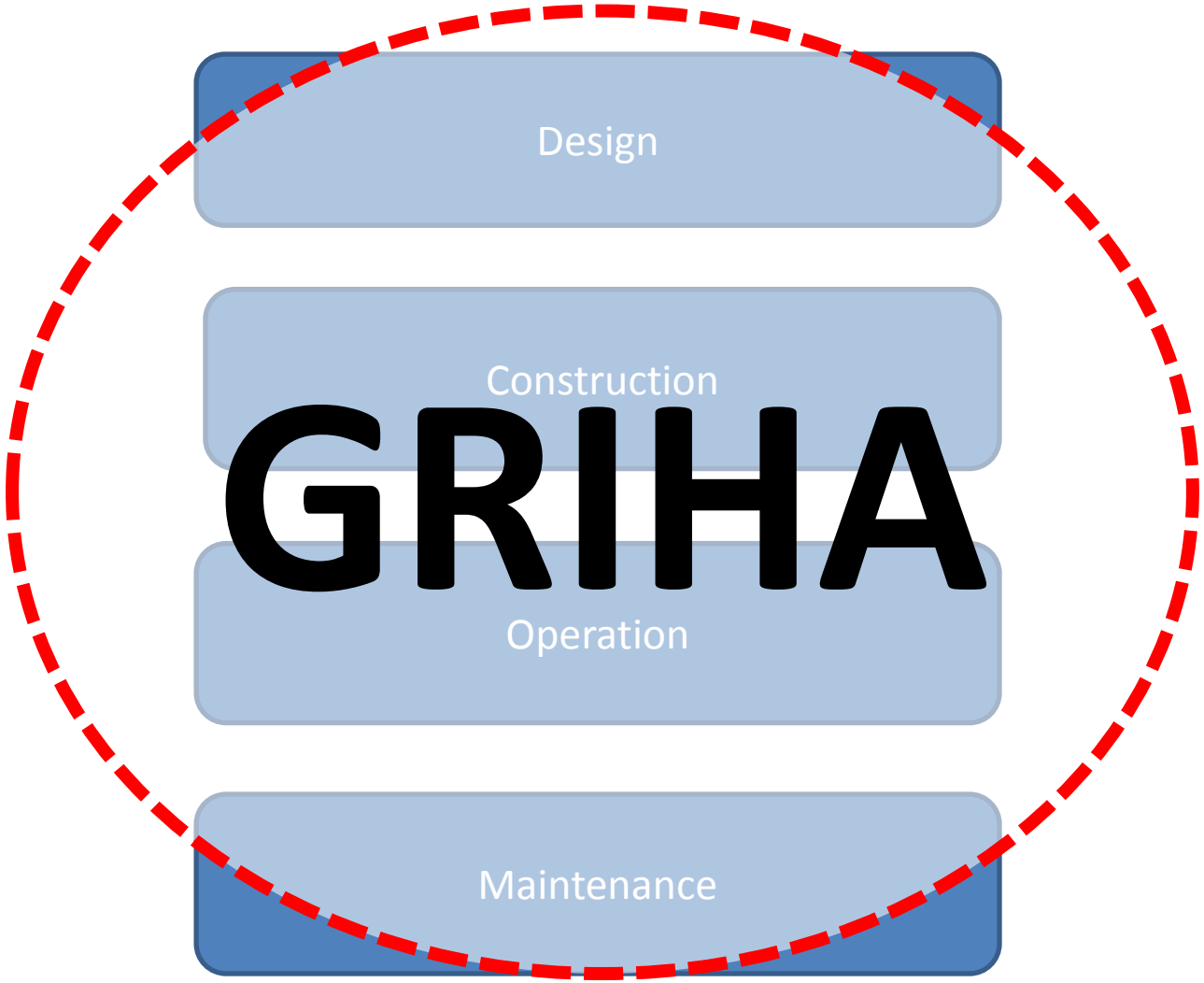
Green Rating for Integrated Habitat Assessment

