



BEEP Integrated Design Process for Energy Efficient Buildings

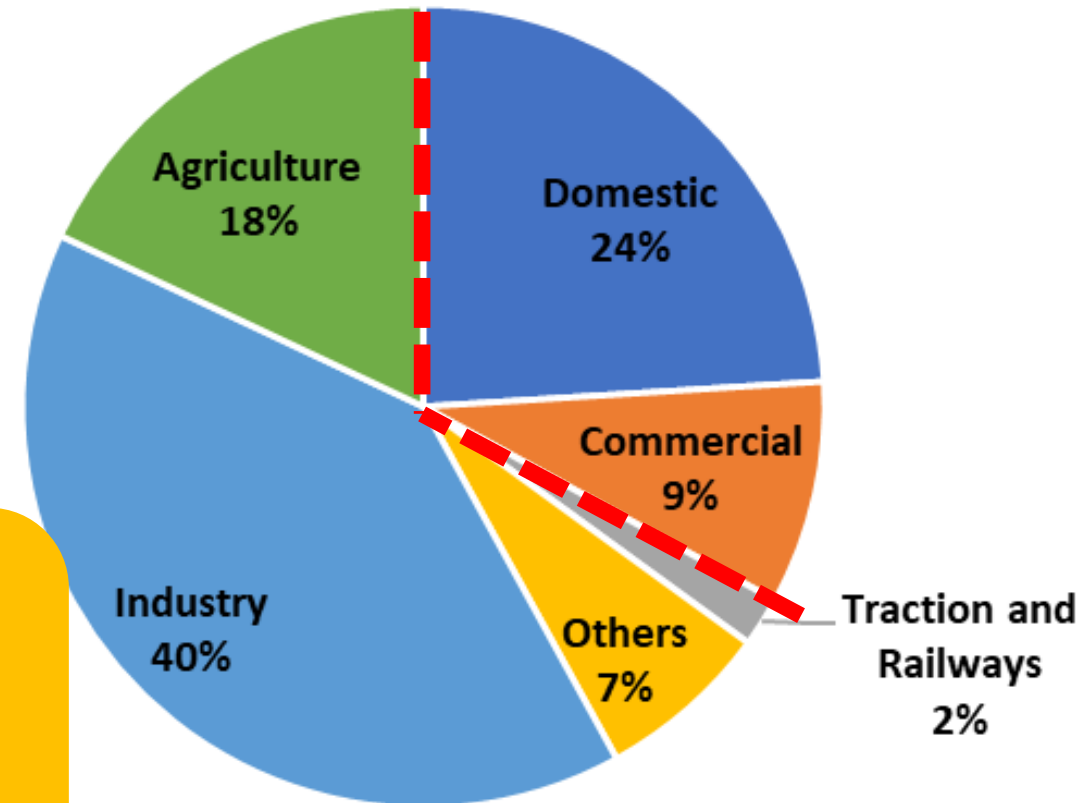
Why environmental sustainability depends on Energy Efficient Buildings?

- Globally, buildings use about 40% of energy and they emit approximately 1/3rd of GHG emissions
- In India, buildings account for 1/3rd of the electricity consumption
- By 2047, buildings will become the highest consumer of electricity

But....

- **Energy sources are limited**
- **Burning more fossil fuels to generate energy means increased GHG emissions & higher global temperatures**

Electricity Consumption in India (2016-17)



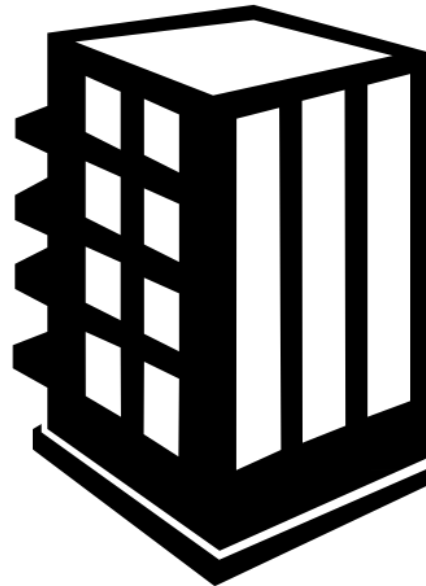
Source: Ministry of Statistics & Programme Implementation, 2018

Energy Efficient Building and Thermal Comfort??

