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InnoVative photocatalytic paintS for healthy envirOnment and eNergy Saving

Process Equipment Design Laboratory AUTh

Energy efficiency in Buildings

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On behalf of PEDL RESEARCH TEAM

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The European Green Deal

- Strong linkage between energy and environmental policies
- The EU should be climate neutral by 2050
- Reaching this target will require action by all sectors of our economy, including
  - investing in environmentally-friendly technologies
  - supporting industry to innovate
  - rolling out cleaner, cheaper and healthier forms of private and public transport
  - decarbonising the energy sector
  - ensuring buildings are more energy efficient
  - working with international partners to improve global environmental standards

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Key pillars in EU Energy Policy for Buildings

- Energy Efficiency
- Renewable Energy
- Energy Performance
- Decarbonisation

Clean energy for all Europeans package - legislative process

	European Commission Proposal	EU Inter-institutional Negotiations	European Parliament Adoption	Council Adoption	Official Journal Publication
Energy Performance in Buildings	30/11/2016	Political Agreement	17/04/2018	14/05/2018	19/06/2018 - Directive (EU) 2018/844
Renewable Energy	30/11/2016	Political Agreement	13/11/2018	04/12/2008	21/12/2018 - Directive (EU) 2018/2001
Energy Efficiency	30/11/2016	Political Agreement	13/11/2018	04/12/2018	21/12/2018 - Directive (EU) 2018/2002
Governance of the Energy Union	30/11/2016	Political Agreement	13/11/2018	04/12/2018	21/12/2018 - Regulation (EU) 2018/1999
Electricity Regulation	30/11/2016	Political Agreement	26/03/2019	22/05/2019	14/06/2019 - Regulation (EU) 2019/943
Electricity Directive	30/11/2016	Political Agreement	26/03/2019	22/05/2019	14/06/2019 - Directive (EU) 2019/944
Risk Preparedness	30/11/2016	Political Agreement	26/03/2019	22/05/2019	14/06/2019 - Regulation (EU) 2019/941
ACER	30/11/2016	Political Agreement	26/03/2019	22/05/2019	14/06/2019 - Regulation (EU) 2019/942

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Energy Efficiency in Buildings: A polyparametric issue

Renewable energy – national targets

National targets for raising the share of renewables in energy consumption by 2030 and 2050, under the Renewable Energy Directive.

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Energy Efficiency in Buildings: A polyparametric issue

Promoting "green" growth and jobs

Tackling the climate and energy challenge contributes to the creation of jobs, the generation of "green" growth and a strengthening of EU's competitiveness.

It is estimated that meeting the 20% renewable energy target could have a net effect of creating around **417,000 additional jobs**, while getting on track to achieve the 20% energy efficiency boosts net employment by some **400,000 jobs**. **Funding programs** promoting energy investments.

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Energy Efficiency in Buildings: A polyparametric issue

Energy efficiency

Measures for increasing energy efficiency are set out in the:

- Energy Efficiency Plan
- Energy Efficiency Directive
- Standarization
- National Laws

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Energy Efficiency in Buildings: A polyparametric issue

Energy Efficiency Plan

The policies to improve energy efficiency in Europe include:

- EU countries making energy efficient **renovations of buildings** owned and occupied by central governments per year
- mandatory and voluntary **energy efficiency and environmental certificates for buildings.**
- the preparation of **National Energy Efficiency Action Plans** every three years by EU countries

