


Energy Certification Vs Comfort Certification for Dwellings in Southern European Countries

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2016 CONSTRUCT PhD Workshop

Summary

1. Motivation
2. Objectives
3. Methodology
4. First results – Conclusions

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1. Motivation

- Directive 2010/31/EU → Buildings Energy Certification Schemes (ECS's)
- Portuguese Regulation for Dwellings → REH

“envelope”

“technical systems”

Winter - $T \geq 18^{\circ}\text{C}$
Summer - $T \leq 25^{\circ}\text{C}$

kWh = €€€

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1. Motivation (2)

- Directive 2010/31/EU → Buildings Energy Certification Schemes (ECS's)
- Portuguese Regulation for Dwellings → REH

Energy “Consumption”

REH

% Area

% Time

Reality

(kWh)

Energy “Savings”

REH

“actual situation”

“future with the IM”

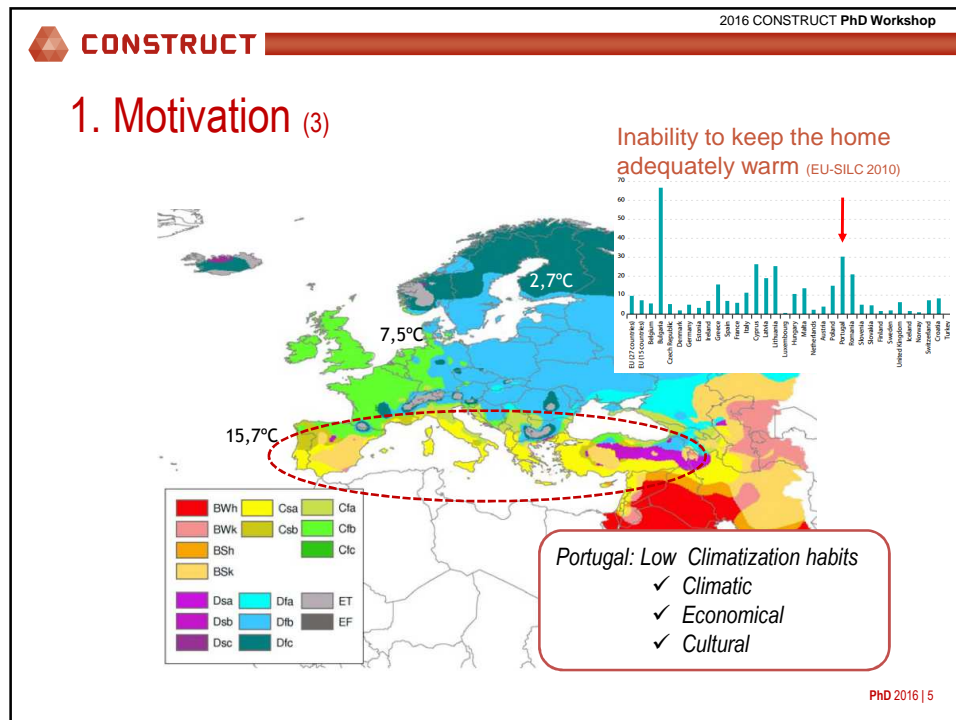
???

(kWh)

(Improvement Measures)

44%	IM1
50%	IM2
11%	IM3

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1. Motivation (4)

Buildings / Rehabilitation / Market opportunities:

- ✓ Portugal: 3,5M buildings / 5,8M dwellings / 2,5M buildings before 1990 (1st thermal reg.)
- ✓ 35% needing some type of intervention - 1,2 Million !
- ✓ ECS (2007-15): 670 000 EC's ~ (408m RCCTE + 262m REH) > 150 M € !!

- ✓ Impact in construction sector? Energy Real Savings for user?
- ✓ Contribute to the 20-20-20 strategy and other European policies?
- ✓ And last but not least...

... Are we feeling more comfortable inside our homes?

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1. Motivation ⁽⁵⁾

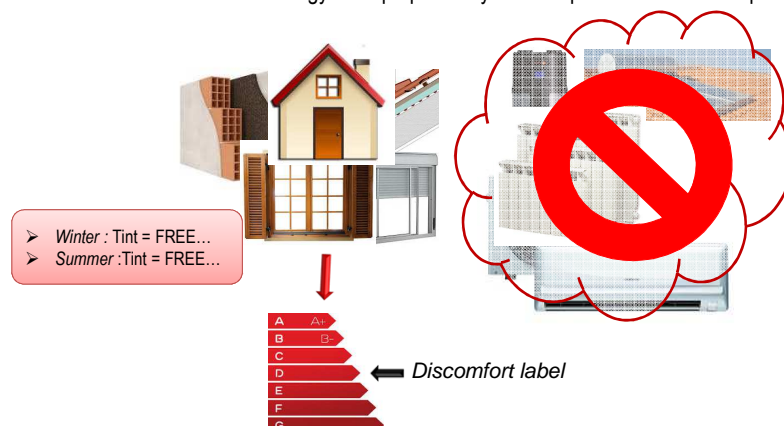
So, we need to take a critical look to the problem, concerning our climate and real habits ...

