



OPTIMISED ENERGY EFFICIENT DESIGN
PLATFORM FOR REFURBISHMENT
AT DISTRICT LEVEL

SCEWC2018

Multi scale integration for district simulations

Álvaro Sicilia, alvaro.scilia@salle.url.edu, FUNITEC (La Salle Architecture School)
Gonçal Costa, goncal.costa@salle.url.edu, FUNITEC (La Salle Architecture School)



This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 680676



contact@opteemal.eu

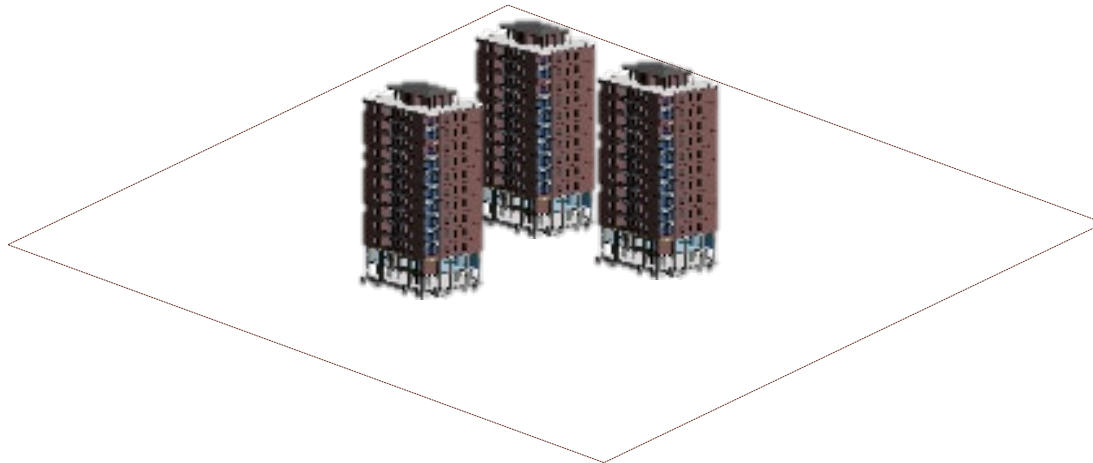


www.opteemal.eu



[@OptEEmAL_EU](https://twitter.com/OptEEmAL_EU)

1 Target buildings that will be refurbished



1 Target buildings that will be refurbished

2 *Surrounding buildings that interact with target buildings (shadows)*



- 1 Target buildings that will be refurbished
- 2 *Surrounding buildings that interact with target buildings (shadows)*
- 3 *District active systems connected to the buildings (district heating)*



1 Target buildings that will be refurbished

2 Surrounding buildings that interact with target buildings (shadows)

3 District active systems connected to the buildings (district heating)

4 Contextual data (weather, energy prices...)



- Weather data
- Energy prices
- Socio-economic data

Input Data → District

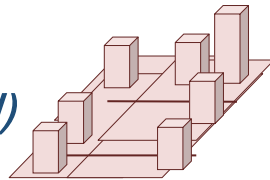
1

BIM models
(IFC standard)



2

GIS models
(CityGML standard)

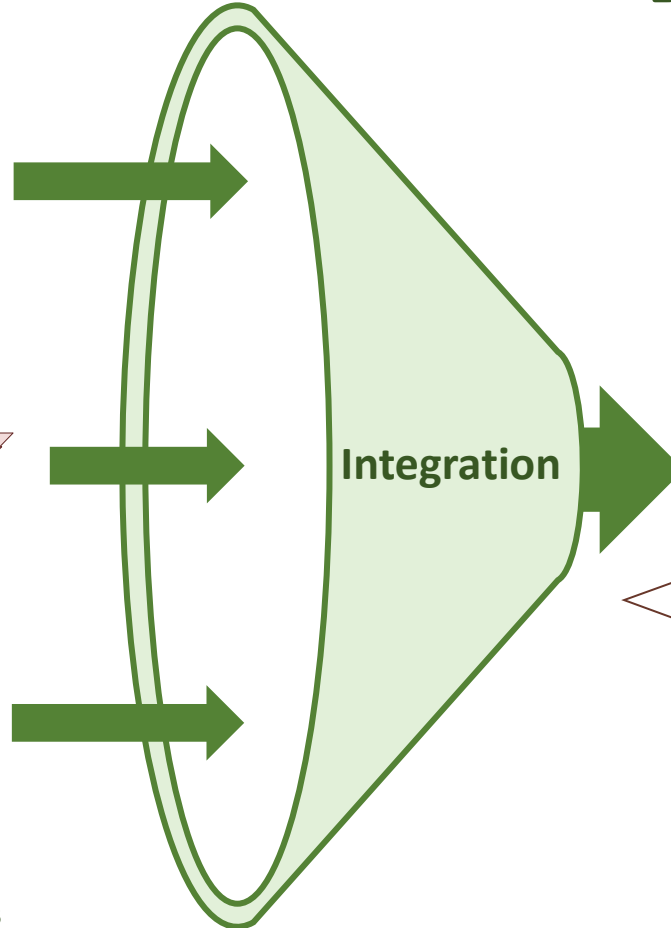


3

Contextual Data
(multiple sources)

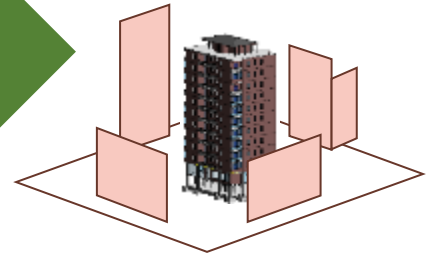


- Weather data
- Energy prices
- Users' objectives
- Socio-economic data



Indicators:

