Energy Assesment of Residential Buildings
IT Toolkit :EnEff ResBuild India

National Conference on Green Design

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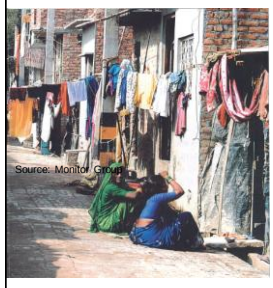
Background study

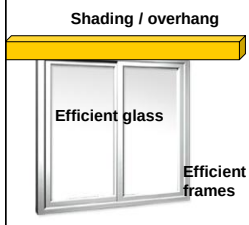
"PROMOTIONAL PROGRAMME FOR ENERGY EFFICIENT NEW RESIDENTIAL HOUSING IN INDIA"

About the Promotional Programme

- Study conducted in 2009-2010
- *Objective*: Designing for implementation of promotional programme for EE new housing
- Recommendations on strategies to improvise comfort conditions and/or energy efficiency in the identified housing units (AC/non AC) along with incremental costs

EXAMPLE: NON AC HOUSE





Features of a high performance window

BASE CASE

1. FALG brick wall with cement plaster on both sides
2. RCC roof
3. 6mm single clear glass with MS frame

→ **DISCOMFORT HOURS: 64%**

RECOMMENDED CASE

1. Heavy concrete block wall, white paint
2. Mud phuska roof with reflective coating,
3. high performance window(SC:0.29)
4. Enhanced ventilation

→ **DISCOMFORT HOURS: 44%**

EXAMPLE: AC HOUSE

Base Case parameters

1. FALG brick wall with cement plaster on both sides
2. RCC roof
3. 6mm single clear glass with MS frame
4. Incandescent lamp, T-12
5. one-star window AC in bedrooms and living room

Case 1

ECBC compliant

1. Wall insulation
2. Roof insulation with reflective coating
3. Single glazed Window with SC compliant with ECBC
4. CFL, T-5
5. five-star rated ACs in bedrooms and living room

Case 2

Recommended case

1. Wall shading
2. Sakora roof with reflective coating
3. ECBC compliant window
4. CFL, T-5
5. five-star rated ACs in bedrooms and living room

EPI_{base} : 152 kWh/m²/annum

$EPI_{ECBCenvelope}$: 111 kWh/m²/annum

$EPI_{eff.light\_fivestareAC}$: 79 kWh/m²/annum

Annual energy savings:

73 kWH/m²

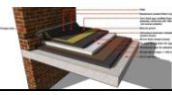
EPI_{base} : 152 kWh/m²/annum

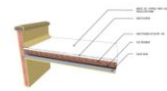
$EPI_{recommended\ case}$ 119 kWh/m²/annum

$EPI_{eff.light\_fivestareAC}$: 86 kWh/m²/annum

Annual energy savings:

66 kWh/m²





NEED FOR AN ASSESSMENT TOOL

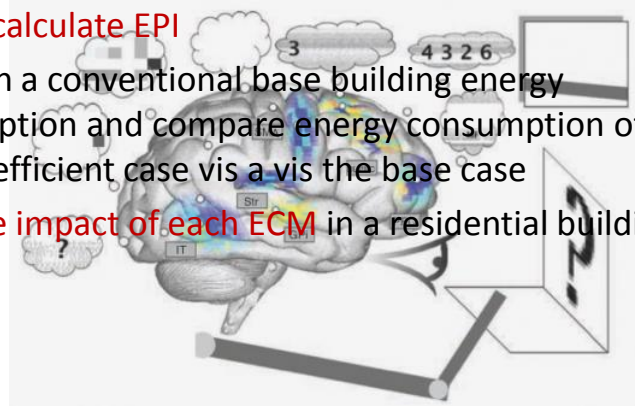
Fraunhofer IRP

Fraunhofer Institute

teri

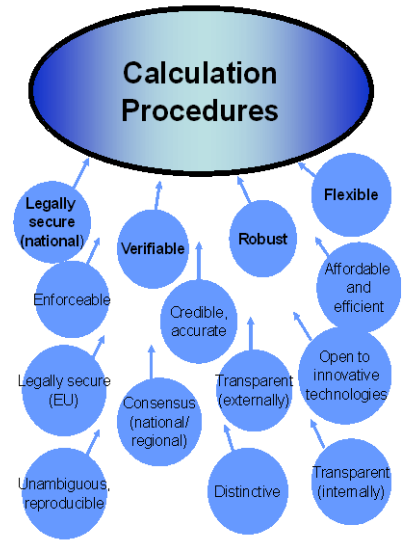
Need for an Assessment tool

- Quantification of energy saving potential in residential buildings as a tool to incentivise EE housing
- **Alternative to complex simulation tools**
- Tool to calculate EPI
- Establish a conventional base building energy consumption and compare energy consumption of an energy efficient case vis a vis the base case
- Evaluate impact of each ECM in a residential building

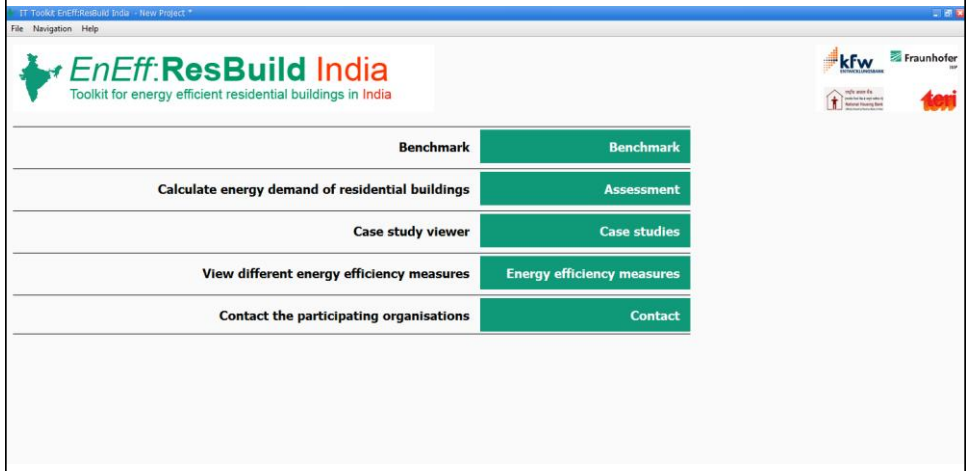


Expected Features of Assessment tool

- **Easy to use** with minimum user dependent variables
- **Flexibility** of choosing a prototype
- Advanced users of the tool shall be able to provide customized buildings specific inputs if template/prototype building information is not used



Overview of Assessment Tool Capabilities and User Interface



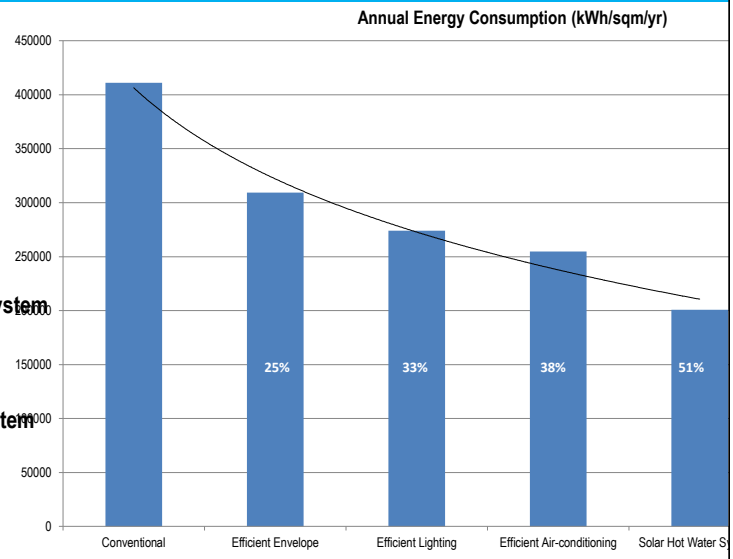
Energy Performance Influencing Parameters

