



# Smart Urban Regeneration in Transition to Positive Energy Block



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VASSI

Professor Andra Blumberga,  
Ruta Vanaga, Ritvars Freimanis, Dagnija Blumberga

*Riga Technical University, Institute of Energy Systems and Environment*

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# Positive Energy Blocks (PEB)

Consist of several buildings  
(new, retro-fitted or a combination  
of both)

Buildings actively manage their  
energy consumption and the  
energy flow between them and  
the wider energy system

PEB have an annual positive energy  
balance

They make optimal use of  
elements:

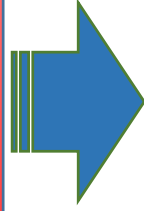
advanced materials, local RES, local storage, smart energy  
grids, demand-response, energy management (electricity,  
heating and cooling), user interaction/involvement and  
information and communications technologies



TRANSITION FROM TRADITIONAL DOWNTOWN BLOCK TO  
POSITIVE ENERGY BLOCK

kWh/m<sup>2</sup> year

TRADITIONAL DOWNTOWN BLOCK HIGH ENERGY  
CONSUMPTION



TRANSITION PHASE 1

BUILDING  
THERMAL  
ENVELOPE  
EE MEASURES



TRANSITION PHASE 2:  
BUILDING SERVICES  
AND ENERGY CYCLE  
ENERGY SAVINGS

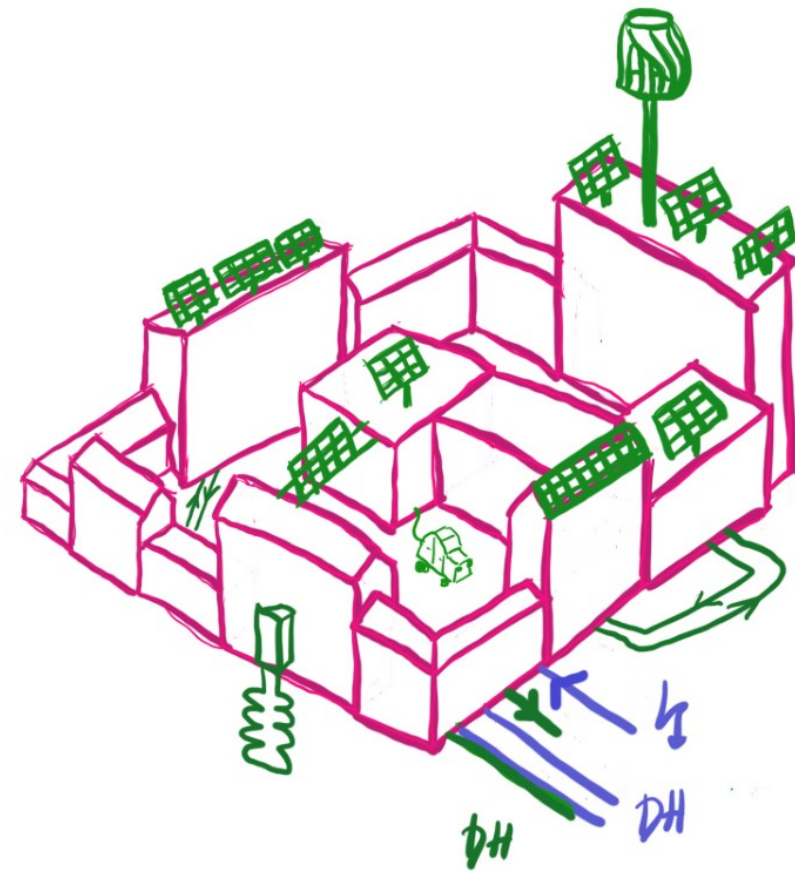
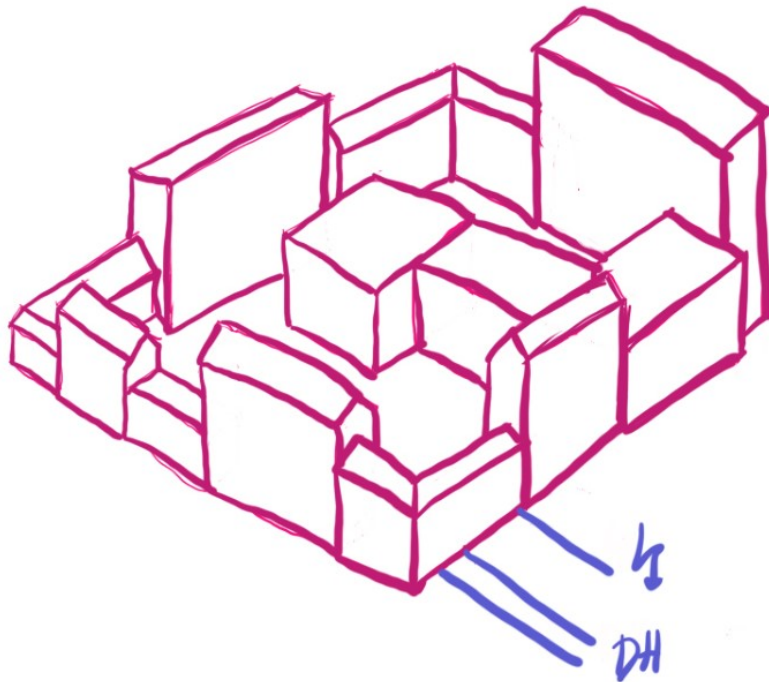


