CO2olBricks

Evaluation of rationality of investment

2012-04-12 Vilnius

Introduction

- Do consumers behave rationally in making decisions regarding energy use and energy efficiency?
- Do observed choices reflect an optimal balance between the costs and benefits of energy-efficient technologies?
- Do people use economic criteria when purchasing appliances or when considering building shell retrofits that would reduce household fuel consumption?
- Do households minimize the present-value costs of obtaining energy services?

The topic

- What does it mean to say that consumers are or are not "rational" or that they do or do not "optimize"?
- What counts in principle as a description or explanation of people's behavior?
- What counts as evidence one way or another?
- And how do the answers translate, in principle, into guidance for policy-makers?

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Multi-criteria analysis

- capable of dealing with the multiple dimensions of evaluation problems;

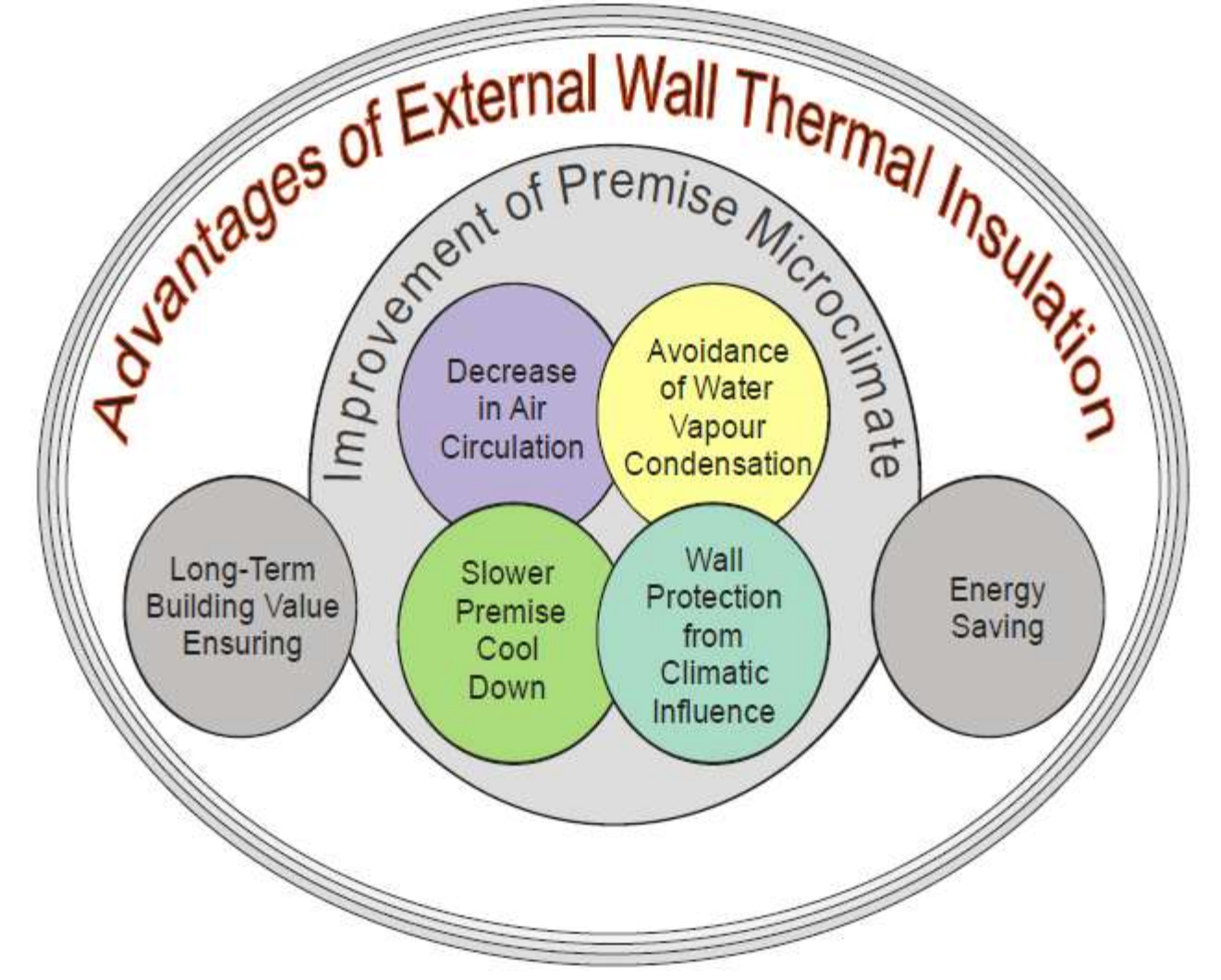
- aim to solve conflicting social, environmental, political and economic issues;

- closely related to the way humans have always been making decisions;

- simple: a finite or infinite set of actions (alternatives, solutions, courses of action ...), at least two criteria, and, obviously, at least one decision-maker;

The main steps of multiple criteria decision making

- generating a set of evaluation criteria that relate system capabilities to goals;
- developing alternative systems for attaining the goals (generating alternatives);
- evaluating alternatives in terms of criteria (the values of the criterion functions);
- applying a normative multiple criteria method of analysis;
- accepting one alternative as "optimal" (preferable);
- if the final solution is not accepted, gather new information and go into the next iteration of multiple criteria optimization.



Advantages of thermal insulation of external walls

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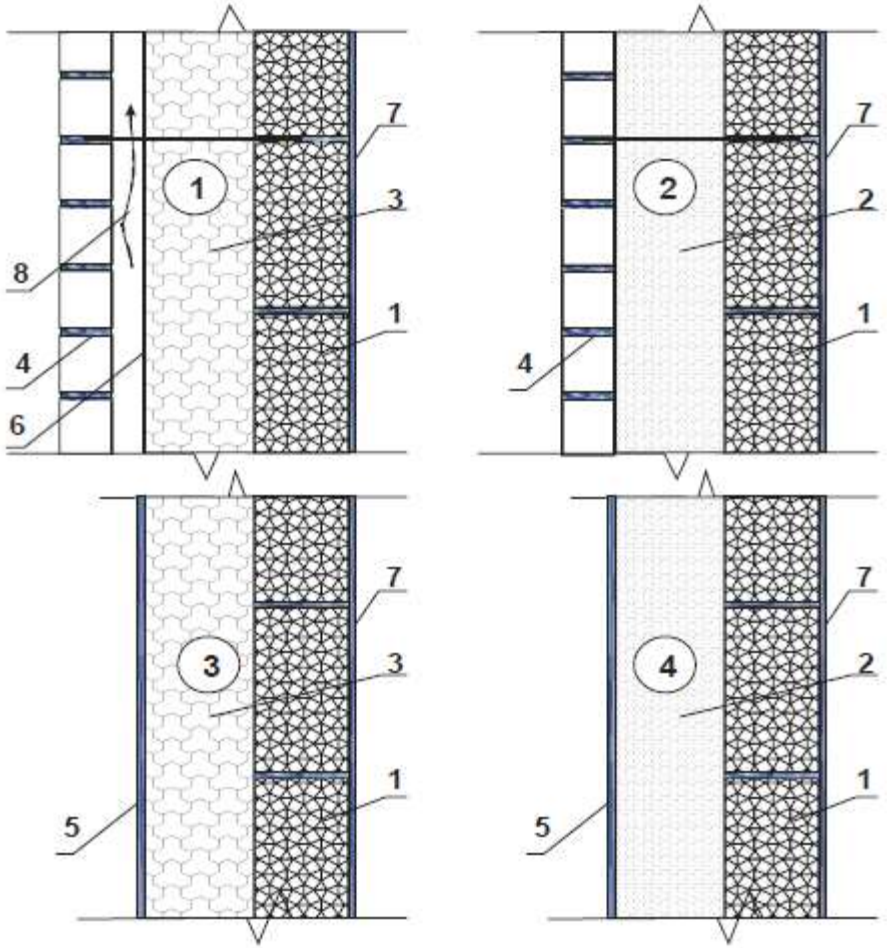
Facade structures of buildings should satisfy:

- Ability to function as bearing or self-bearing walls.
- High thermo-insulation properties.
- Good soundproofing.
- Moisture resistance.
- Frost resistance.
- Air permeability.
- Steam permeability.
- Sufficient light-weightiness.
- Ecological cleanliness.
- Satisfactory fireproofing.
- Durability.

Physical-mechanical properties:

- expansion and shrinkage coefficients,
- compressive and tensile strength,
- adhesion properties,
- behaviour under different types of wind load,
- behaviour under exposure to ultraviolet ray,
- difference between strain values in adjacent walls with relatively high temperature,
- variation due to different sun rays exposure and colour of the final facade coating,
- difference in aging properties of each composite in usage,
- air and steam permeability values.



1 – Bearing block
2 – Expanded polystyrene
3 – Rock wool
4 – Finishing brick
5 – Outer plaster
6 – Wind insulation
7 – Inner plaster
8 – Air space (2-3 cm)

Main alternatives of multi-layered external walls

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Multi-layered exterior wall systems advantages:

- covers the entire building wall (except windows and doors). Provides an insulation layer over potential thermal bridges.
- Building airtightness is improved.
- Building structure is kept warm; this minimizes thermal expansion and contraction.
- The system avoids a build-up of moisture in the building cladding.

- Cost-effectiveness in application of multi-layered external walls - the most significant issue for the investor, without getting into all the inferior physical, thermo-technical and ecological properties of the usually applied facade structures.
- Three basic material configurations is considered: insulation inside or outside the massive layer, and insulation located between two massive layers.

Wall insulation is aimed:

- reducing energy consumption;
- increasing market value of buildings
- improving performance of building structures and increasing service life of a building;
- raising the comfort level in a building;
- improving architectural solutions of buildings' facades matching up with the environment.

Most effective measures of building renovation can be determined:

$$SIR = \frac{current\ value\ of\ energy\ saving,\ Lt}{cost\ of\ investments,\ Lt} \geq 1$$

where SIR - the efficiency of energy saving improvement.

Specific weight of the cost as a criterion reflecting economic efficiency of the suggested alternative should be not smaller than:

- 60% – when cost and three or more other criteria are considered;
- 70% – when cost and two other criteria are considered;
- 80% – when cost and one more criterion are considered.

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Thank You for Your attention!