Building Architecture	•Area Calculation for **Floor, Walls, Fenestration, Shading devices** etc.
Thermo-physical Properties of Building Materials	•Guides the **heat ingress** in the building
Lighting Load	•Guides the energy consumed towards illumination
HVAC System Efficiency	•Guides the energy consumed towards cooling of building
Hot Water System Details	•Guides the energy consumed by hot water system and energy saved due to Solar Hot Water systems

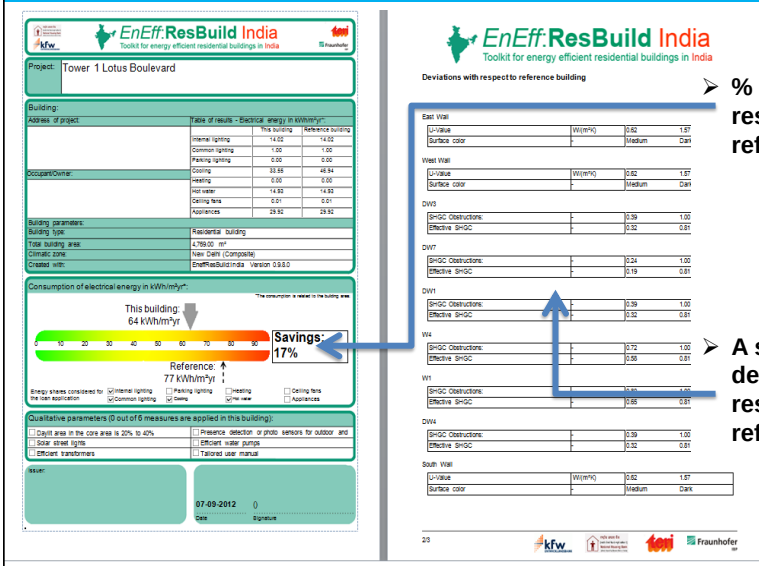
Energy Conservation Measures

Energy Conservation Measures –

- **Efficient Envelope Materials**
- **Efficient Lighting System**
- **Efficient AC system**
- **Solar Hot Water System**

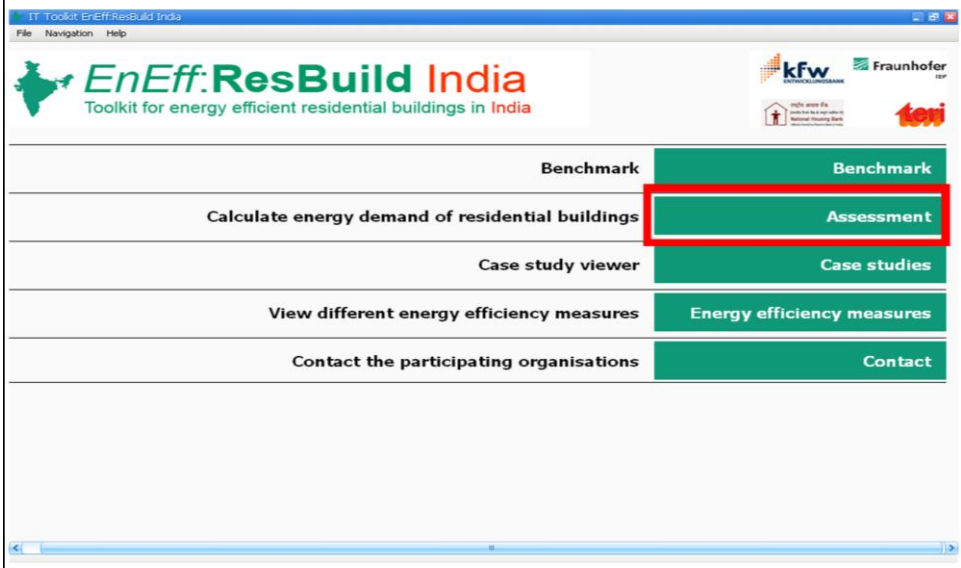


Certificate

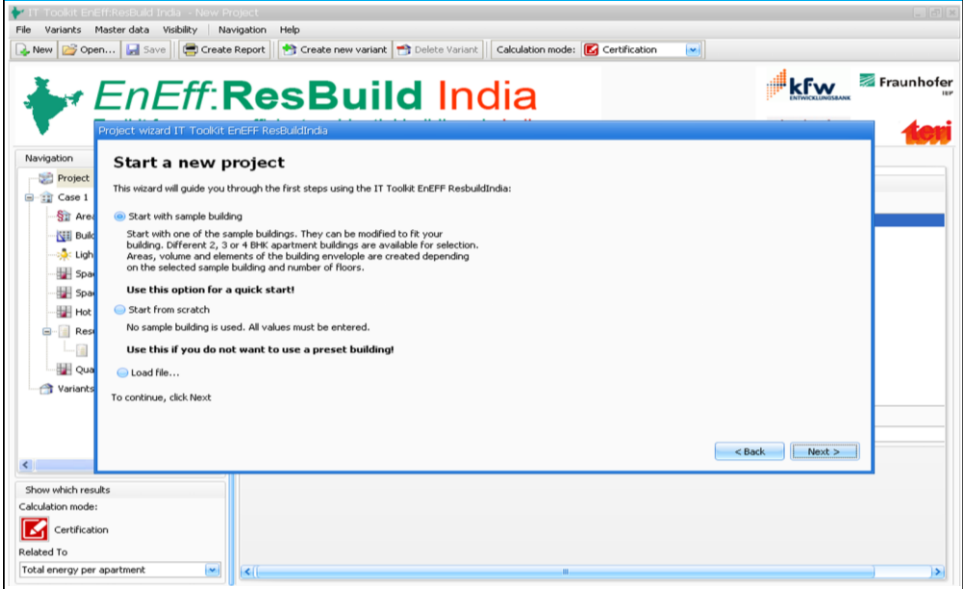


- **% Saving with respect to the reference case**
- **A short report on deviations with respect to reference case**