- Thermally comfortable buildings are necessary to maintain the health and well-being of the occupants



- 75% of a person's time is spent inside buildings



- But, only 5% of Indians have access to cooling—though this number is increasing.

What is needed?

Provide thermal comfort with reduced energy use.

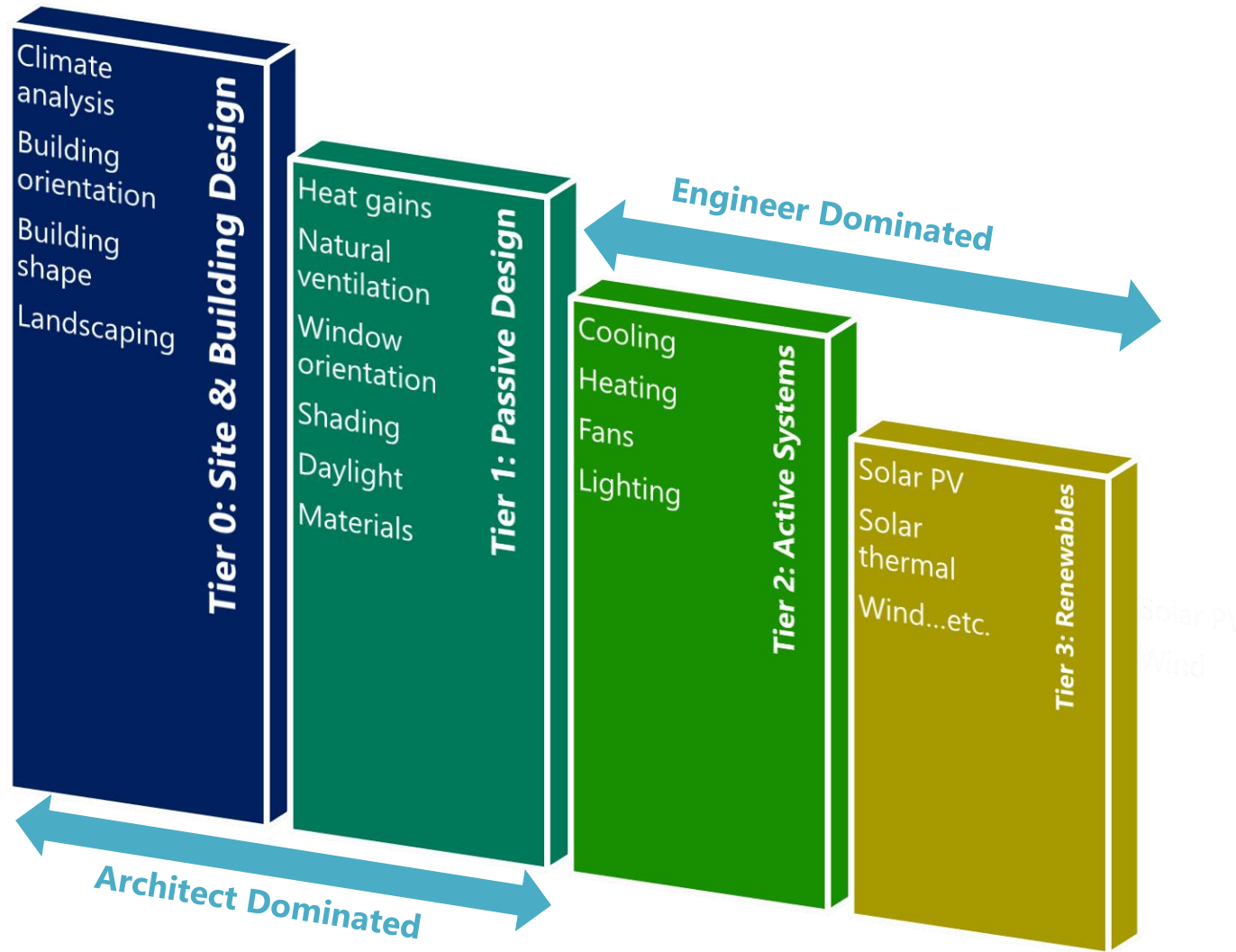
BEEP Integrated Design Process & Charrettes

Conventional Design Process



Concept design	Schematic design	Design development	Construction drawings	Construction	Commissioning
<ul style="list-style-type: none"> • Client • Architect... 					
<ul style="list-style-type: none"> • Structural Engineer • HVAC Engineer • Green/Energy Consultant..... 					
<ul style="list-style-type: none"> • Project manager • Contractor.... 					

Integrated design- What do you integrate?



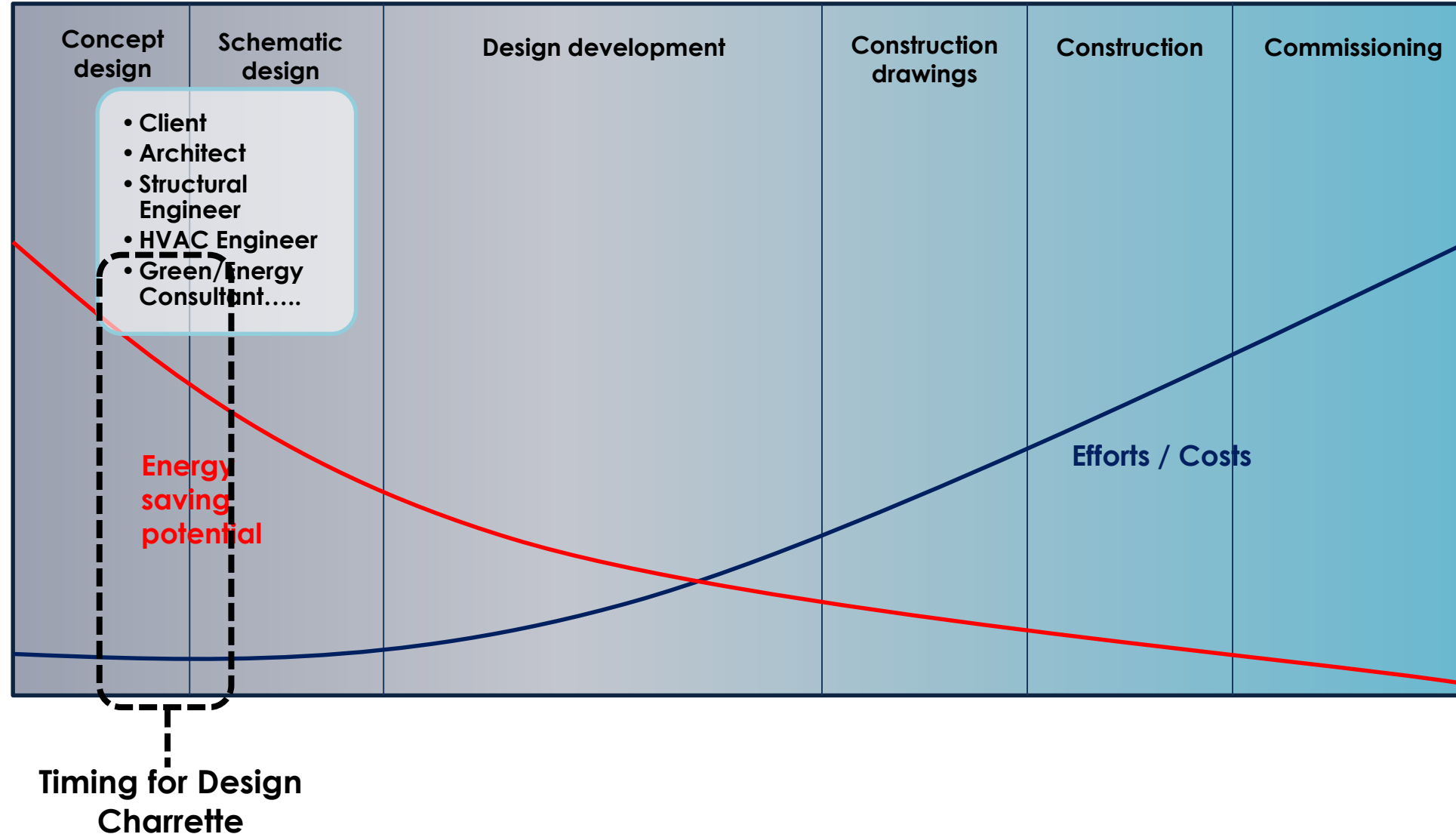
Integration of:

- Multiple design professionals
- Multiple aspects of building design and construction