TRANSITION PHASE 3:  
BEHAVIORAL ENERGY SAVINGS



TRANSITION PHASE 4:  
RES SOURCES /  
ENERGY STORAGE



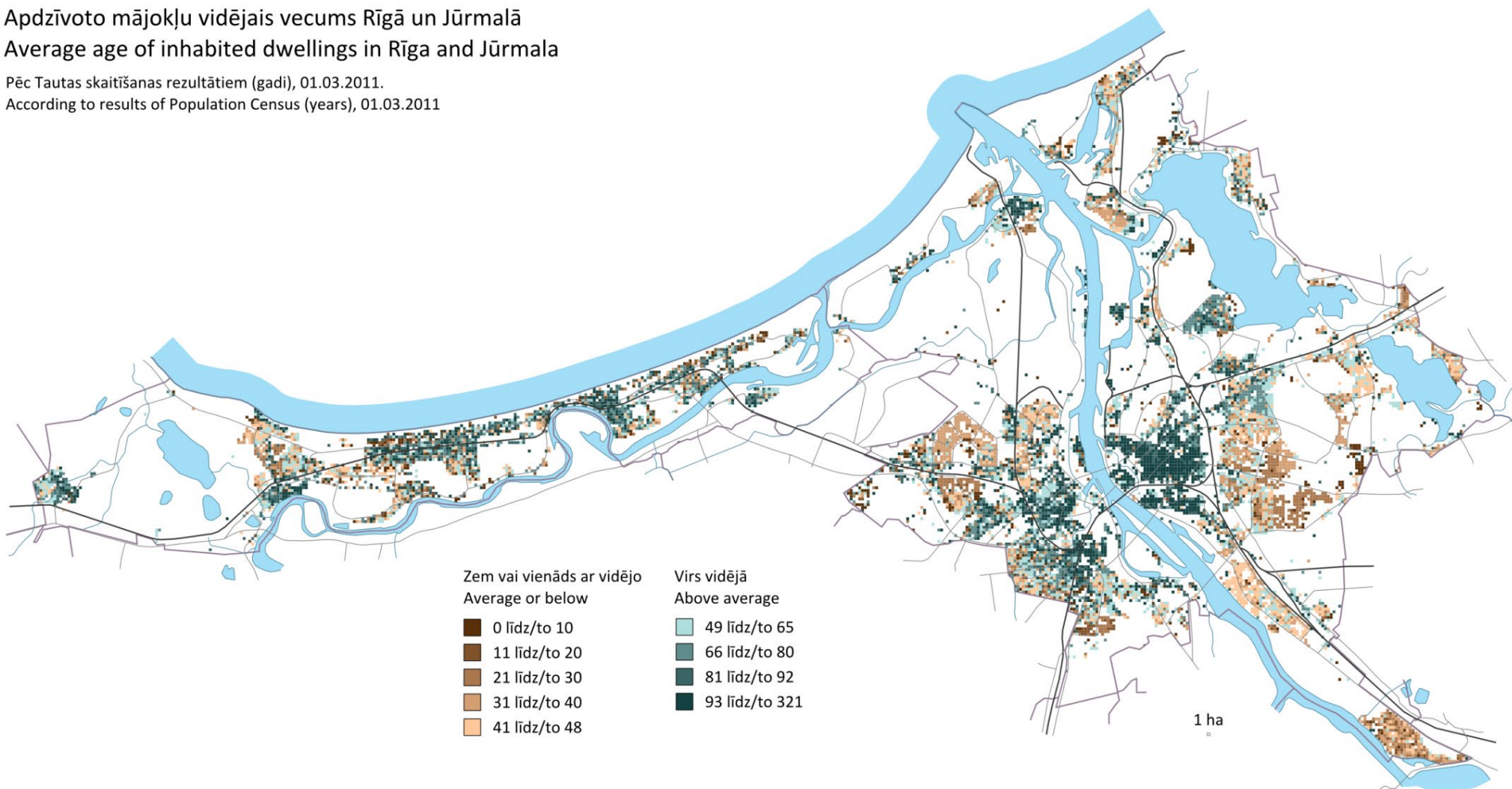




# Existing building stock in Riga

Apdzīvoto mājokļu vidējais vecums Rīgā un Jūrmalā  
Average age of inhabited dwellings in Rīga and Jūrmala