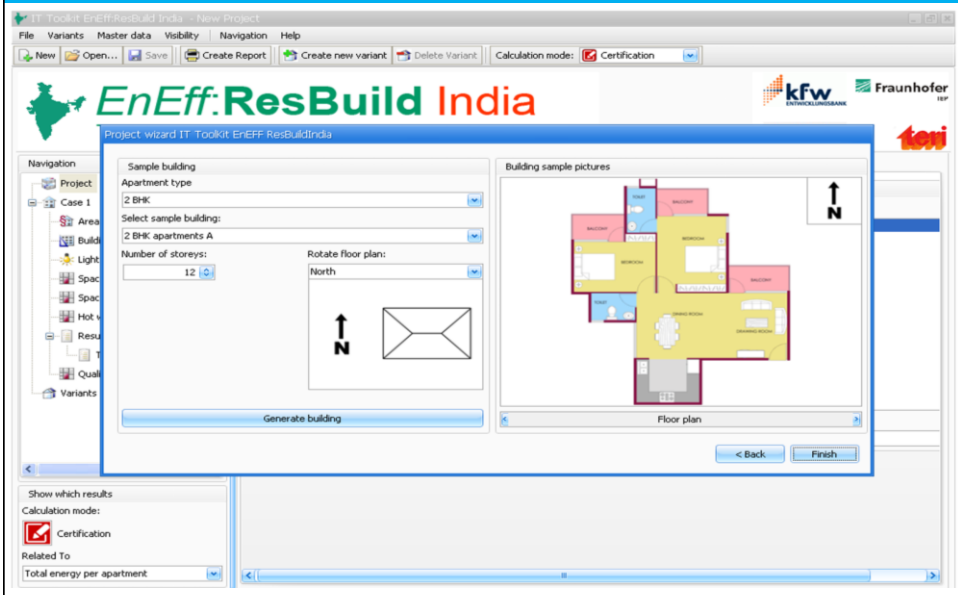
IT Toolkit : Demo



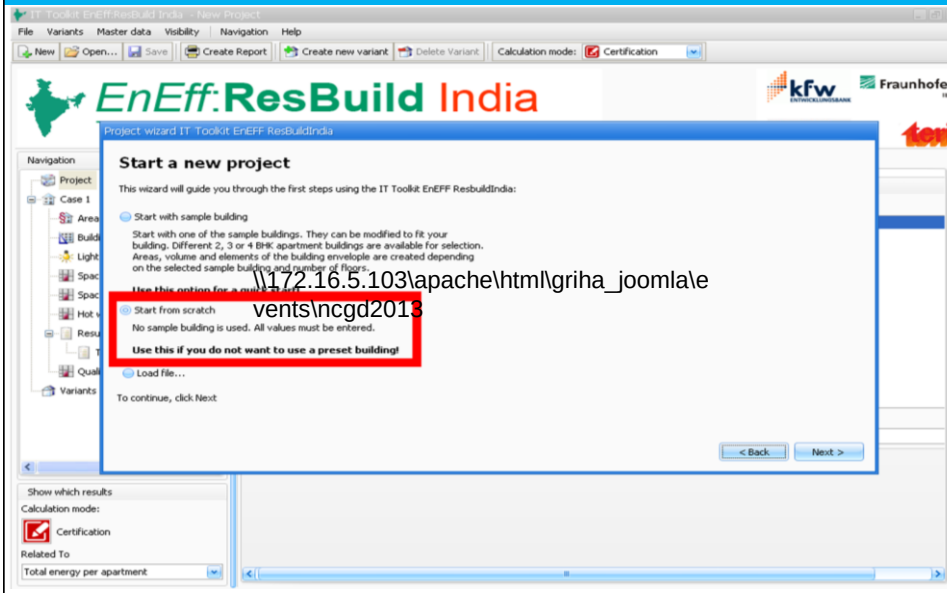
Project Start Options



Sample Building



Select Start from scratch option for a new case



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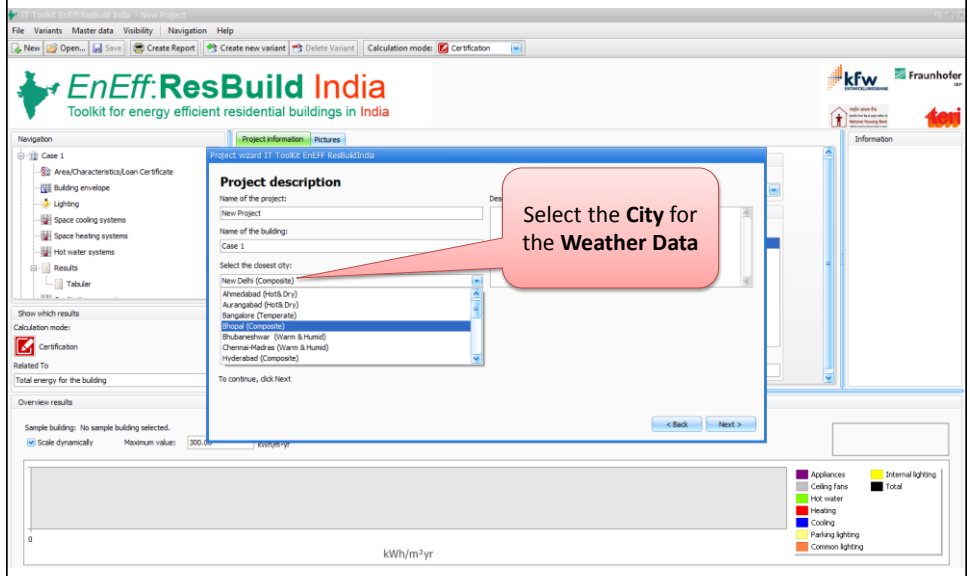
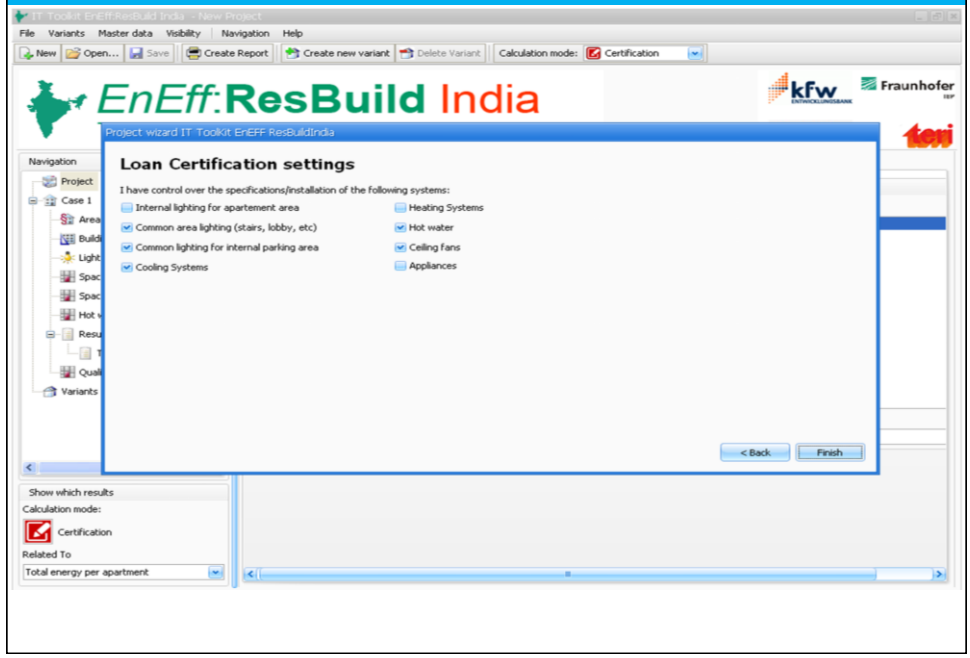
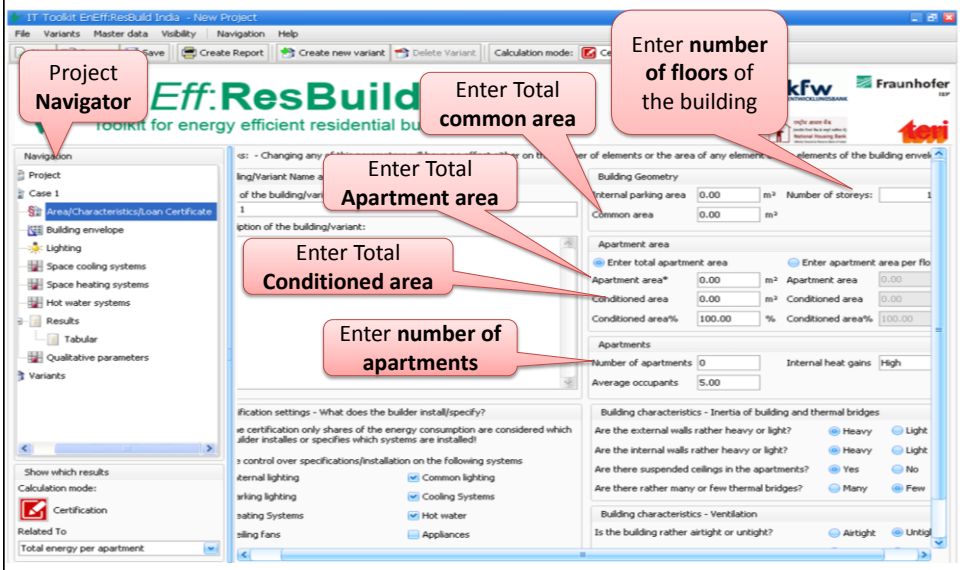
Describe project