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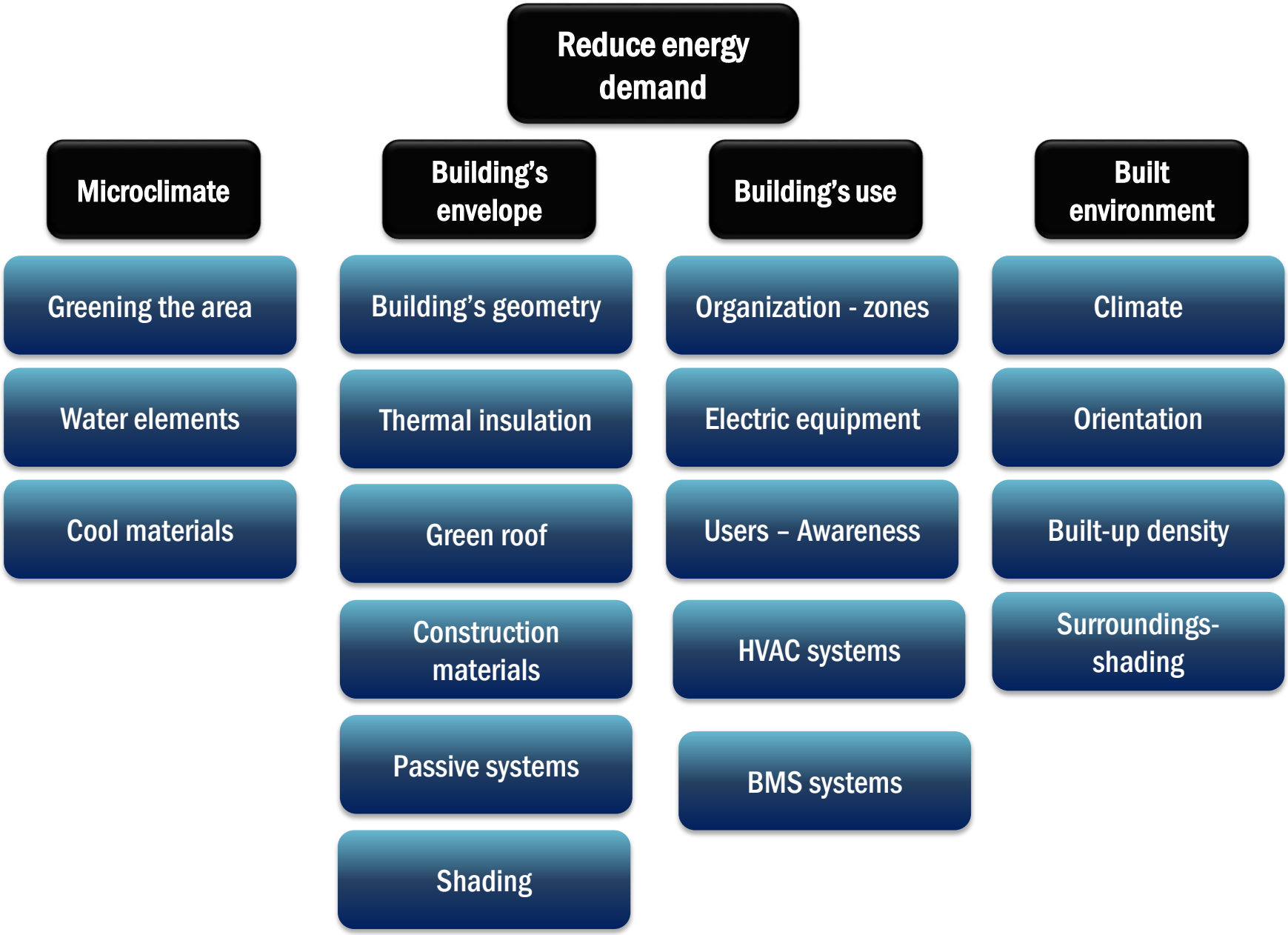
Energy Efficiency in Buildings: A polyparametric issue

Energy Efficiency Plan

- minimum energy efficiency **standards and labelling** for a variety of products such as boilers, household appliances, lighting and televisions (EcoDesign)
- **smart metering** for electricity and energy systems
- large companies conducting **energy audits** at least every four years
- protecting the rights of consumers to receive easy and free access to data on **real-time and historical energy consumption**, monitoring, KPIs.



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Methodology in brief in VISIONS PROJECT

Measurements – Simulations in Demo Houses and in real scale application in Naval Academy

Simulations with DesignBuilder and Contam

- Energy consumption
- CO_2 emissions
- Thermal comfort

The target was to identify the correlation of ventilation rates and photocatalysis (ventilation is related to energy consumption).

Indirect reduction of energy consumption because of the ventilation rate reduction.