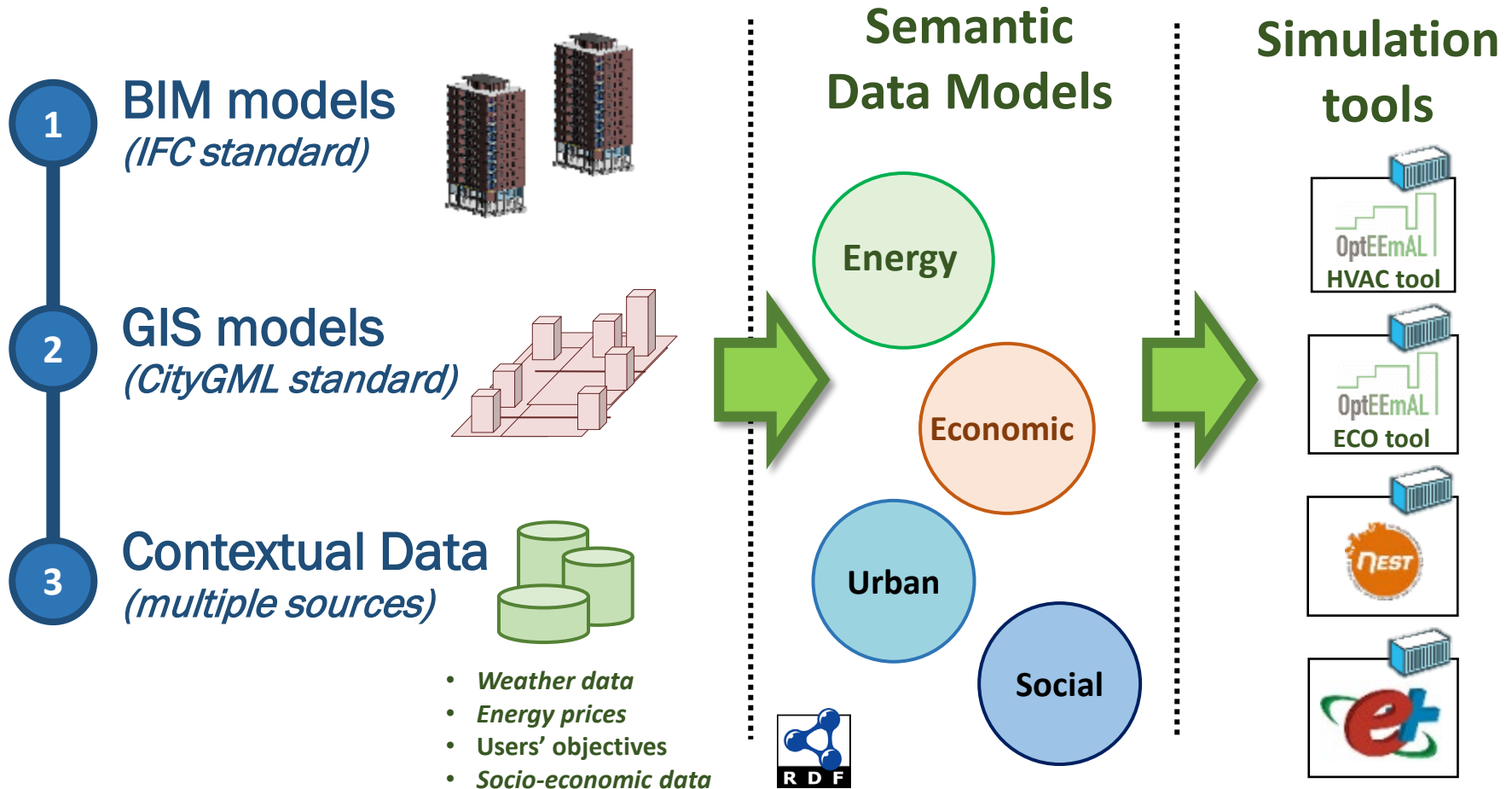
- Energy
- Comfort
- Environmental
- Economic
- Social...



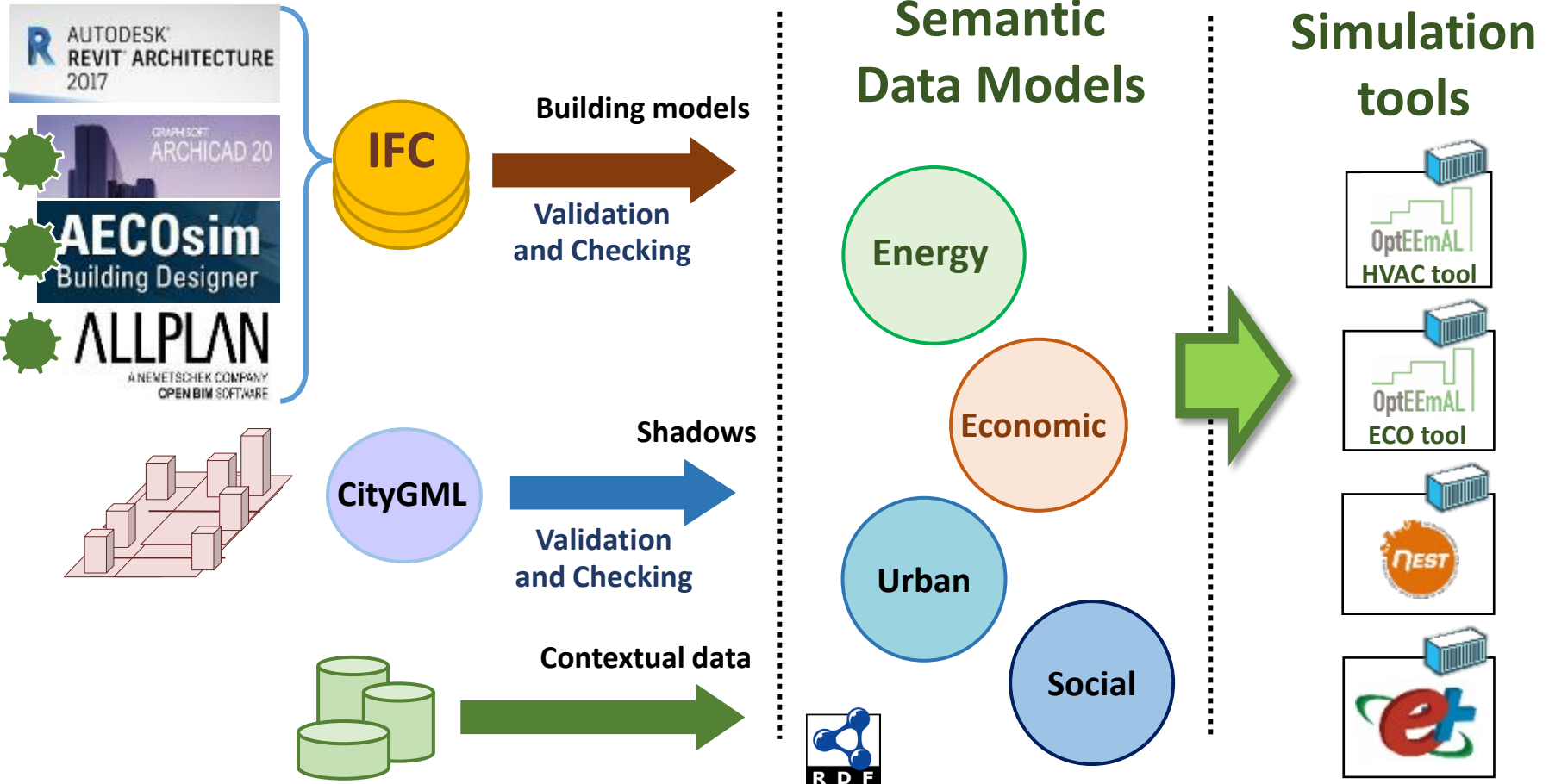
Measures:

- Passive
- Active
- Renewables
- Control

Input Data → District Model → Simulation



Input Data → District Model → Simulation

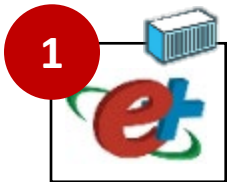


Simulation



District Retrofitting

Simulation
tools



District Performance Indicators
Calculation sequence

Energy demand

ENERGY DPI's

COMFORT DPI's

ENVIRONMENTAL DPI's

ECONOMIC DPI's

SOCIAL DPI's

URBAN DPI's

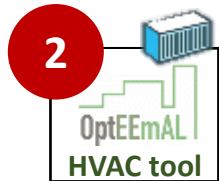
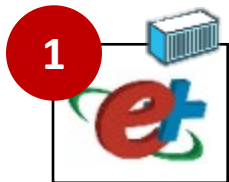
GLOBAL DPI's

Simulation

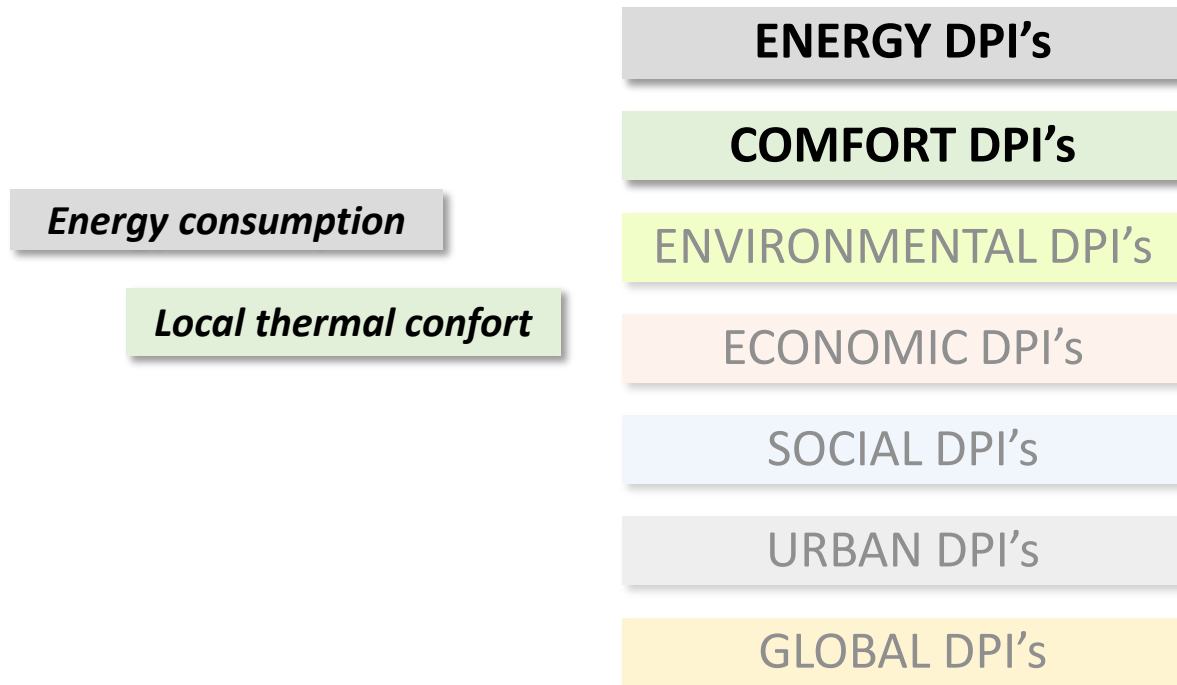


District Retrofitting

Simulation tools