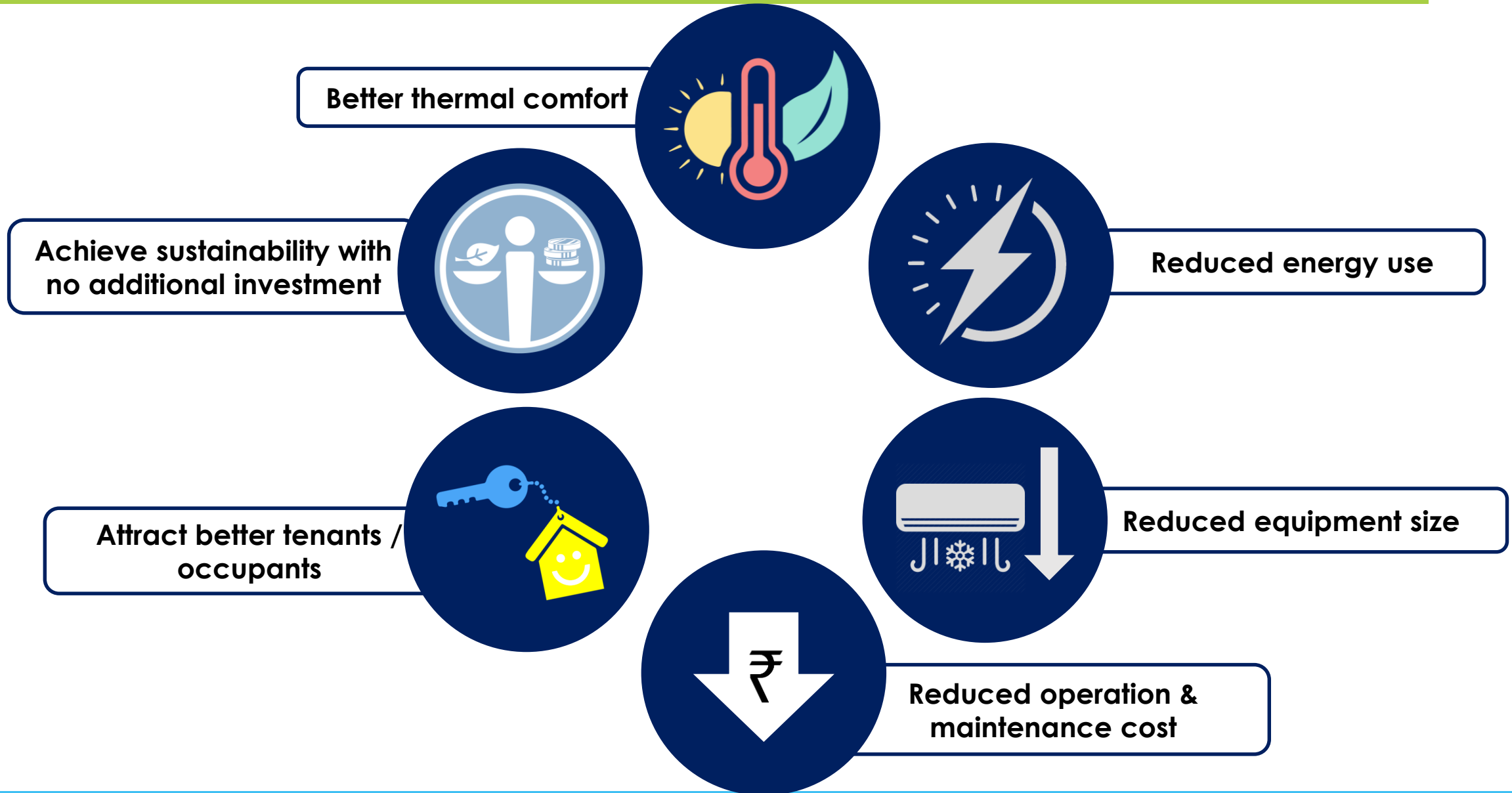
Integrated Design Process

Experience shows:

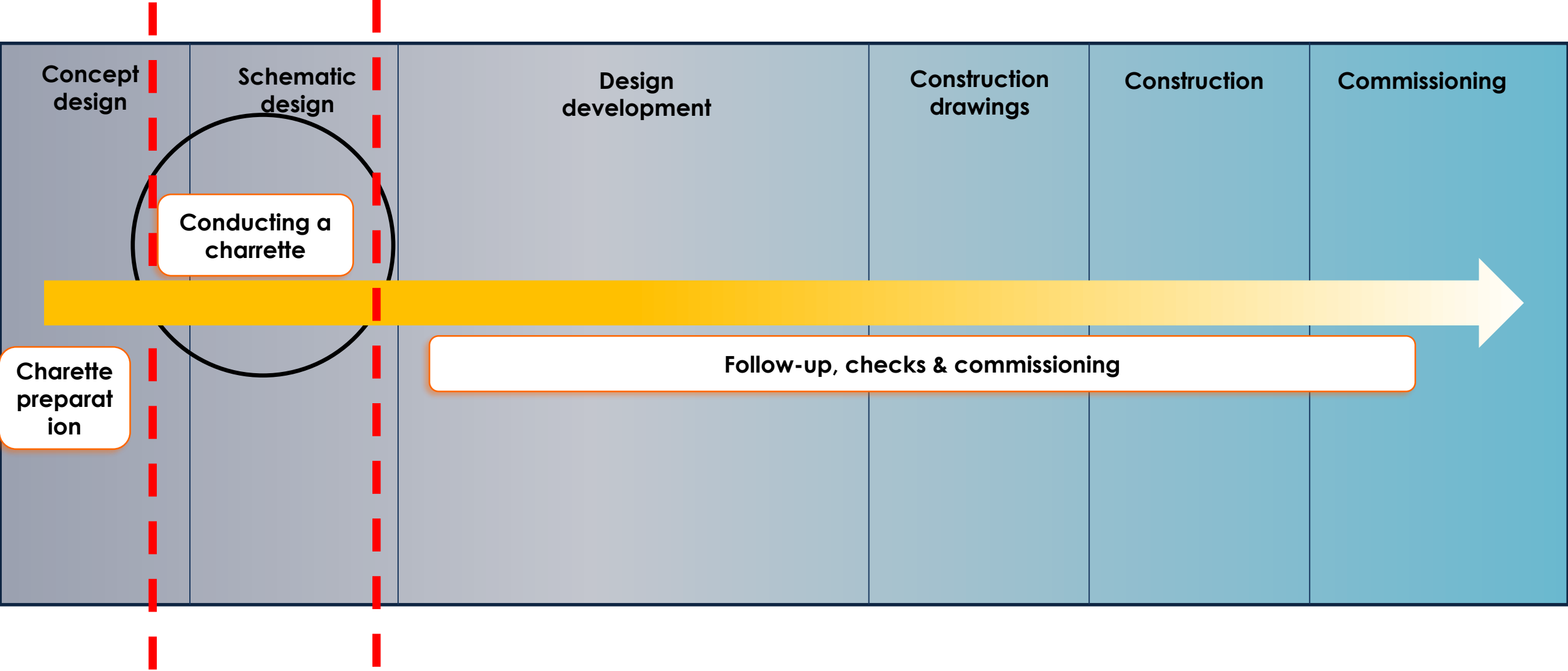
- Cost-effective and energy efficient design (25-40% energy savings at no/marginal cost increase) is possible if the **architect, engineer and client** work together in a Design Charrette/Workshop during the early design phase.
- More savings are achieved when the **architects and engineers** continued to work together in the design phase.



Why Integrated Design?



Stages of an Integrated Design Process



What is a Charrette?



The word “Charrette” is a French word, originally meaning a cart. It has evolved to mean a collection of ideas or a session of intense brainstorming.

This happened in the 19th century, when students of L’ecole des Beaux Arts in Paris would ride in the cart sent to retrieve their final art and architecture projects, frantically working together to complete or improve these projects.

Today it implies an intensely focused activity intended to build consensus among participants and develop specific design goals.

Who participates in a charrette?

Client

- Owner
- Promoter
- Building operator, Facilities / O&M etc.

- Users
- Building operator, Facilities / O&M etc.

Design Team

- Architect
- HVAC consultant
- Electrical consultant
- Green Building Consultant etc.

- Landscape designer
- Interior designer

Building execution team

- Project manager

- Construction manager
- Contractor

Charette preparation

- Prepare the project brief
- Identify an individual or team to own / lead the integrated design process
- Assemble the design team, and (if possible) the execution team
- Create a few conceptual architectural designs
- Carry out climate and other preliminary analysis to understand what strategies may work
- Get background information on possible strategies (Technical specs, cost....)