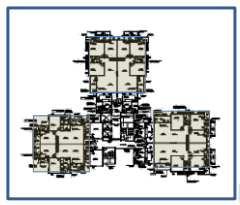
Select certification settings for the project



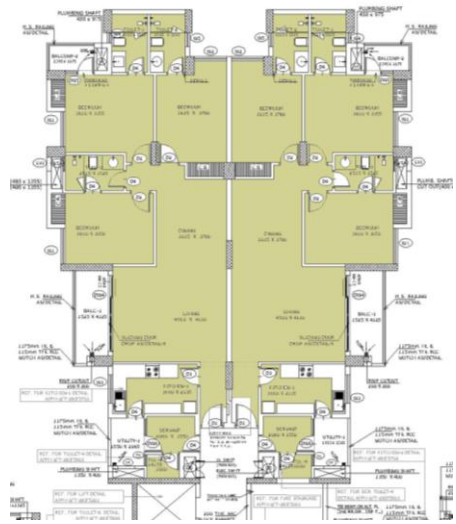
Fill up various details for Area



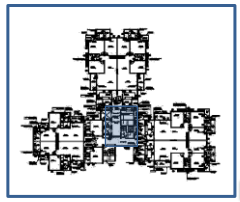
Apartment Area



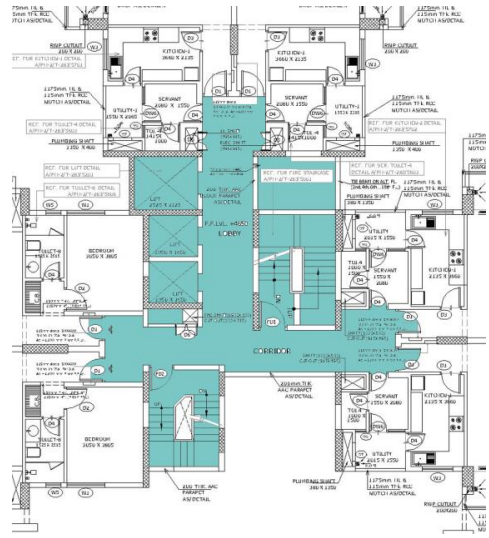
Key plan showing the typical floor plan consisting of 6 apartments.



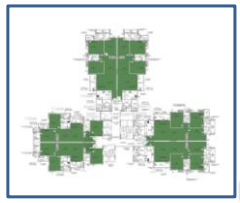
Common Area



Key plan showing the typical floor plan



Conditioned area



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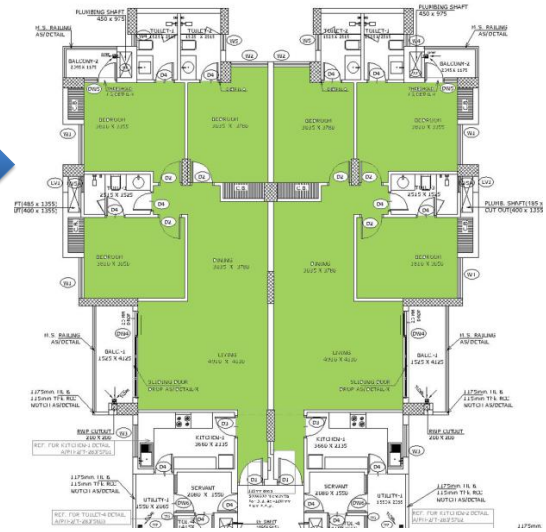
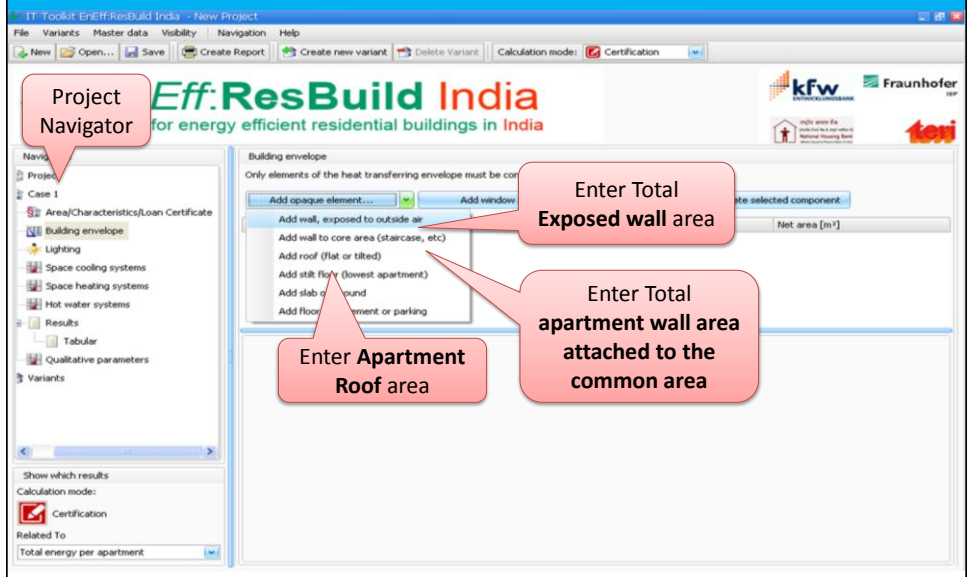
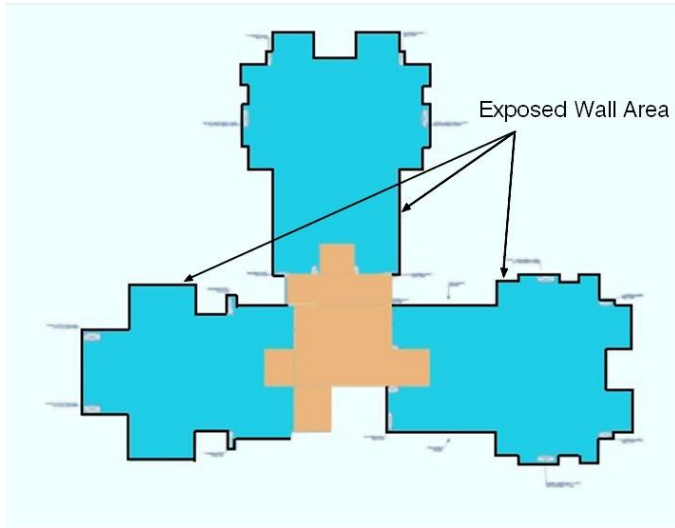