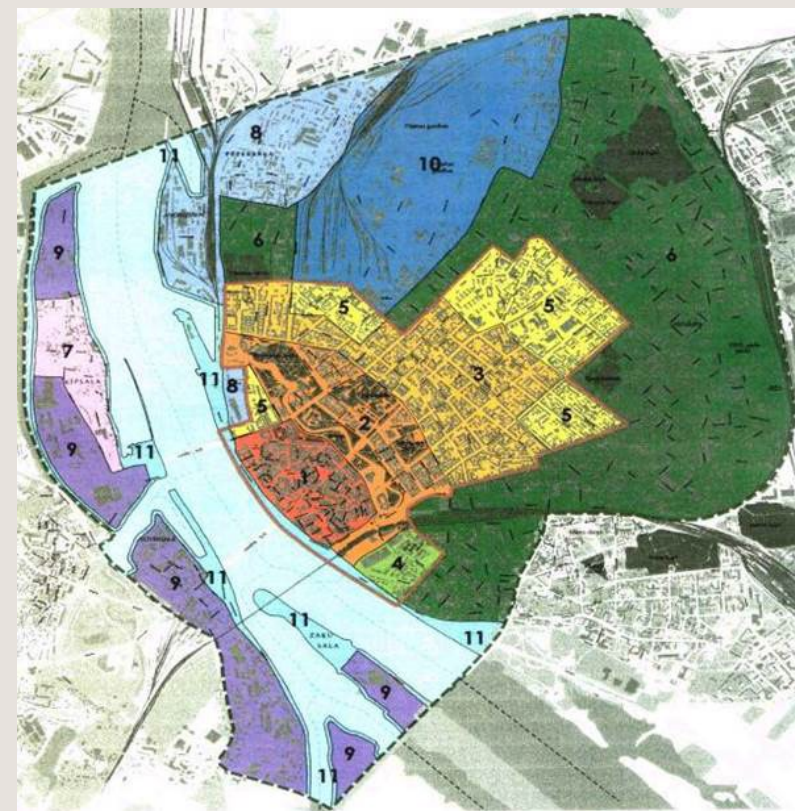
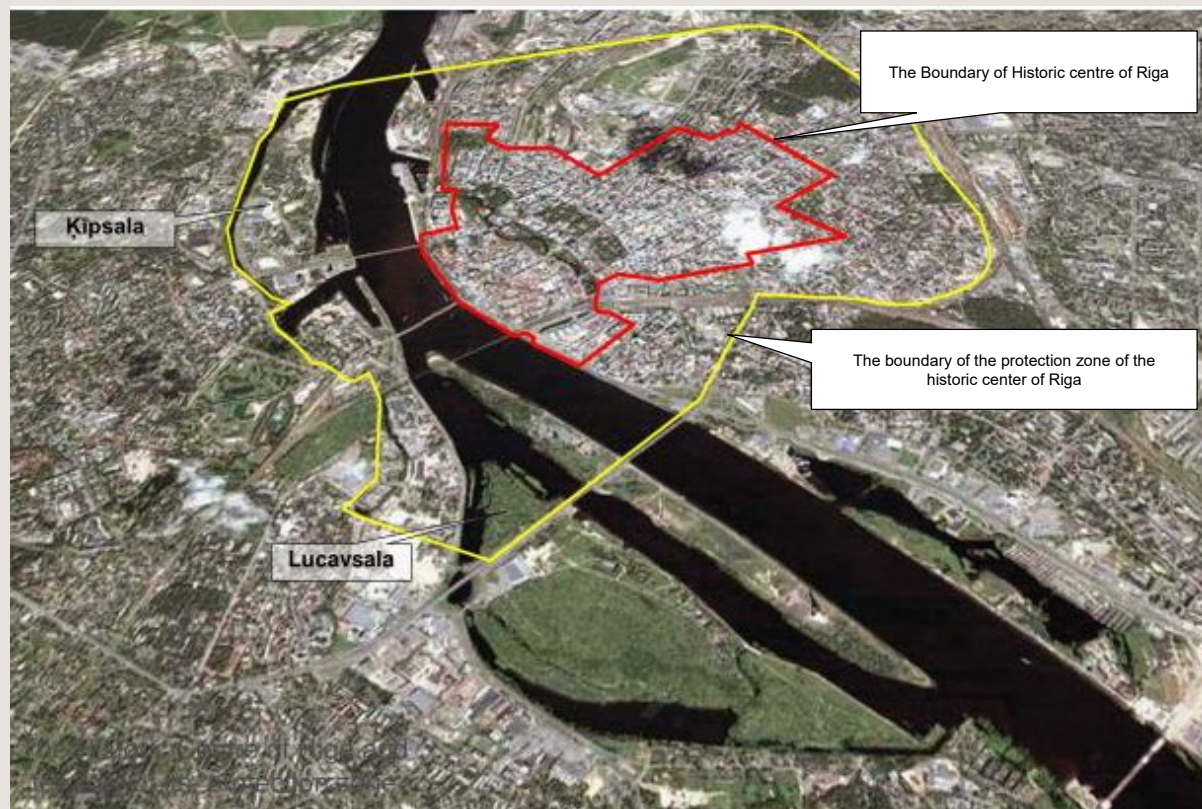
Pēc Tautas skaitīšanas rezultātiem (gadi), 01.03.2011.  
According to results of Population Census (years), 01.03.2011







# Historic centre of Riga: UNESCO protected area





# High quality *Baukulturs* global climate challenges

## Energy perspective

- EU Energy Performance of Buildings directive 2018/844/EU

## Cultural heritage and livability perspective

### Davos declaration:

- *Baukultur* not only fulfils functional, technical and economic requirements, but also satisfies people's social and psychological needs
- Calls to take measures which will ensure that **present and future social, economic, environmental and climatic developments and trends do not further diminish the quality of the built environment**, but are instead used as opportunities for improvement