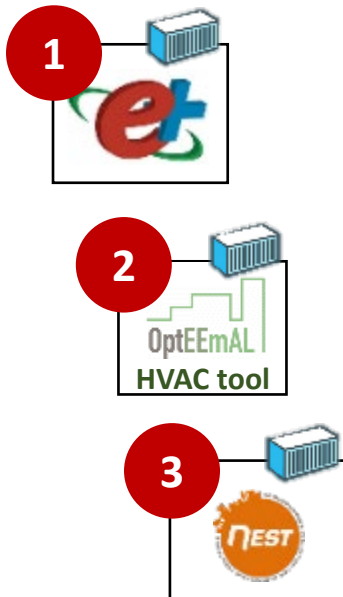


District Performance Indicators Calculation sequence

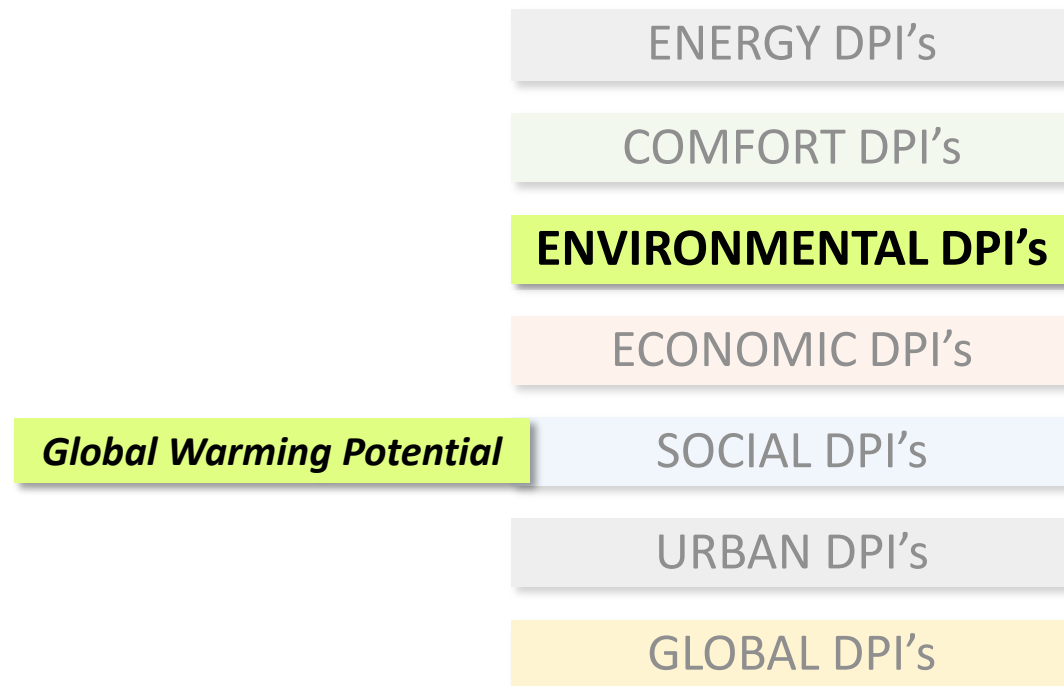


Simulation → District Retrofitting

Simulation tools

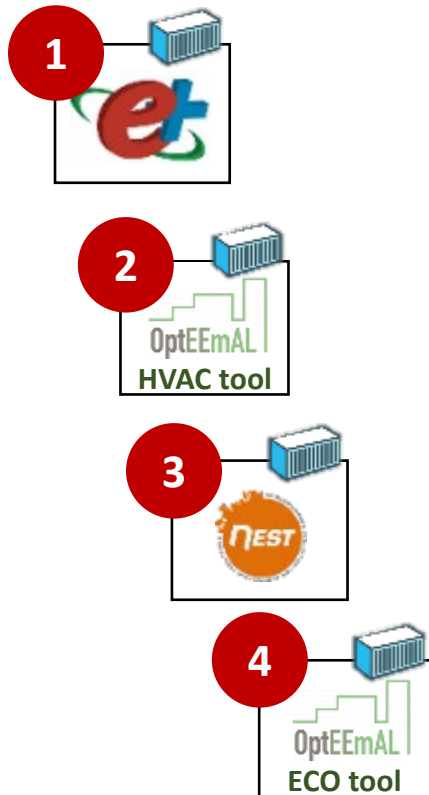


District Performance Indicators Calculation sequence

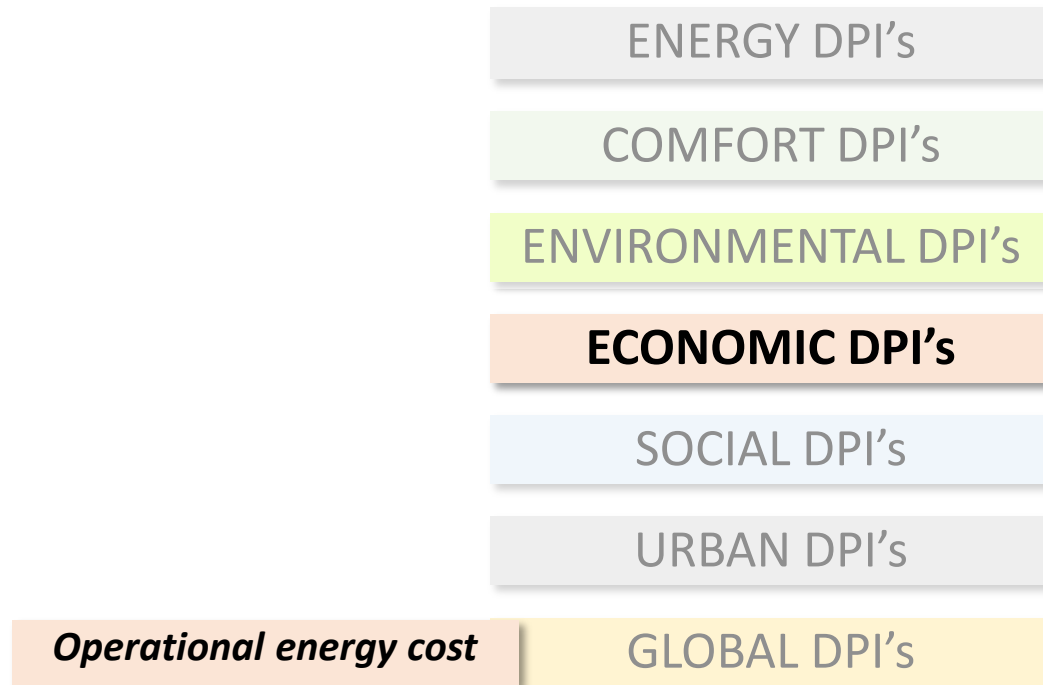


Simulation → District Retrofitting

Simulation tools

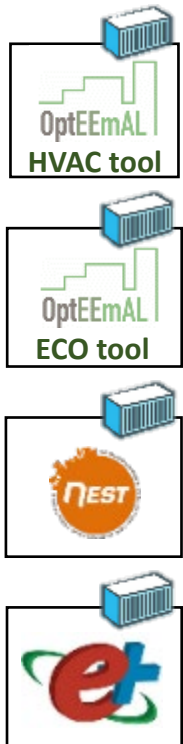


District Performance Indicators Calculation sequence

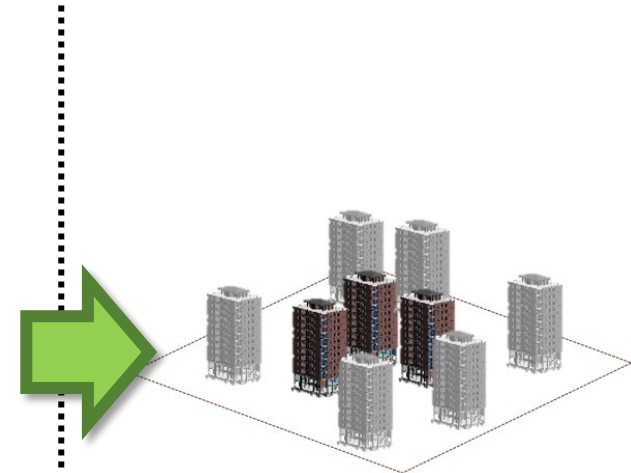
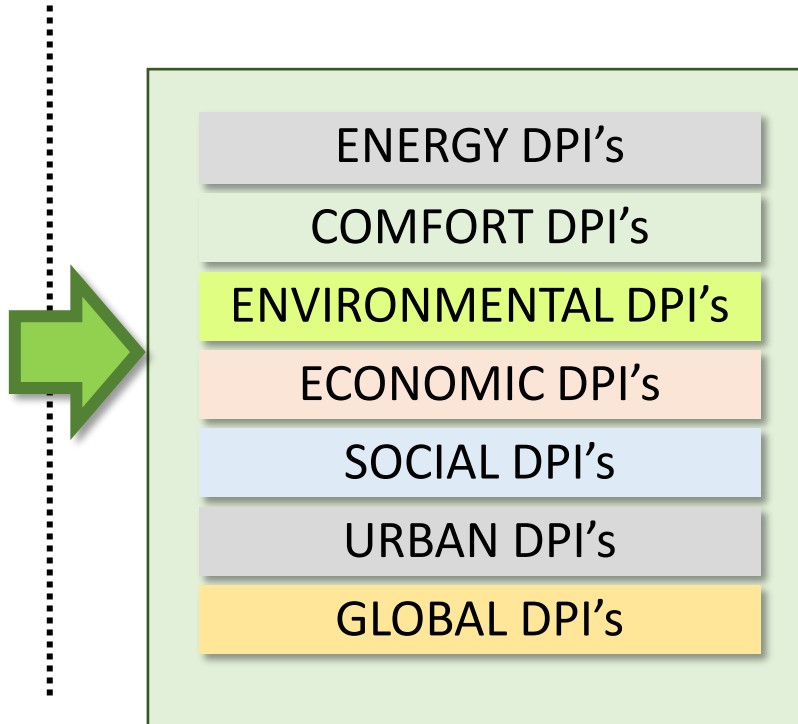