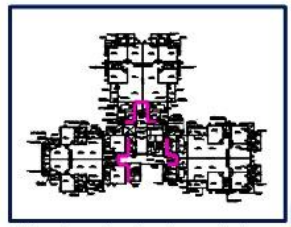
Fill up various details for Building Envelope



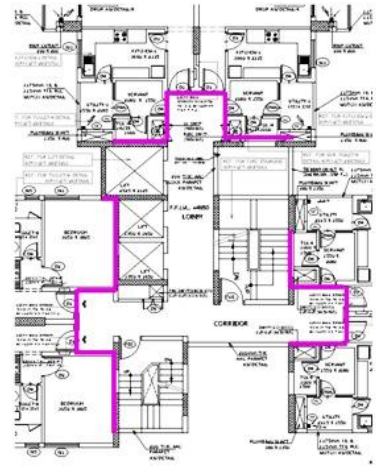
Apartment Exposed Wall Area



Core wall Area attached to the apartment area

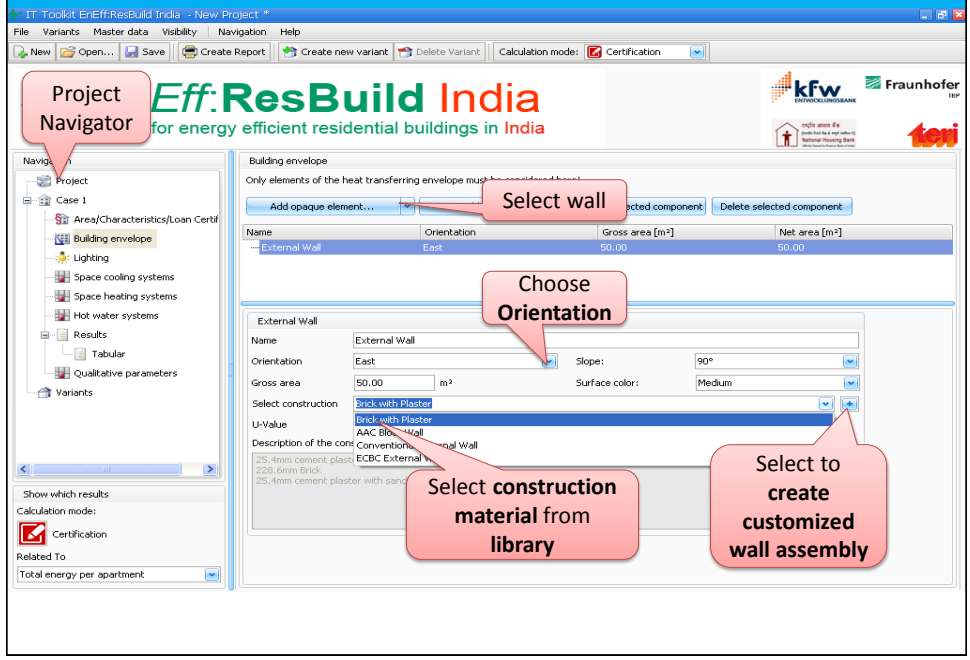


Key plan showing the typical floor plan

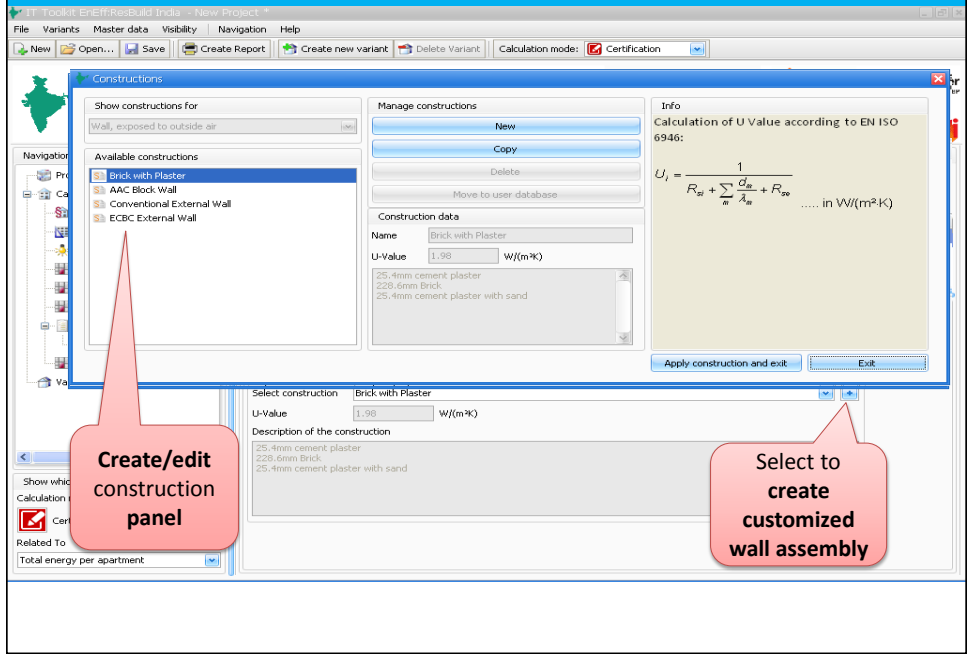


Apartment Roof Area

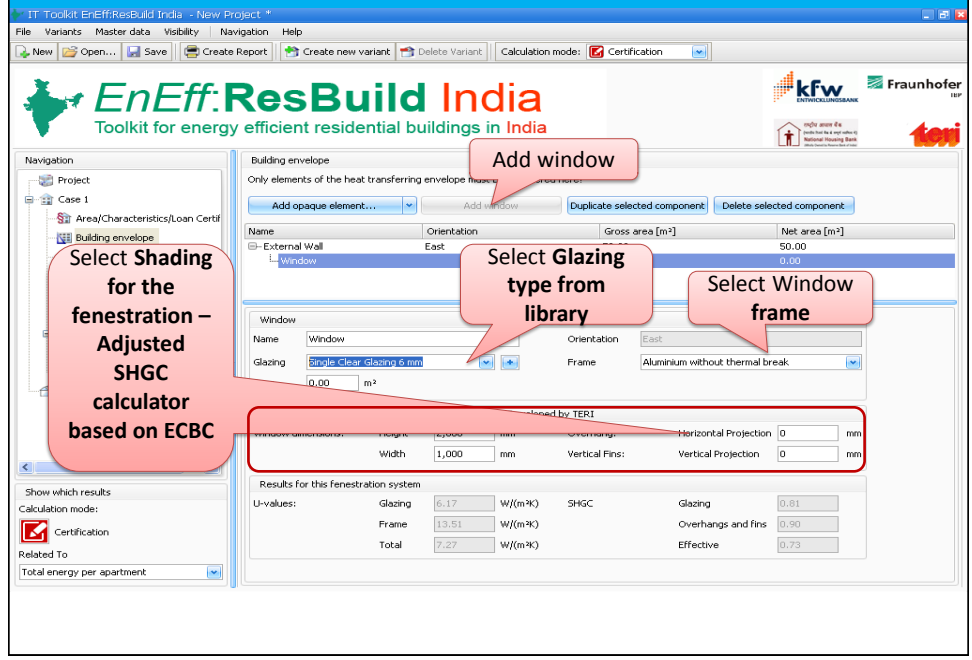
Fill up various details for the project