# High quality *Baukultur*vs global climate challenges



<http://populars.eu/riigas-dzemdibu-nama-notikusi-tragedija-1/>



<https://medicine.lv/raksti/rigas-dzemdibu-nama-dzemdibu-centram-pieskirs-jaunu-nosaukumu-dzimusi-latvija>





# Outranking selection criteria for PEB:

## Cultural heritage and livability perspective

- Art Nouveau building
- Wooden building
- Listed building of national importance

## Energy perspective

- Energy intensive consumer
- Empty plot for new development



# Multi criteria analysis

## Cultural heritage and livability perspective

### Criteria

#### Cultural heritage

Cultural and historical significance

Variety of construction periods

#### Protection

Protection against crime and violence

Protection against unpleasant sensory experiences.

#### Comfort

Opportunity to stay and sit

Landscaped courtyard

#### Delight

Positive sensory experiences

Renovation cycle of buildings

## Energy perspective

### Criteria

Building density

Proportion of residential function

Possible future development, new buildings

Possible intensive refurbishment

Energy intensive function

Type of energy intensive function



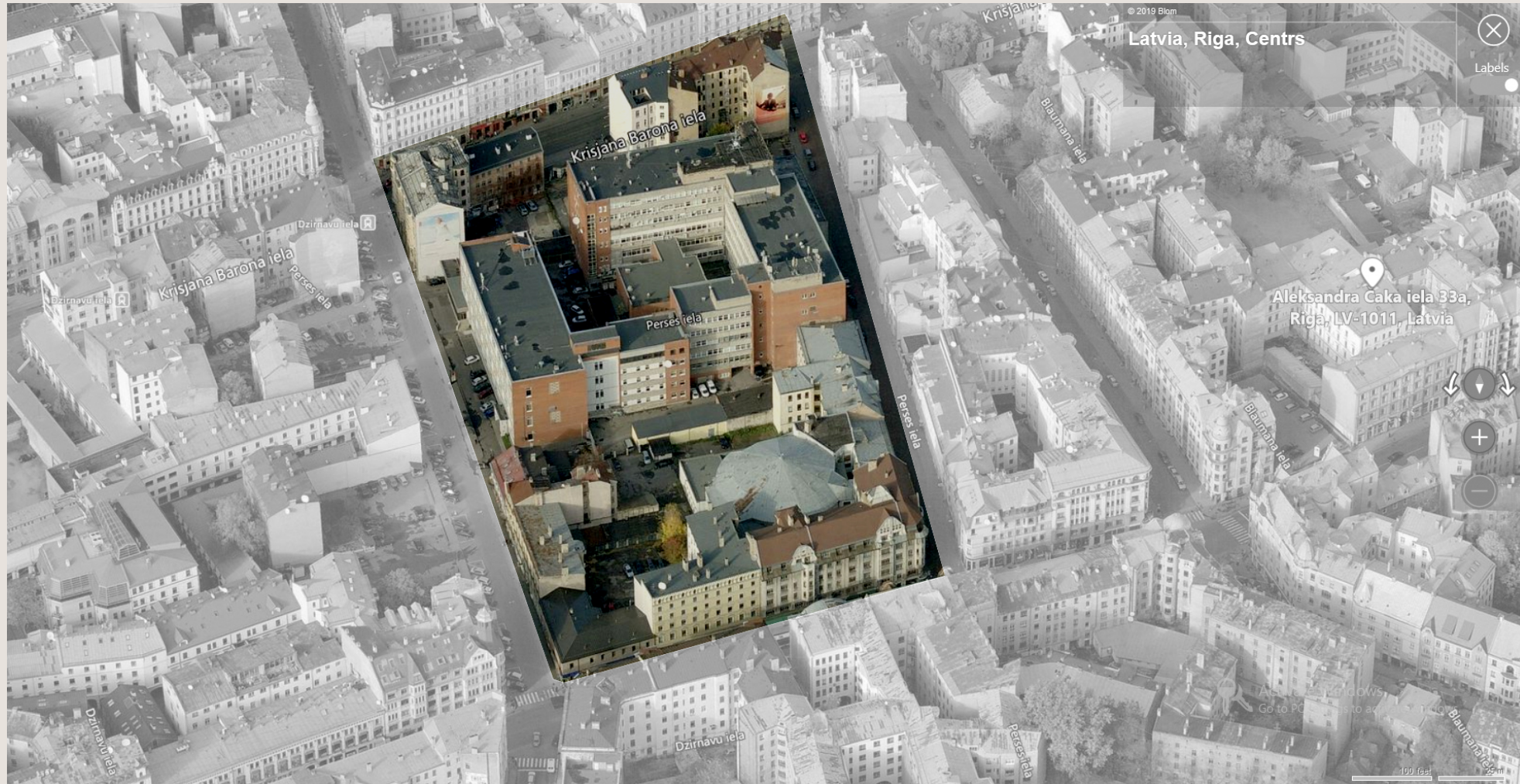
## We found that ...