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Indoor conditions measurement equipment

System	Measurements	Measurement equipment
DEMO HOUSES	Air temperature	• Comfort and air quality conditions using testo 480 and the necessary sensor probes (temperature, radiant temperature, relative humidity, CO2, air velocity, pmv/ppd) • HOBO MX1102 (temperature, relative humidity, CO2). The installation and methodology is based on the international standards ISO 7726:1998 and ASHRAE 55
	Relative Humidity	
	Air velocity	
	Radiant temperature	
	PMV/PPD	
	CO_2	

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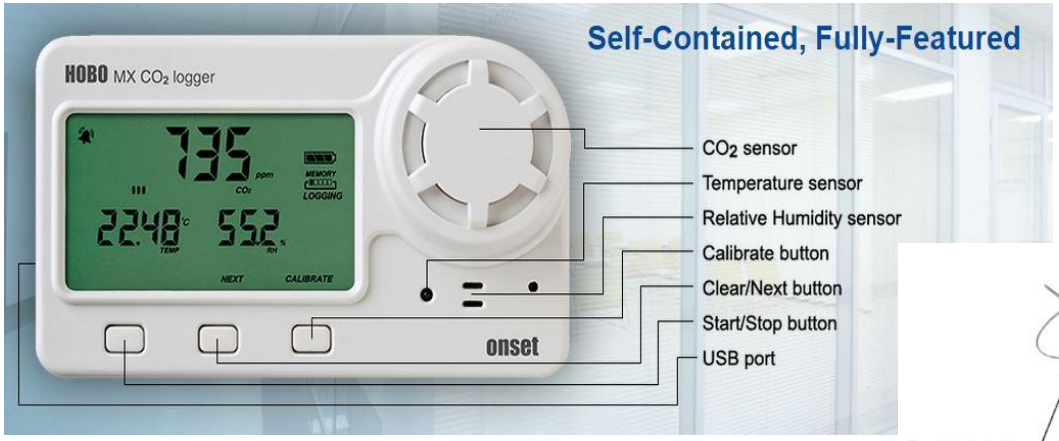
Indoor conditions data loggers



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A. Simulation - Demo Houses

Parameters:

- Mechanical ventilation (ASHRAE 62.1)
- Natural ventilation
- Photocatalysis

Output data:

- Energy consumption
- CO_2 emissions
- NOx emissions

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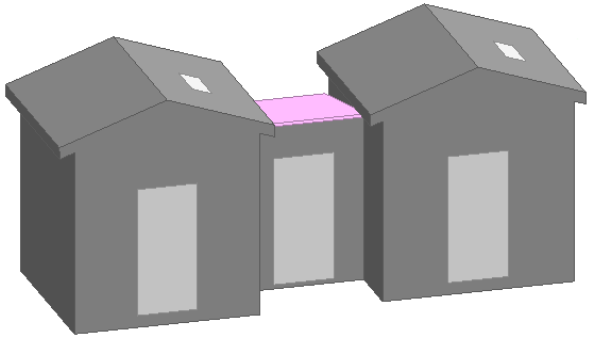
A. Simulation - Demo Houses