It's fundamental to define solutions which ensure not only **energy efficiency**, but also **thermal comfort** and reasonable investments to our budgets expectations and climatization habits.



2. Objectives

- Define a methodology of **"comfort / passive discomfort" buildings certification**, based on dynamic calculation of the temperature inside the building, in realistic conditions of use, taking into account the habits of users, and compare this level of "passive quality" with the environmental and energy label proposed by the European environmental policy.

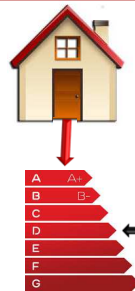




2. Objectives (2)

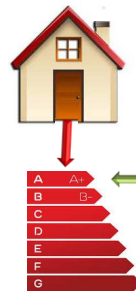
- While ECS quantifies the *energy* required to achieve a defined comfort level...
- we intend to quantify the *discomfort* within a passive scenario (free floating temperature), and, in a forward stage, the "*envelope*" improvements AND/OR *energy required to reduce that discomfort* and that way, improve the "discomfort label".

- ✓ Free floating Temperature
- ✓ No Heating / Cooling (0 hour)



Discomfort Label 1

- ✓ "Envelope" Improvement Measures
- ✓ Intermittent heating (X hours)



Discomfort Label 2

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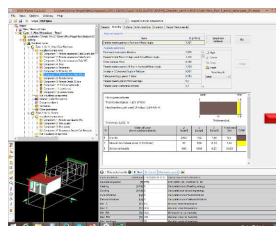
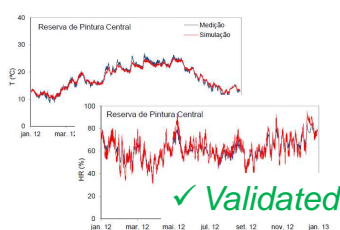


3. Methodology (2)

a) Real Case Study – Oporto Traditional Building



b) Model it in an hygrothermal advanced program – WUFI



- Temperatures (°C)
- Energy Consumptions (kWh)

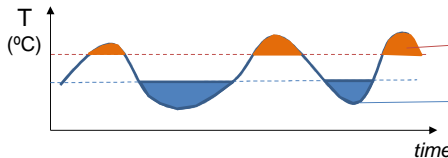
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3. Methodology (3)

c) Build a *Passive Discomfort Index*

Adaptive Comfort Approach
EN 15251



$$IDT - V = \int (T_{int} - 25) * A_i$$

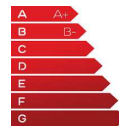
$$IDT - I = \int (20 - T_{int}) * A_i$$

d) Compare the *Passive Discomfort Index* with the *Energy Cert. Label*

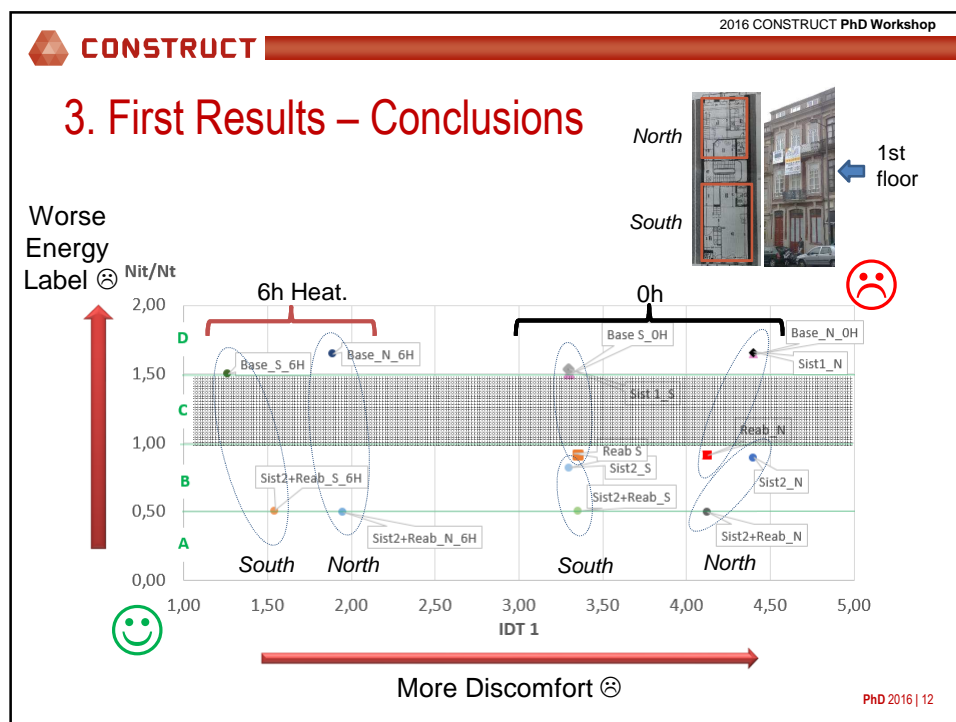
e) Define different scenarios – sensitive analysis

- Changing Envelope Thermal Characteristics / Intermittent Heating Simulations

f) Build a “*Passive Discomfort Certification Model*”



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Thank you!