- Multi criteria analysis shows adequate results
- Blocks with high energy efficiency potential poorly overlap with cultural heritage blocks
- The launched project will be developed in the block with highest energy efficiency potential, but not the finest architecture
- All the energy efficiency measures and RES solutions have to be applied in high quality *Baukultur* manner

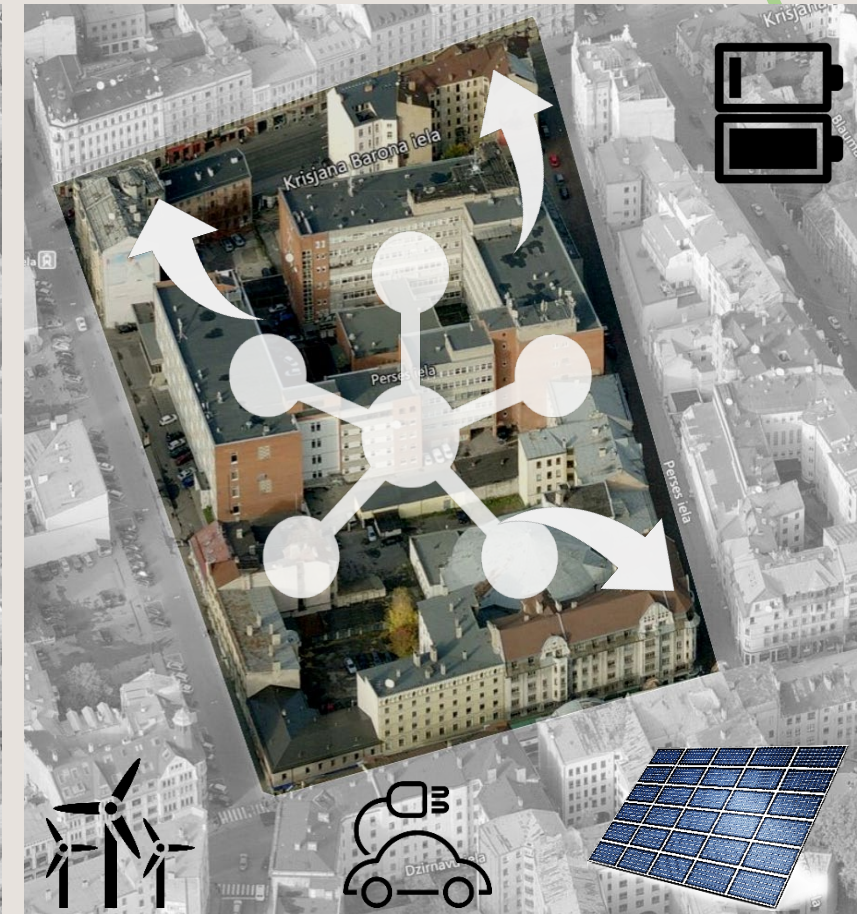
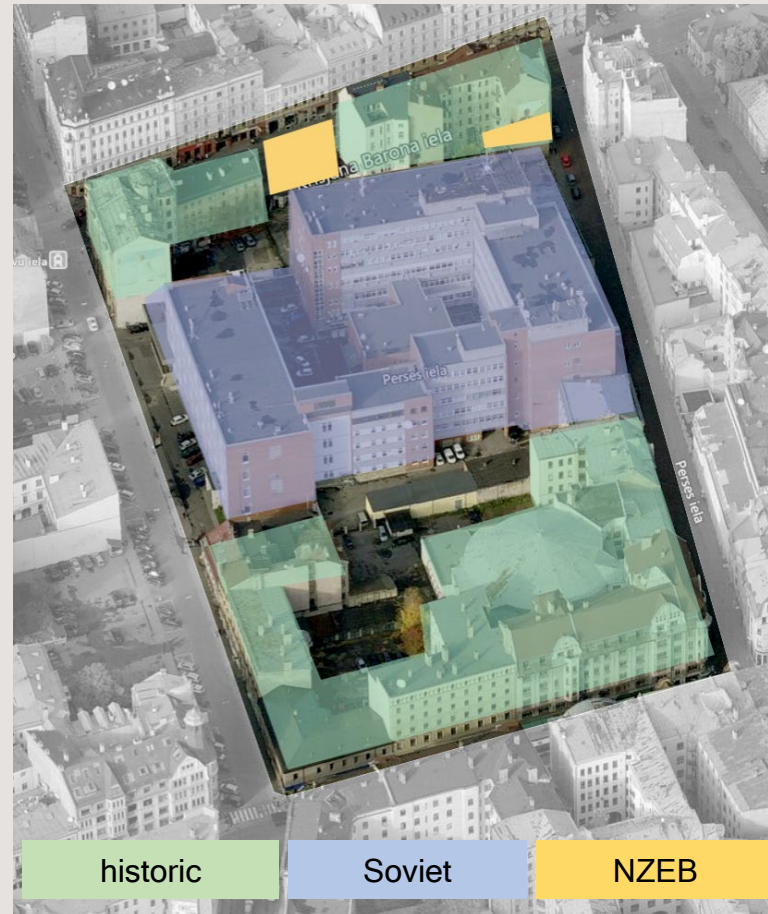
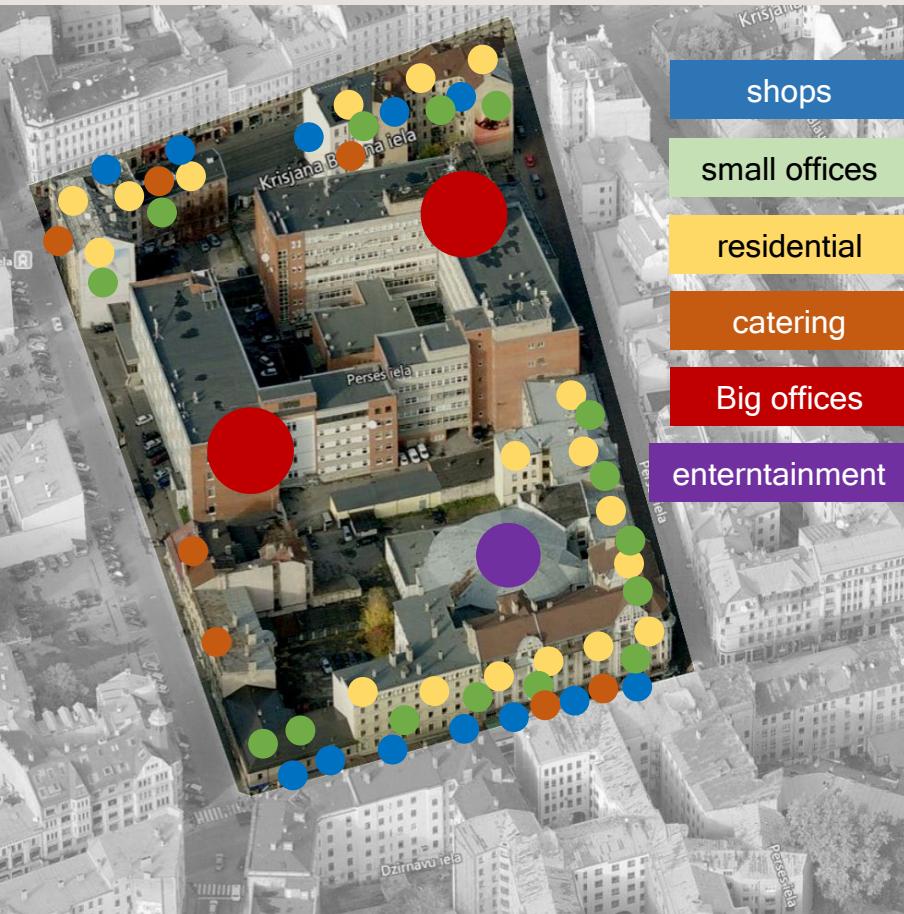