Envelope design

HVAC systems

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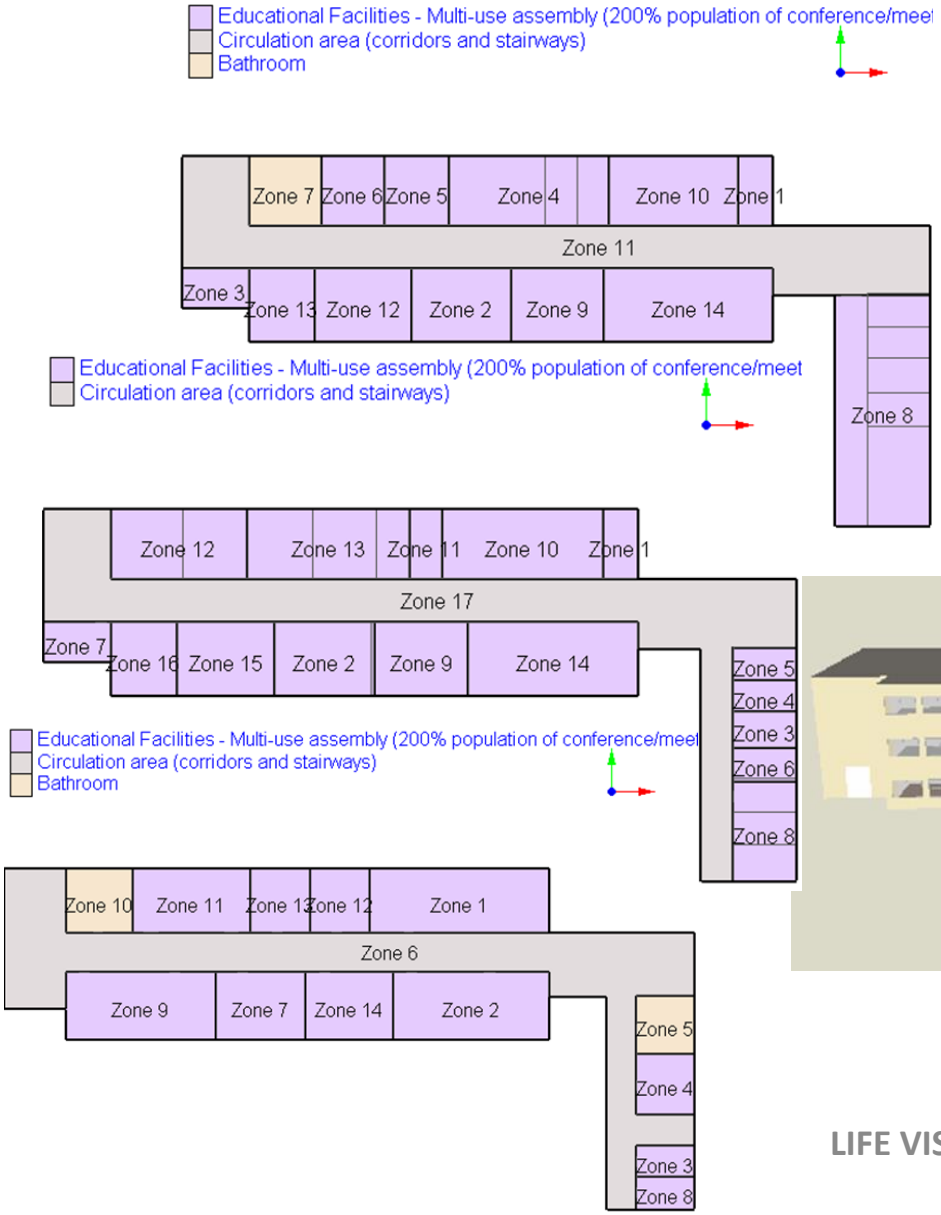
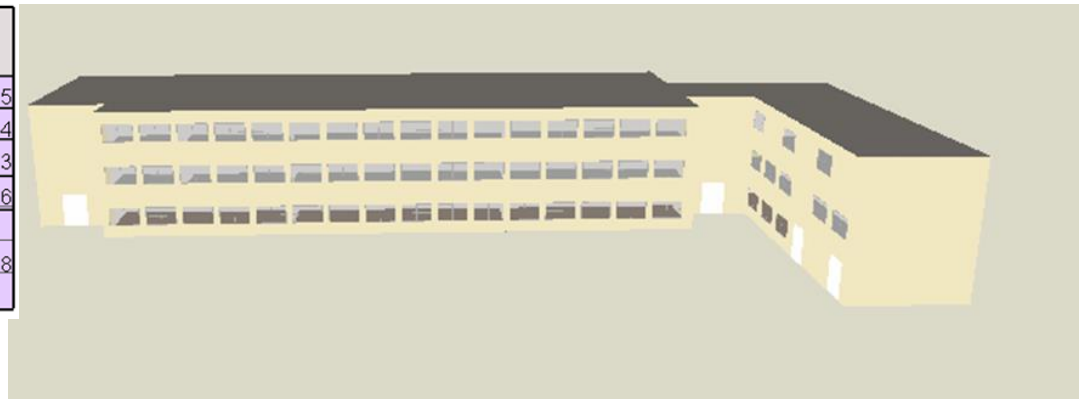
B. Simulation – Naval Academy