Tool to facilitate design, construction, operation of a green building, and in turn ….measure “greenness” of a building in India

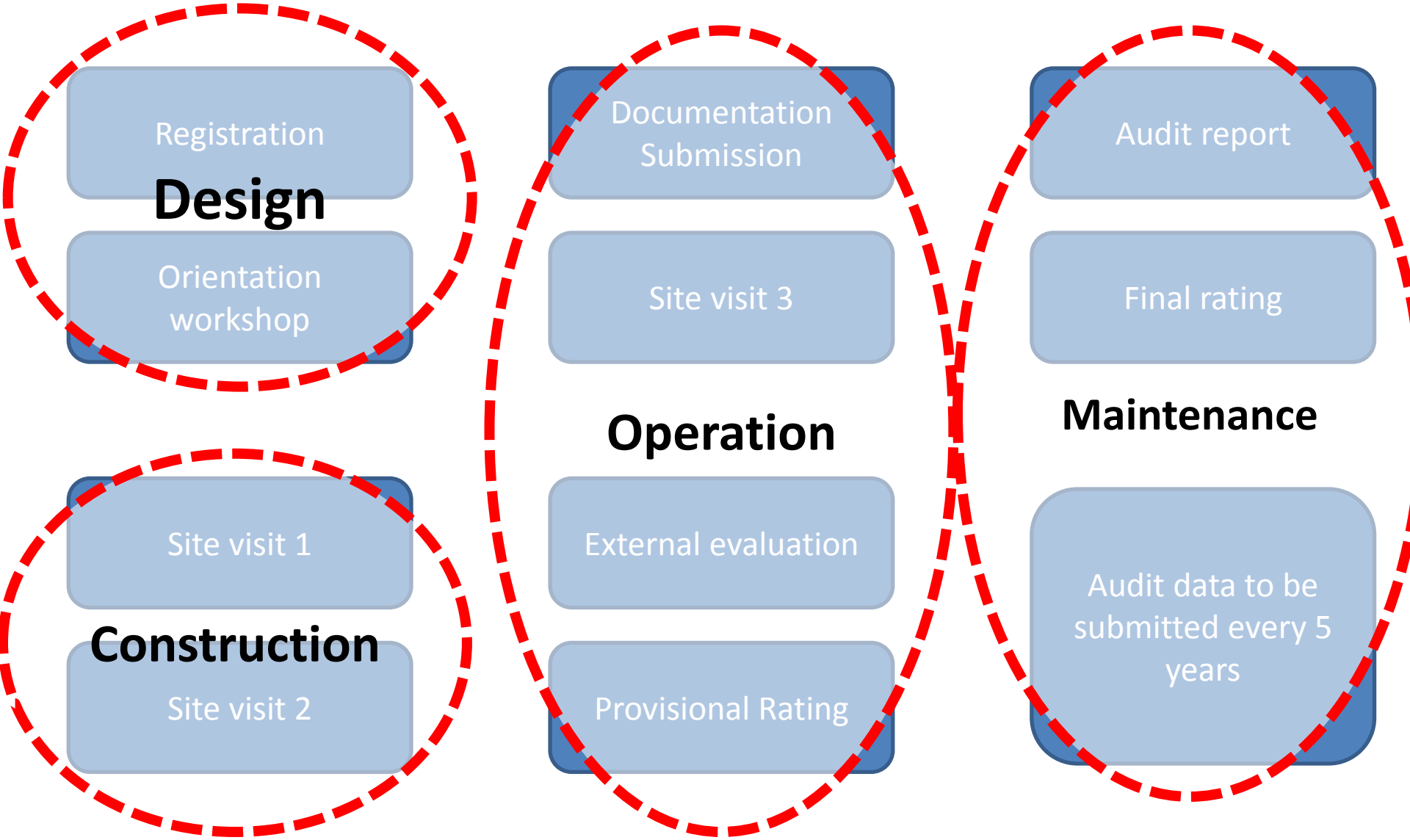
GRIHA

What gets measured gets managed

Stages involved in project



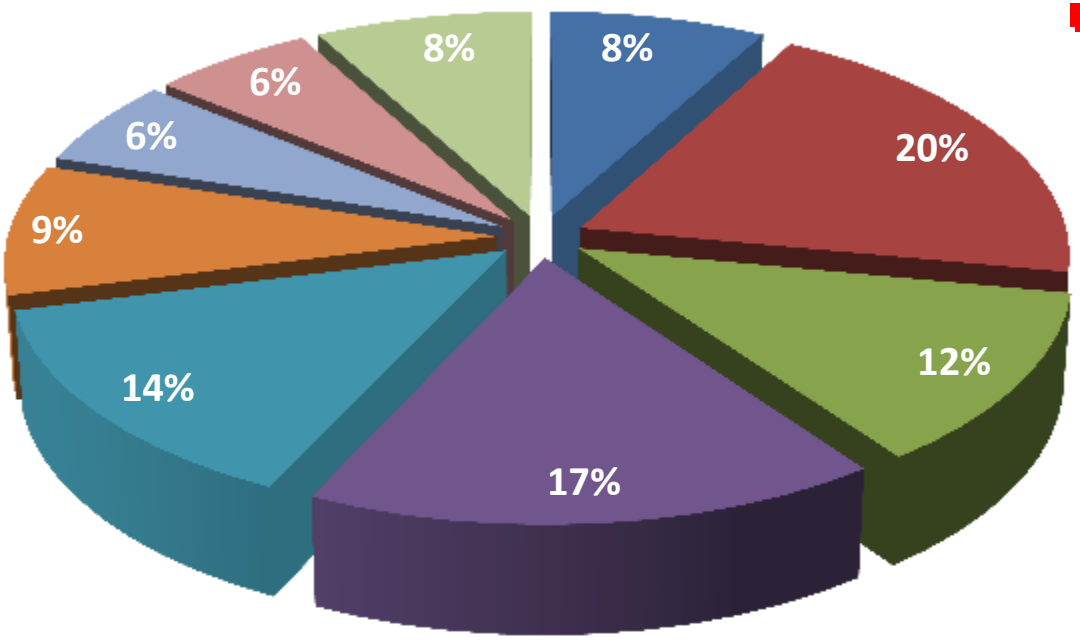
Rating process