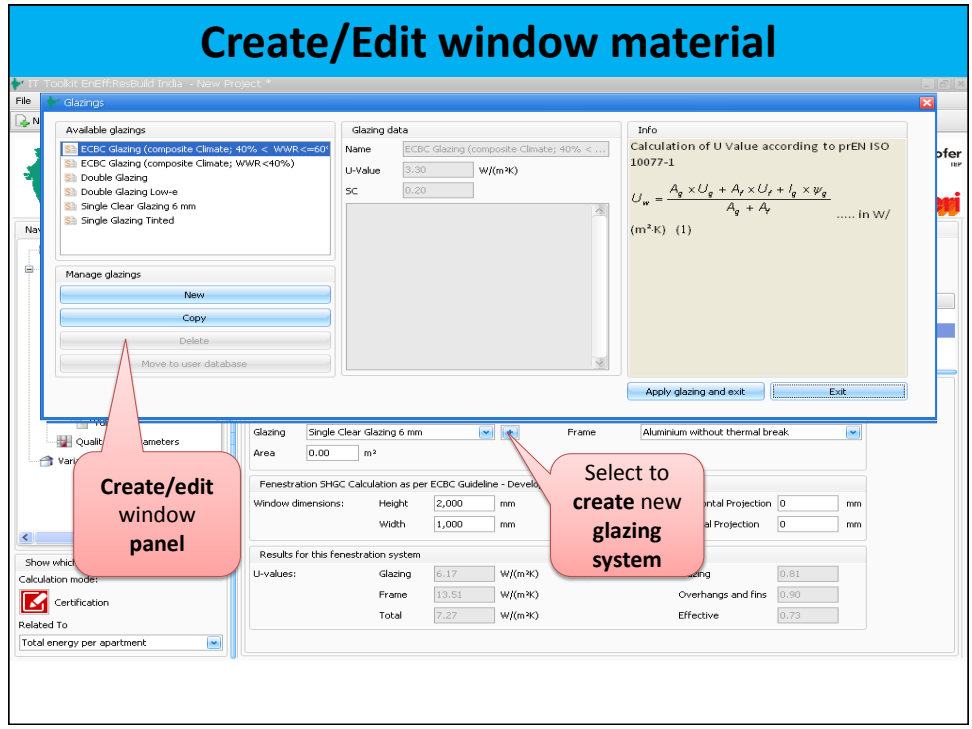
Create/Edit wall constuction materials



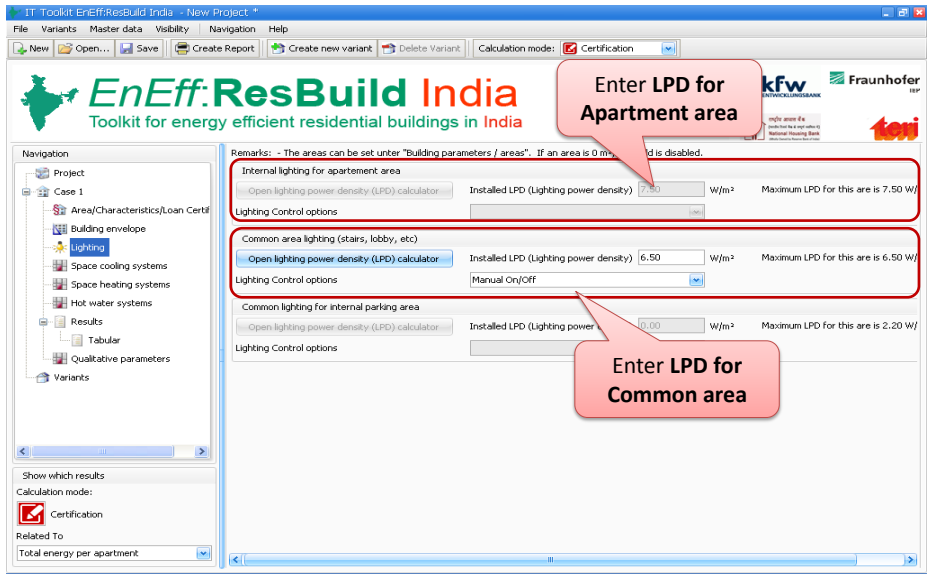
Add Window details



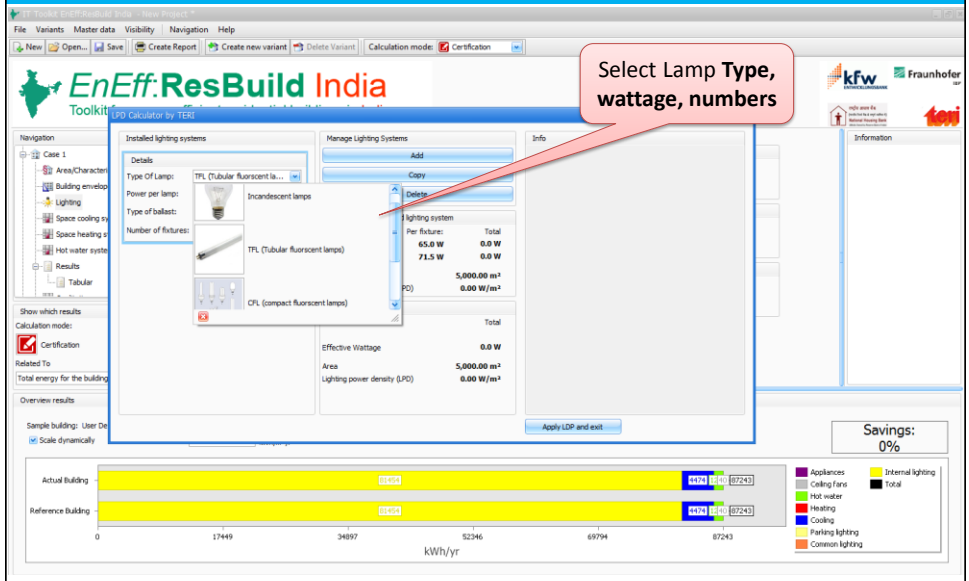
Create/Edit window material



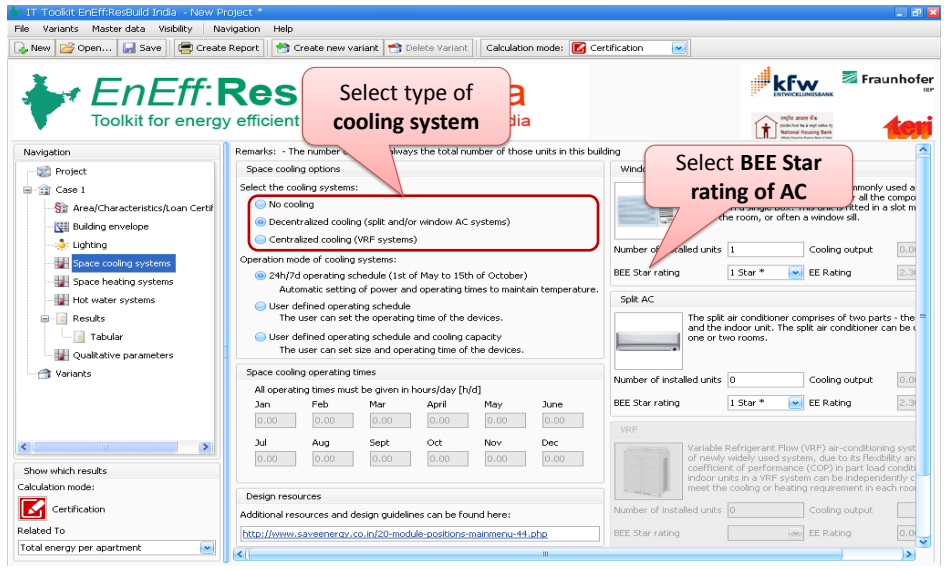
Lighting Template



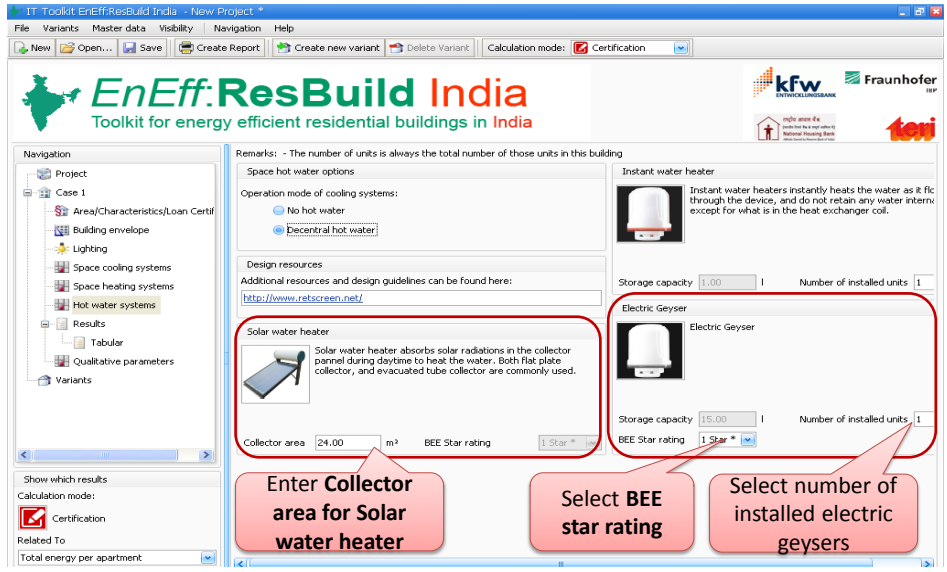
Lighting Power Density (LPD) Calculator



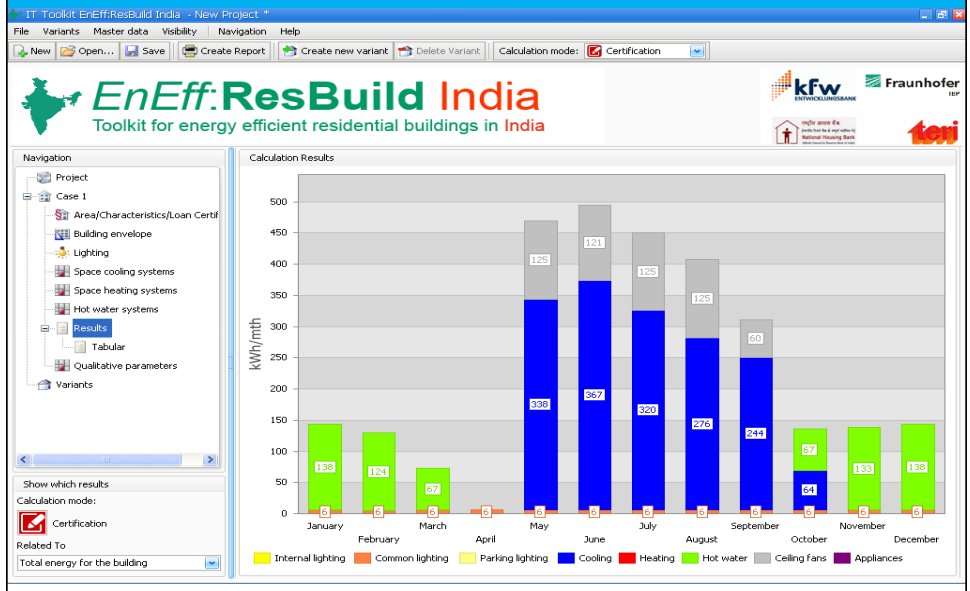
Space Cooling Systems Template