Simulation → District Retrofitting

Simulation tools

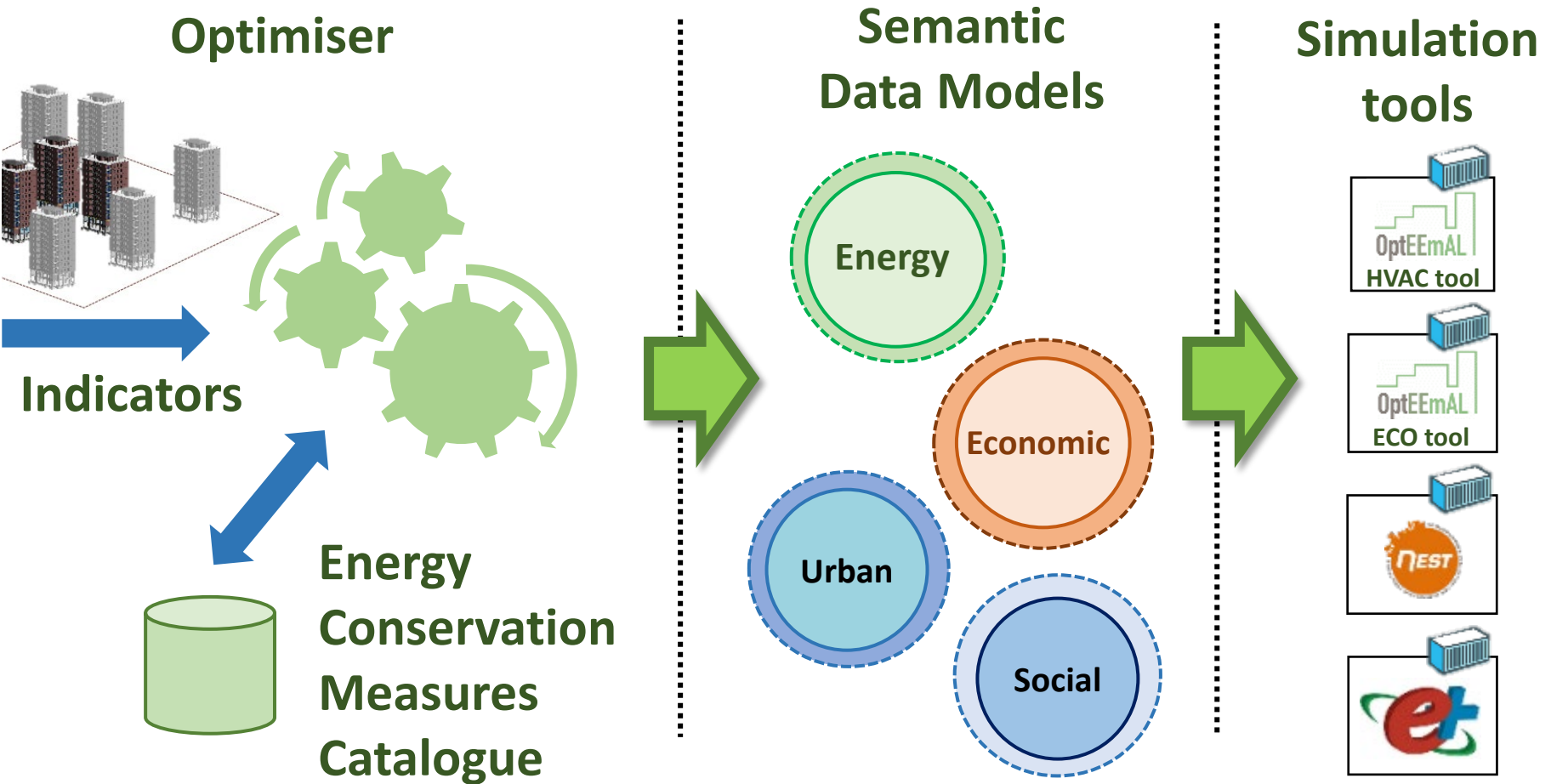


District Performance Indicators



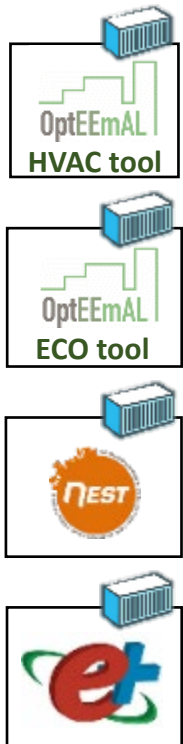
**Current status
of the district**

District Retrofitting → District Model → Simulation