GRIHA Key Features

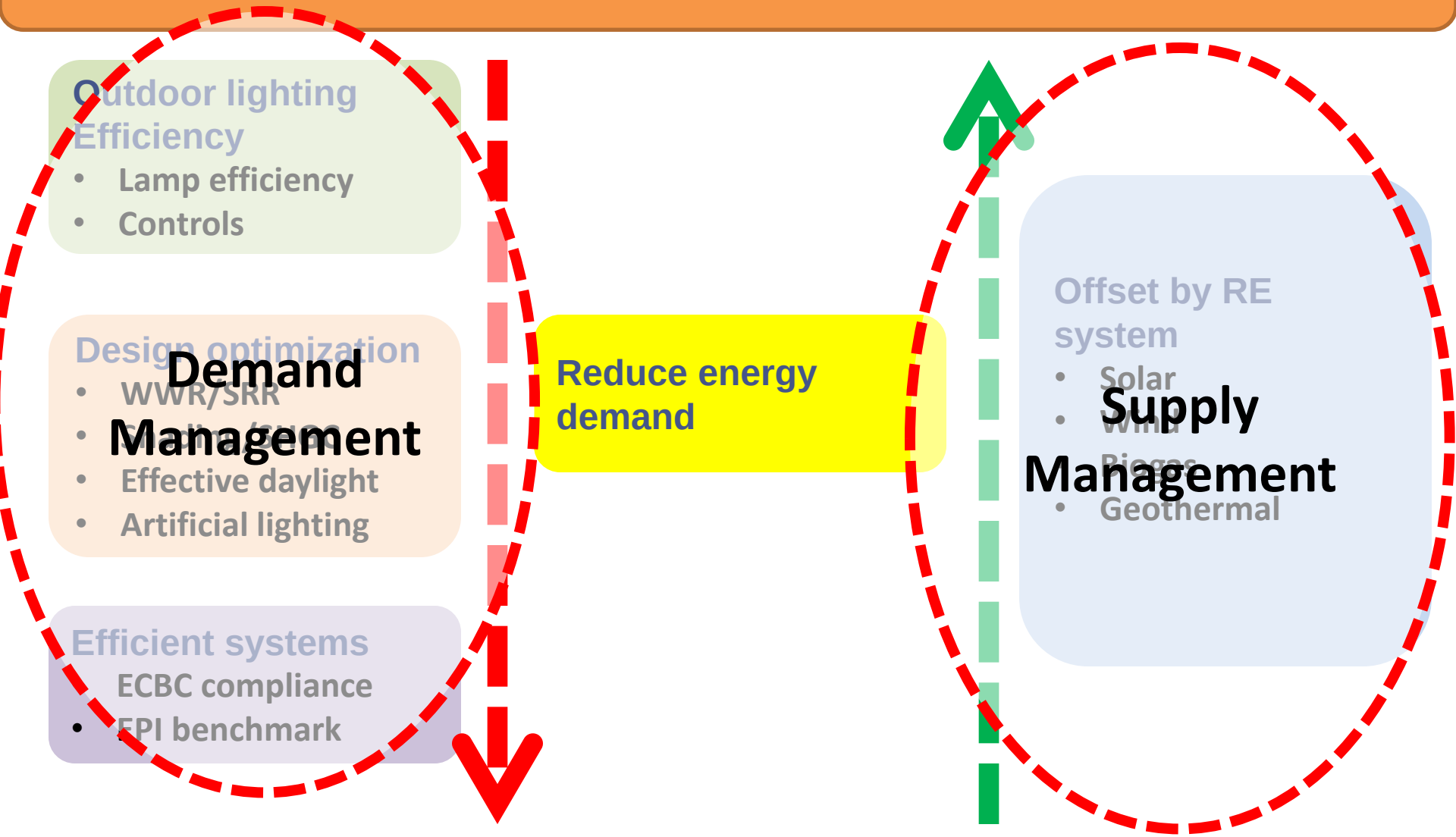
- Percentile based rating
- Common sense oriented rating system - Non-applicability clauses.
- Rates AC, non-AC as well as hybrid buildings.
- Performance based rating system.
- Lays emphasis on “cost-effective” strategies for making green buildings.
- Emphasizes on Integrated Design Approach towards green buildings.

Points Weightage



- Site Planning
- Energy
- Occupant Comfort and Well Being
- Water
- Sustainable Building Materials
- Construction Management
- Solid Waste Management
- Socio-Economic Strategies
- Performance Monitoring and Validation

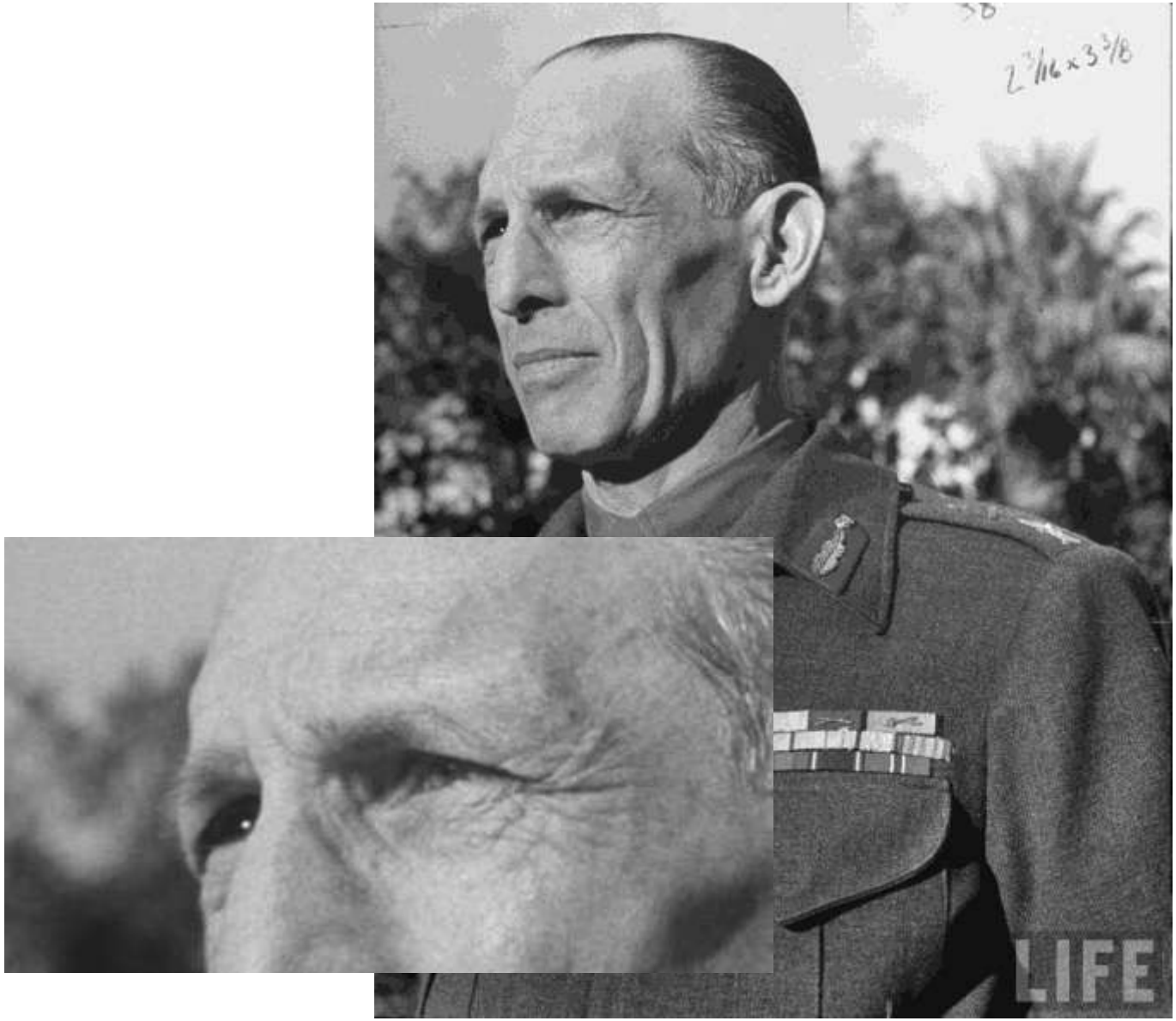
Energy management **in GRIHA**



Window to Wall Ratio in Nature…

  - Most recommendations in the GRIHA follow simple logic
  - Not following the GRIHA is impossible for an intelligent engineer/architect/client
- In other words
  - Any rational architect / engineer / consultant will instinctively follow the GRIHA
  - Whether he/she consciously knows it or not.
- Let’s examine instinct for a bit…

http://lh6.ggpht.com/__2tJjrIFCs8/RoCs2VAI9XI/AAAAAAAAAko/bYxoTHdv4iQ/Me%20Shading%20Eyes%20in%20Cinque%20Terre.jpg



http://www.gstatic.com/hostedimg/cef2c6feda04a57d_large

http://farm3.static.flickr.com/2469/3917233084_6ba0cc4c36.jpg

Even Animals Know Better…

http://www.best-of-web.com/PICTURES/free_images/cute_old_fat_orangutan_shading_its_eyes_and_keeping_an_eye_out_for_trouble_0001-0404-1218-2437_SMU.jpg

Large Window to Wall Ratio in Nature…

http://nocturnal-animals.com/wp-content/uploads/2010/03/tarsier_nocturnal_animals.jpg

http://nocturnal-animals.com/wp-content/uploads/2010/06/redeyedtreefrog.jpg

http://daddu.net/wp-content/uploads/2010/02/Colugo-climbing.jpg

http://www.spin4suggies.com/images/pict3899_yc4p.jpg

So what is the cheapest option?

Is it shading?

- Is it external shading?
- Is it internal shading?

- Is it glazing?
  - Is it regular glazing?
  - Is it high-performance glazing?

National Building Code

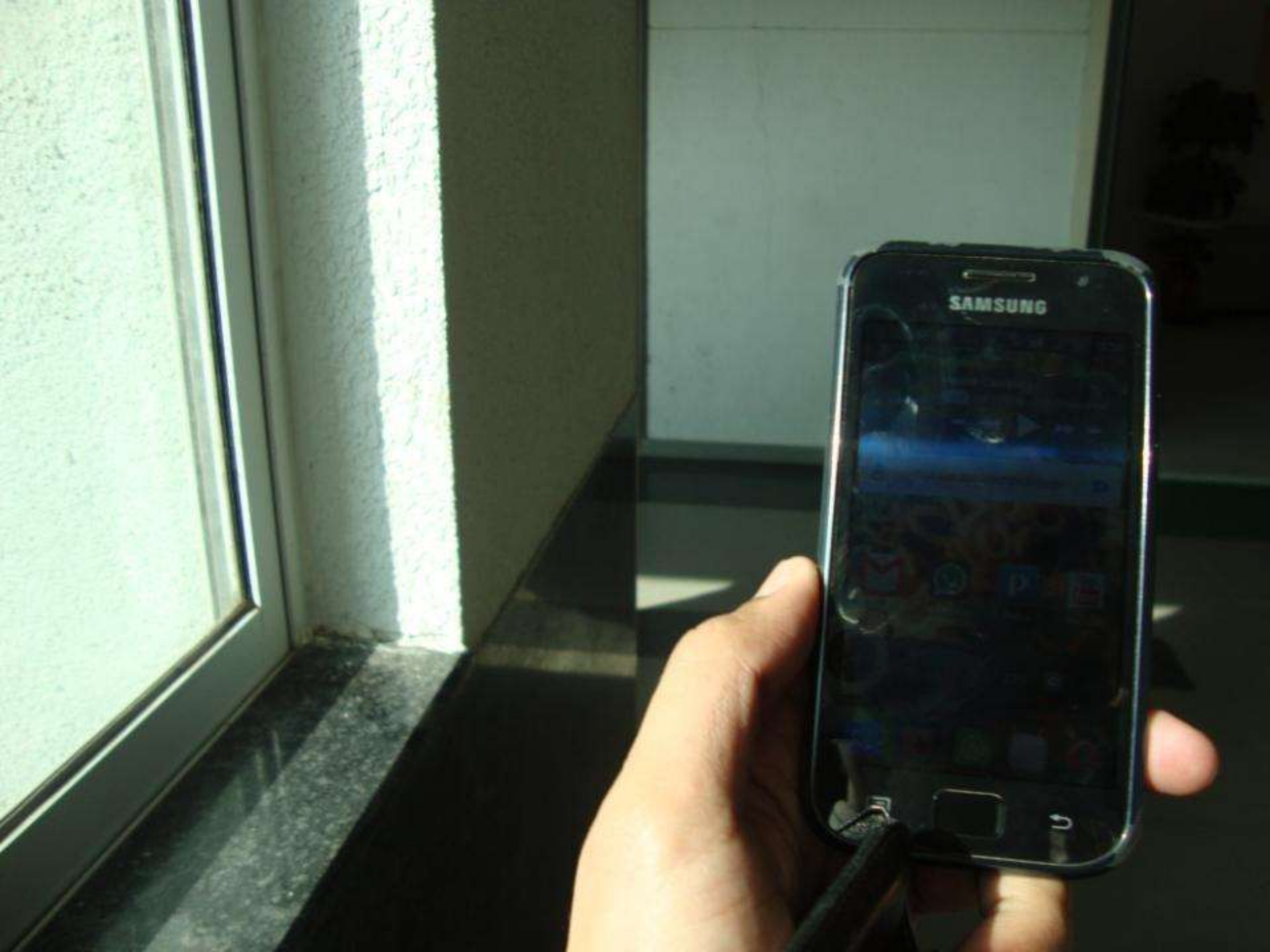
http://213.211.198.27/wwshop/images/ManMarinCap.jpg

Current Market Practice

http://cdn.koimoi.com/wp-content/new-galleries/2012/08/Salman-Khan-in-Bodyguard-Ready-Dabangg.jpg

ECBC recommendation

http://jkhgroup.com/flben4.jpg


SAMSUNG

Case studies

Panchakula, Haryana


SERVICE PARKING
VERANDAH
CAVITY WALL
CHOWKIDAR ROOM
TOILET
KITCHENETTE
AHU
STORE
WORKSHOP
ACCOUNTS OFFICER
RECORD ROOM
PRINTER/FAX STORAGE
LOW HEIGHT PARTITION
SOLAR CHIMNEY
EXTENT OF SLAB
GLASS CURTAIN WALL
CURTAIN WALL
CHAIRPERSON ROOM
25'-0" X 23'-9"
CHAIRMAN'S WAITING ROOM
CHAIRMAN'S PA/ VISITOR ROOM
GLASS PARTITION
SKYLIGHT FOR BASEMENT
WATER BODY
2'-9" HIGH RAILING
8'-0" WIDE CORRIDOR
2'-0" WIDE CORRIDOR
SLAB AT LINTEL LEVEL
TOILET (HE)
TOILET (HC)
SEATING ROOM
VISITORS WAITING
RECEPTION
6'-0" CORRIDOR
LIFT
AHU ROOM
ADITYA SOLAR SHOP
COUNTER
EXHIBITION SPACE
ENTRANCE FOR EXHIBITION SPACE
DRINKING WATER
EXTENT OF RAMP
RAMP DN
RAMP UP
ENTRANCE
HANDICAP ENTRANCE
DUCT
UP
DN
A
B
C
D

Snapshot of the courtyard in HAREDA


HAREDA, Panchkula

VVIP Circuit House, Pune

General Information

Site Area: Approx 9584.24m^2

Built up Area: 4886.90 m^2

Air-conditioned Area: 2629.93 m^2

Non Air- conditioned Area: 2256.97 m^2

Energy Performance Index (EPI): 89.16 KWh/ m^2/year

Renewable Energy: Rated capacity of solar PV installed on site is 22 KW

GRIHA provisional rating: 5 Stars

Year of completion: 2014 - 15

More than 80% of the regularly occupied spaces receive optimum daylight. The building is optimally oriented and façade is designed such that the heat gain is minimized and daylight is maximized.

- The landscape water demand has been reduced by minimizing the turf area, planting only indigenous species and using drip irrigation system for shrubs and trees.
- Building water use has been reduced by using low flow fixtures.
- Phytorid technology based STP of 25 kLD capacity has been installed on site. 35 kL of storage tank has been installed to collect rainwater for use in the building.

- Landscape has been designed to maximize green area and minimize hard paving. The net paved area is only 21.32% of landscape area.

- Fly ash has been extensively used in the project in RCC, mortar plaster and in the form of AAC blocks.
- Low energy materials such as unpolished stone and ceramic tiles have been used.

Thank You

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akashdeep@grihaindia.org

GRIHA app available on iOS and android

Connect with us on