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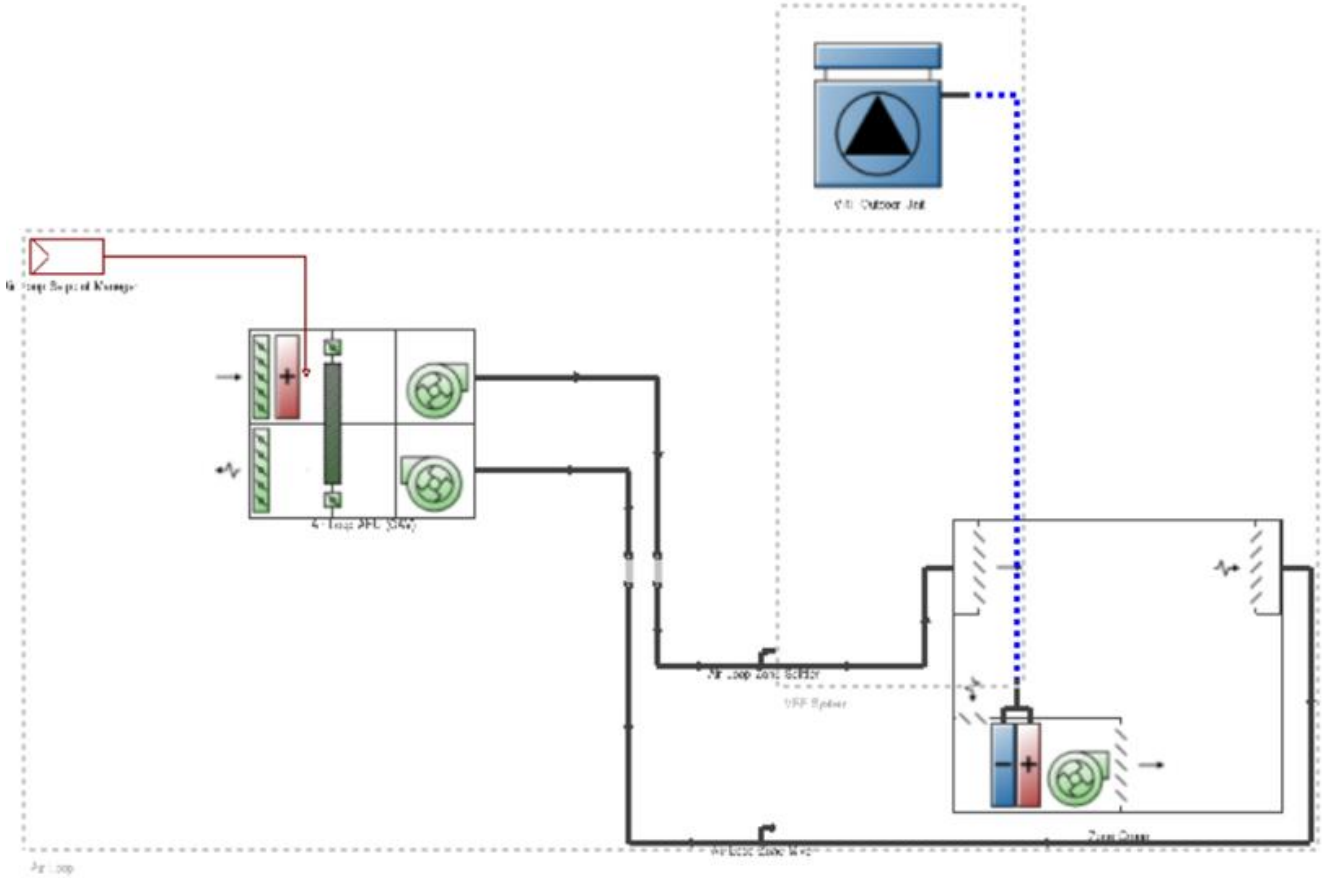
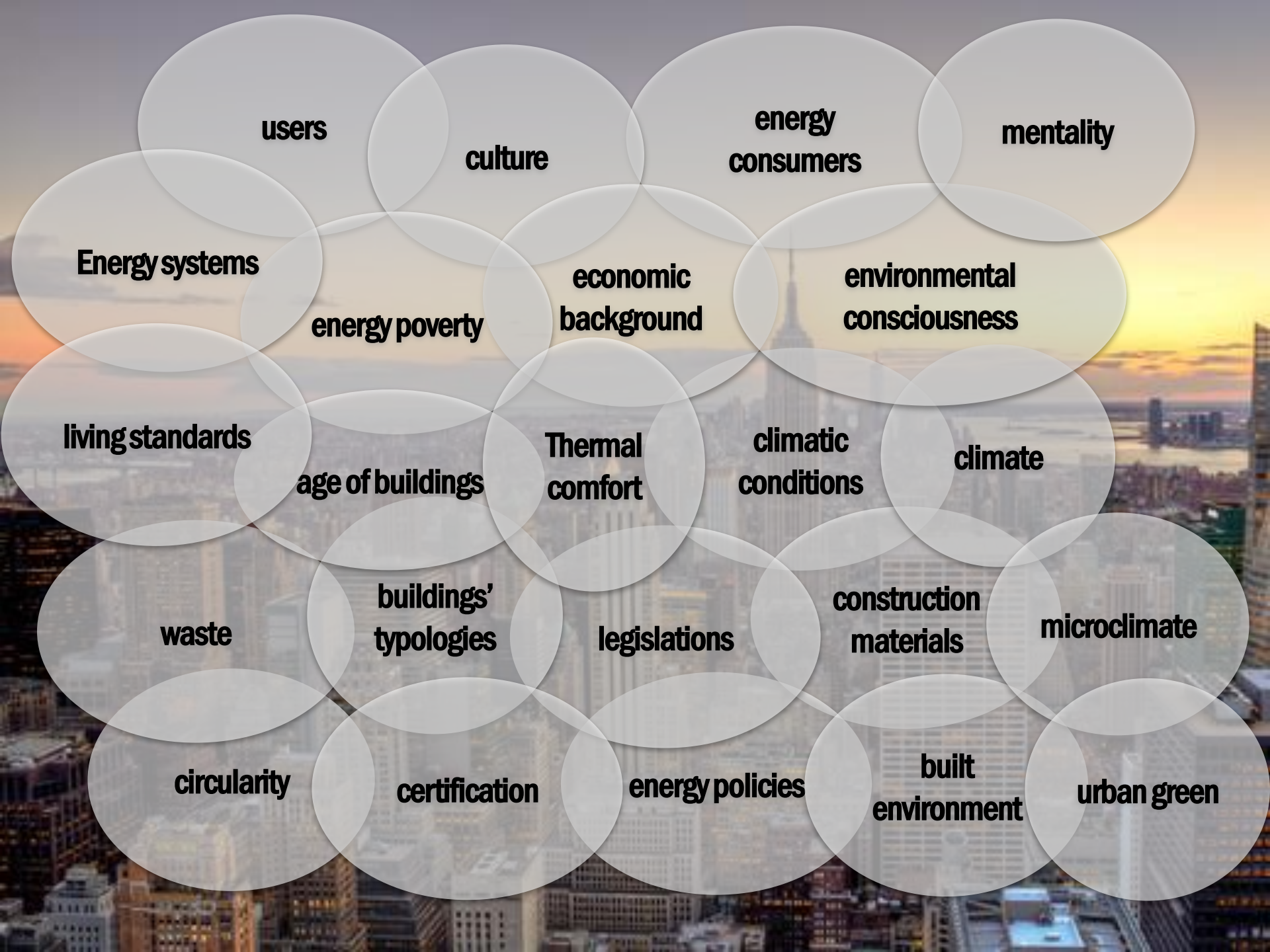
B. Simulation – Naval Academy



Naval academy-VRF (Variable Refrigerant Flow) system simulation


users
culture
energy consumers
mentality
Energy systems
energy poverty
economic background
environmental consciousness
living standards
age of buildings
Thermal comfort
climatic conditions
climate
waste
buildings' typologies
legislations
construction materials
microclimate
circularity
certification
energy policies
built environment
urban green

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THANK YOU!

https://lifevisions.gr/