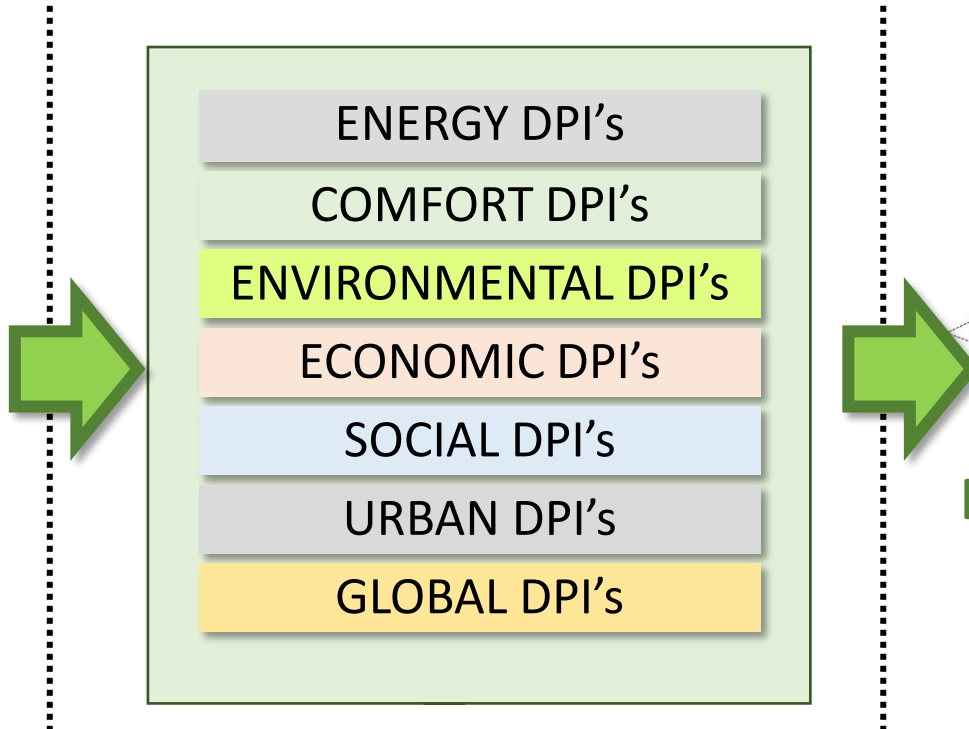


Simulation → District Retrofitting

Simulation tools

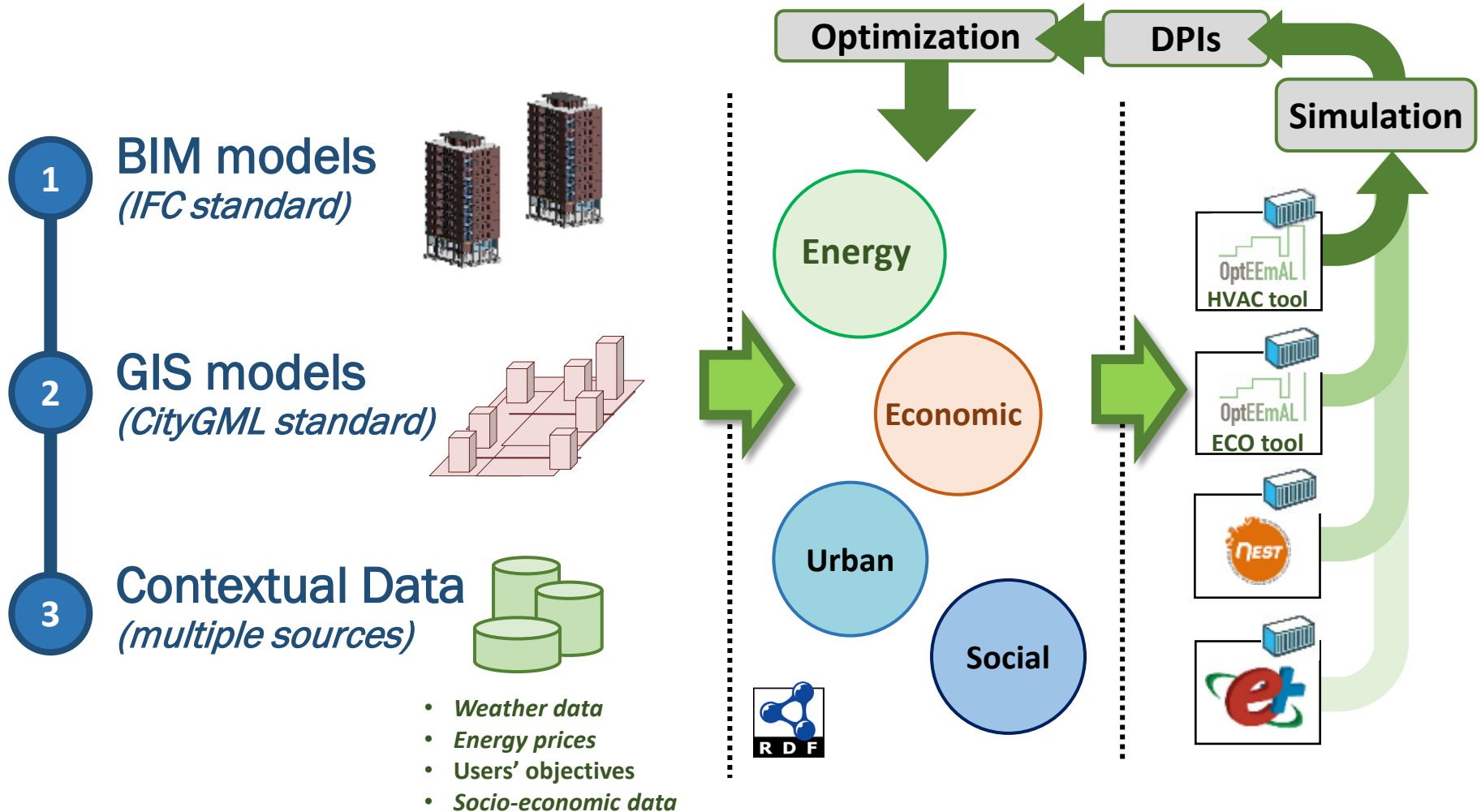


District Performance Indicators



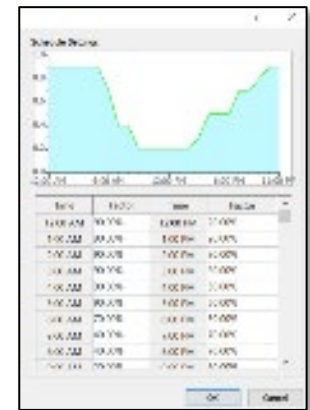
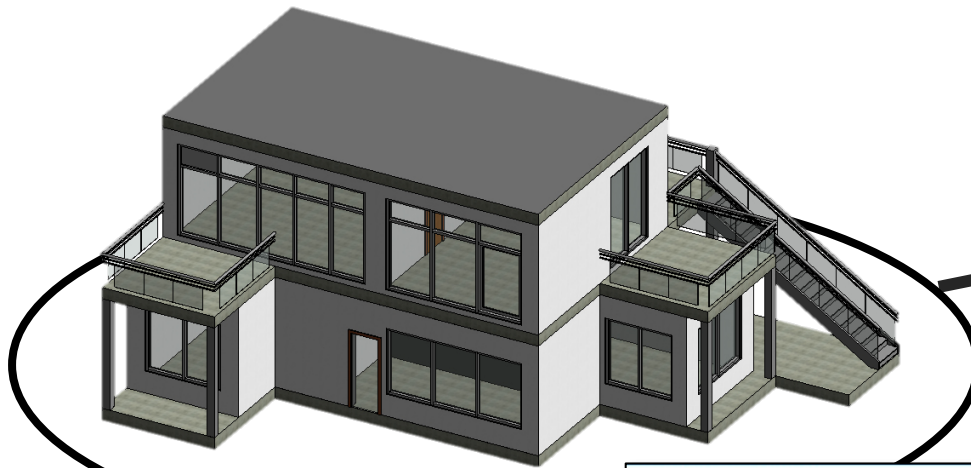
Optimiser