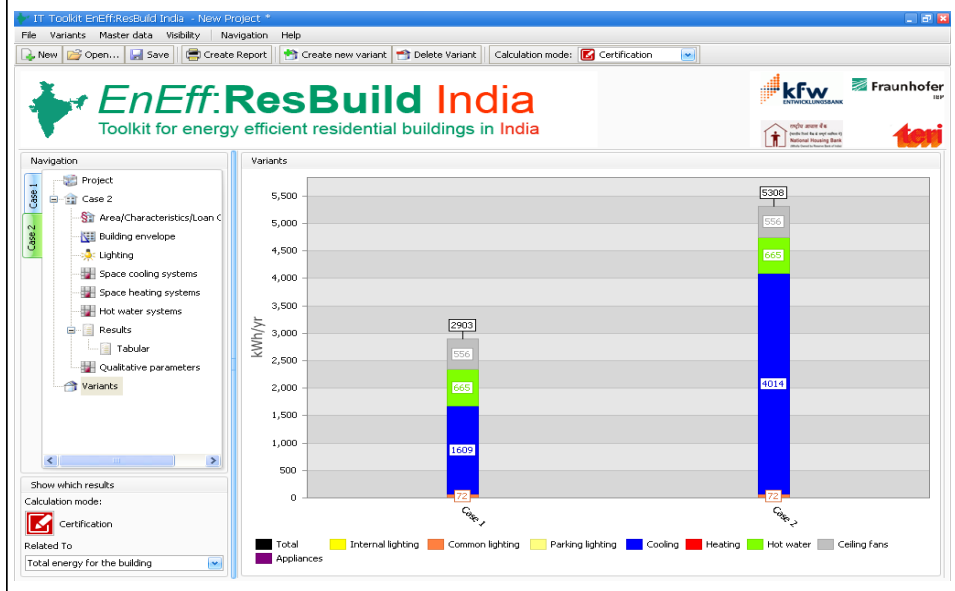
Hot Water Systems



Results: Monthly consumption



Comparision of different cases

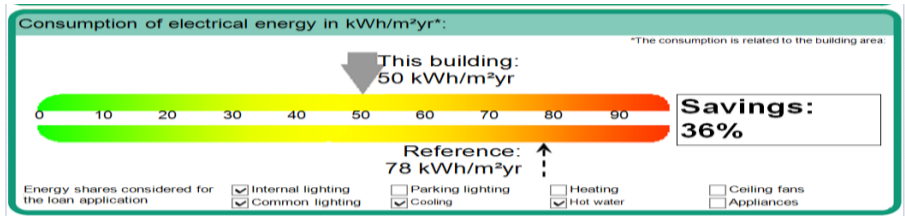


Certified Project Example

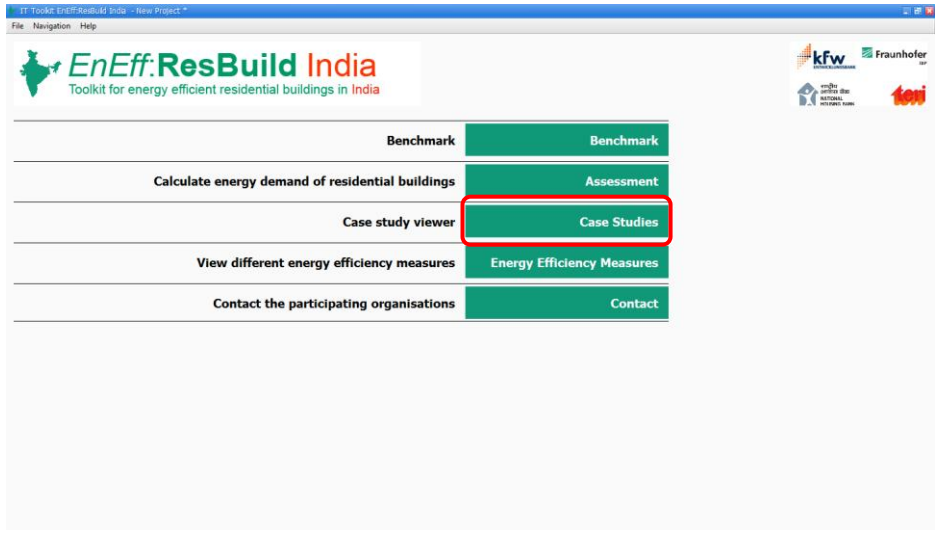
HIRCO Project – *Panvel*

ECMs (energy conservation measures) **adopted:**

1. Roof **Insulated**
2. Wall with **AAC block**
3. **Windows well shaded**
4. Efficient Lighting – **LPD** in range of **5.4-5.7** W/sqm
5. Efficient Air-Conditioners – **BEE 4* Acs**
6. **Solar Hot Water System** – 25% of the roof top area



Case Studies



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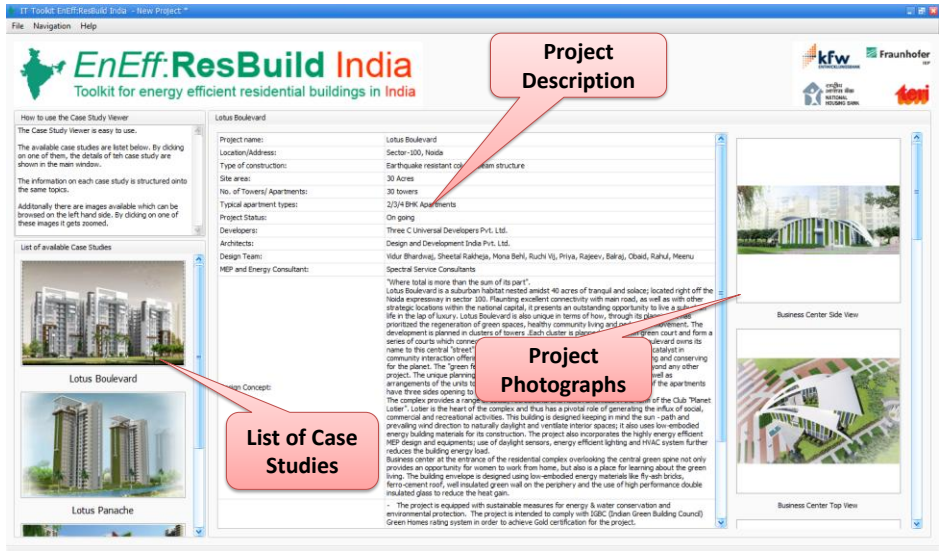
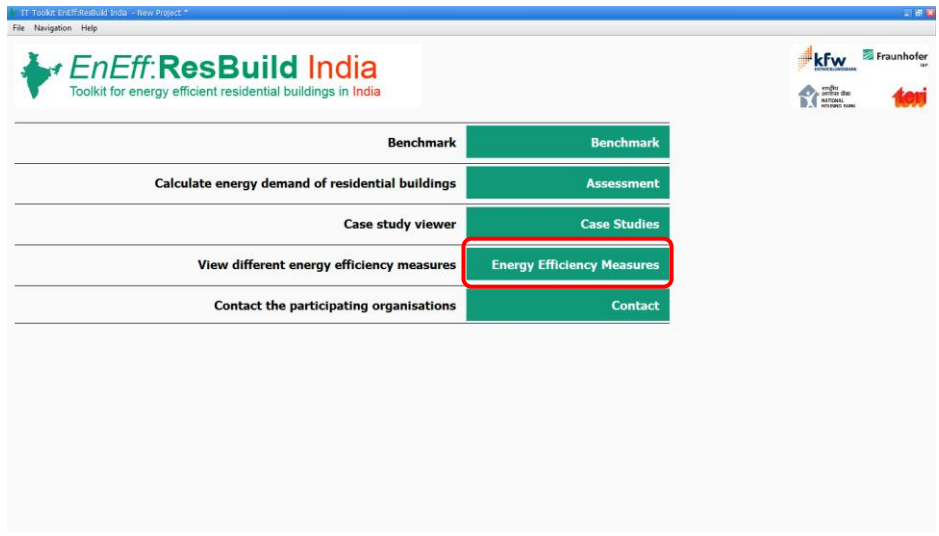
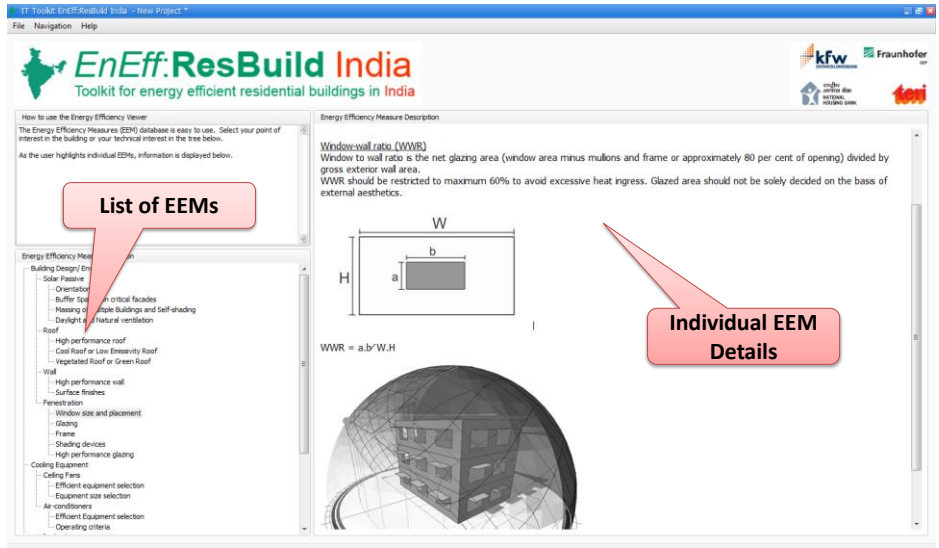


Energy Efficiency Measures



Energy Efficiency Measures



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