Conducting a charrette

DAY 1:

- Fix the energy / comfort goal for the building

DAY 2:

- Finalise the set of strategies that may be applied

DAY 3:

- Test out the effectiveness of the strategies
 - Energy savings and comfort (through simulation tools)
 - Capital and operational cost (cost database tool)
- Develop alternative designs

DAY 4:

- Decide on final strategies / design
- Decide on next steps & assign responsibilities to track progress

Charrette Follow-up

Prepare a charrette report and circulate to all participants

Make sure the lines of communication are open between all charrette participants

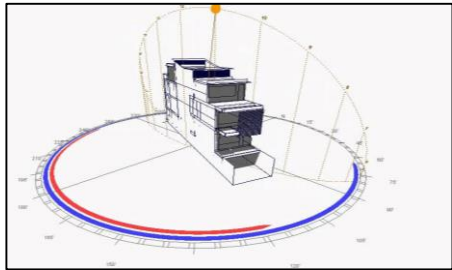
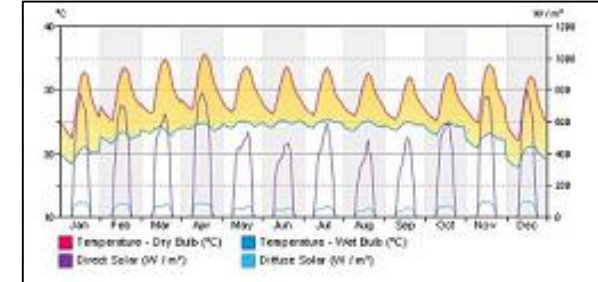
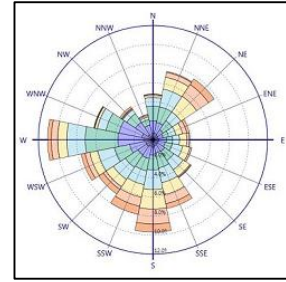
Hold periodic meetings to review the implementation of the charrette recommendations

Prepare a final assessment after the completion of the project and after occupation.

Charrette tools (Analytical)

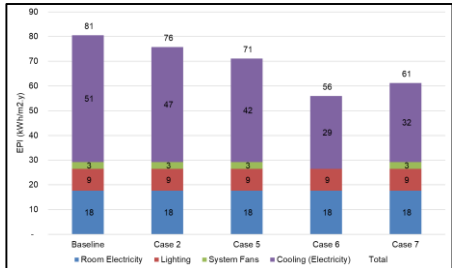
Climate analysis tool (e.g. ClimateConsultant etc.)

Weather data (.epw files etc.)

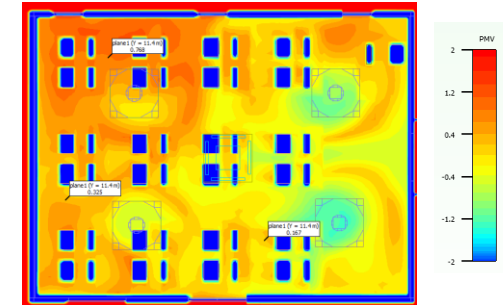


Basic sun-path tool (e.g. Sketch-up, Ecotect etc.)

Tool to calculate heat gains through building envelope (e.g. RETV compliance tool)

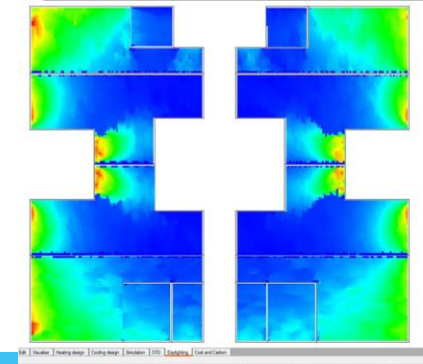


Thermal comfort and energy simulation tool (e.g. EnergyPlus, DesignBuilder etc.)



Daylight simulation tool (e.g. Radiance, DesignBuilder)

Cost Database tool



- Technical support to 22 building projects (IT buildings, hospital, offices, residential complexes, academic institutions,..)
- >1.5 million m² built-up area
- 25-40% estimated energy savings

Building Design: Integrated Design Process



Hospital



Educational campus



Residential township



World Trade Centre



Office & Retail complex



Training institute & govt. office

Thank you

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