Design retrofitting candidate

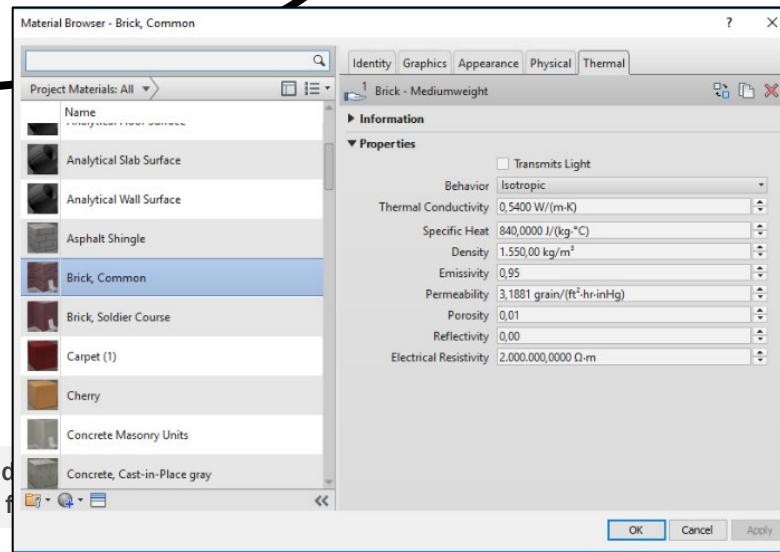


Building data extraction (Processes, issues, decisions)

BIM model



Material / Thermal Properties



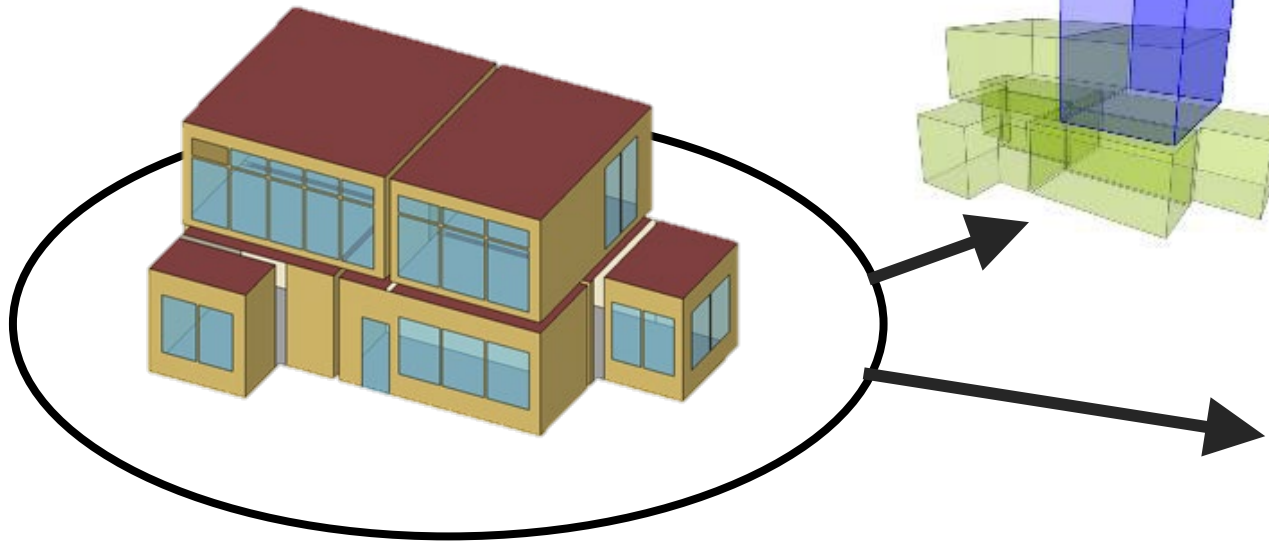
Light, Occupancy
and Equipment
Schedules