# Selected block



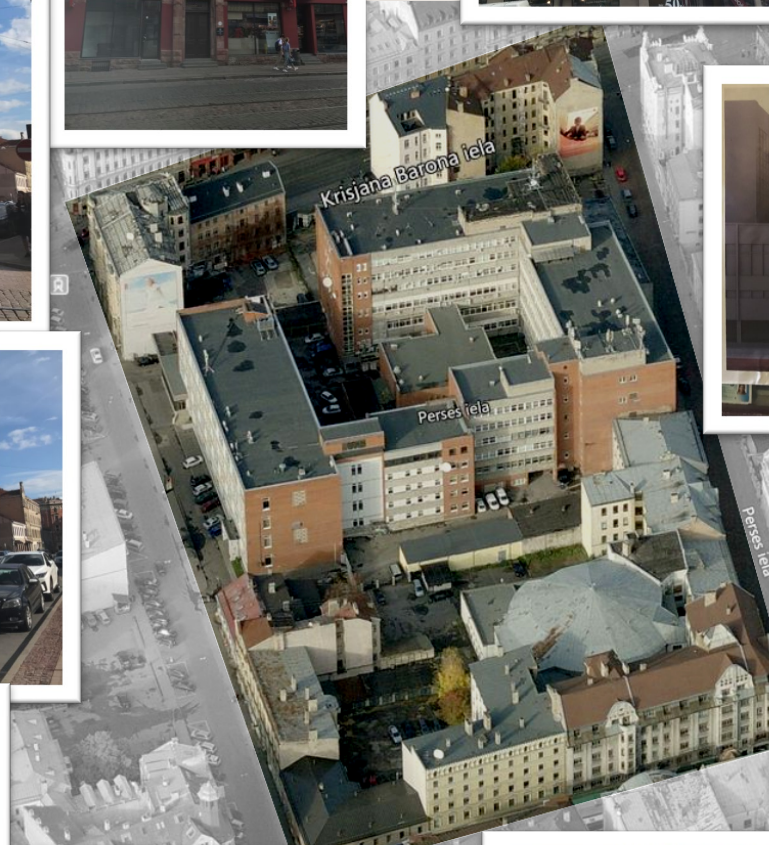








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Right  
of Energy Systems and Environment





# Conception of PEB

- Data collection and measurements of electricity, heat and gas consumption
- Energy audits
- Energy consumption seasonal patterns
- EE and RES technologies
- Thermal energy accumulation in the building envelope
- System Dynamics model about Waste to energy between buildings
- RES and energy storage
- ICT
- 2 scenarios: (1) energy efficiency first and (2) *Baukultur* first



# Challenges for PEB

- Only internal insulation for historic buildings: energy efficiency vs hygrothermal challenges
- External insulation for Soviet buildings: changes of facade of a building
- View from the sky protected by UNESCO requirements: challenges for RES installations
- Role of district heating
- Impact of changes in building use on PEB
- Is there an optimal solution for Baukultur and global climate challenges?