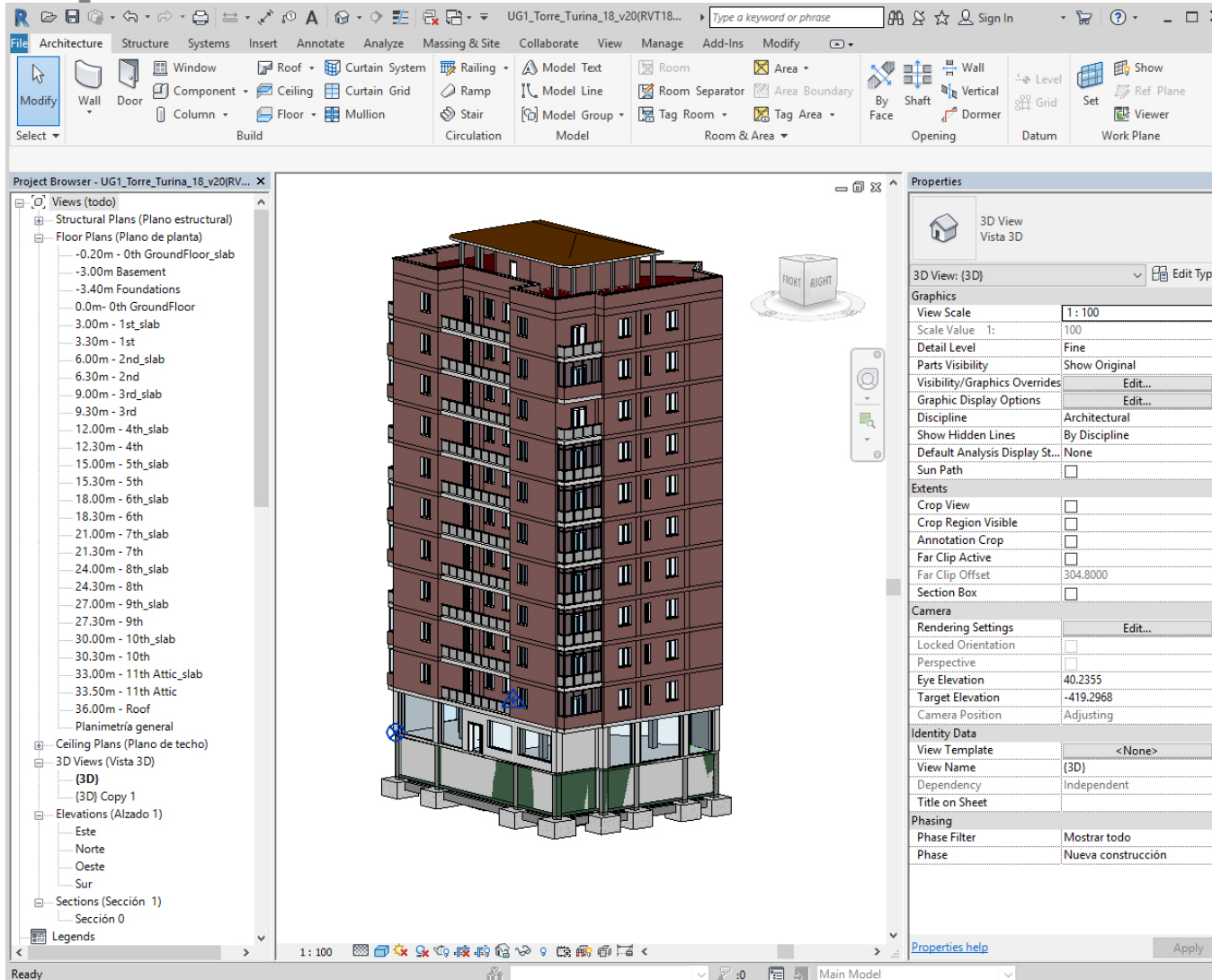
IFC model

2nd Level Space
Boundaries

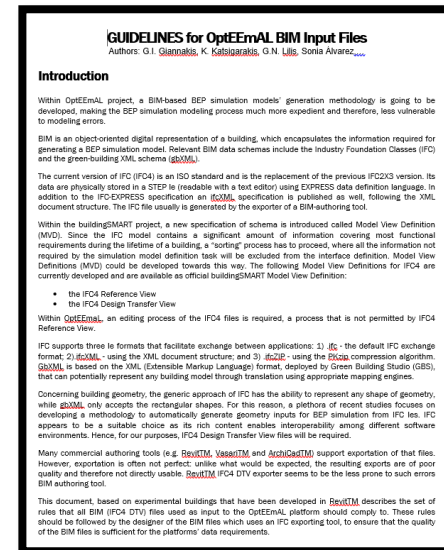
Slab partitioning



Lilis, G. N., Giannakis, G., Katsigarakis, K., and Rovas, D., District-aware Building Energy Performance simulation model generation from GIS and BIM data, 4th IBPSA-England Conference on Building Simulation and Optimization, Cambridge, UK, 2018, pp. 177-184.



BIM modelling and IFC export Guidelines



THANK YOU FOR YOUR ATTENTION!

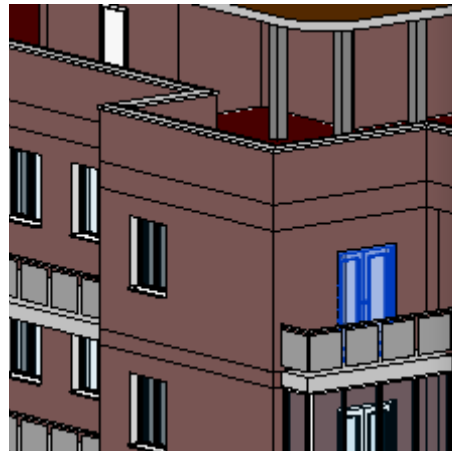
Álvaro Sicilia, alvaro.scilia@salle.url.edu, FUNITEC (La Salle Architecture School)
Gonçal Costa, goncal.costa@salle.url.edu, FUNITEC (La Salle Architecture School)

WALL Opaque material



Family:	System Family: Basic Wall	Load...
Type:	4M_External_2nd-3rd_floor	Duplicate...
		Rename...
Type Parameters		
Parameter	Value	= ^
Analytical Properties		
Heat Transfer Coefficient (U)	0.5930 W/(m ² ·K)	
Thermal Resistance (R)	1.6863 (m ² ·K)/W	
Thermal mass	44.55 kJ/K	
Absorptance	0.100000	
Roughness	1	

WINDOW Glazing material



Type:	4M_1400x2110mm_metal 3	Duplicate...
		Rename...
Type Parameters		
Parameter	Value	= ^
Analytical Properties		
Visual Light Transmittance	0.900000	
Solar Heat Gain Coefficient	0.780000	
Heat Transfer Coefficient (U)	3.6886 W/(m ² ·K)	
Analytic Construction	1/8 in Pilkington single glazing	
Thermal Resistance (R)	0.2711 (m ² ·K)/W	

Configuration of the values of some parameters:

