Portugal's experience with building regulations in the context of a mild climate

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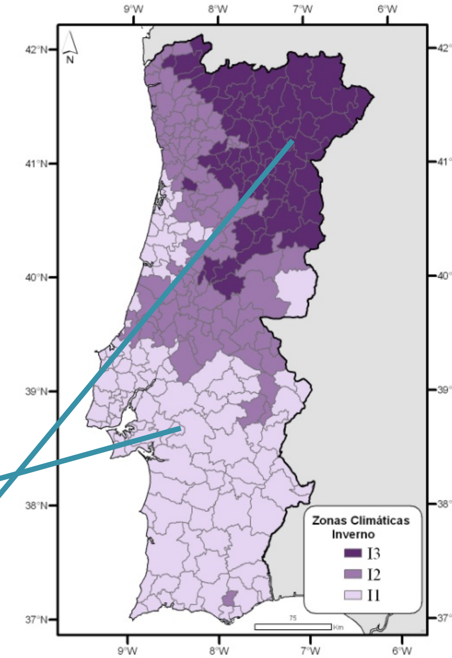
Portugal

winter

< 1,300 °C.days

> 1,800 °C.days

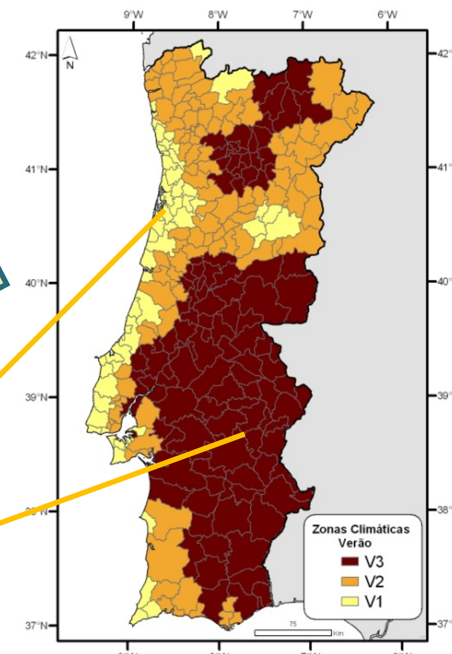
(Ref. 18°C)



summer

Average T<20°C

Average T>22°C



We do not know the meaning of words like "snow" and "freezing"... except a couple of days a year in zone I3...

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Typical buildings

- **<u>Average size dwelling</u>: 120 m^2 for a family of 4;**
- **<u>Heating habits</u>: only occupied spaces during occupancy (ca. 13.4% of all-winter 24/7 heating consumption);**
- **<u>Ventilation</u>: natural ventilation is most common, central extraction through bathrooms and kitchens in large multifamily buildings – no tradition of balanced ventilation in dwellings;**
- **<u>Very little AC</u>.**

- Heavy masonry construction
- Heavy inertia

- 10-15°C day-night outside variation;
- 3-4 °C indoor temp. variation.

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Building Regulations

- First set in 1990;
- Revised with EPBD in 2006;
- Last update with EPBD recast in 2013.

- Cost-optimal calculated on the basis of 24/7 heating and cooling needs winter and summer;
- Calculated primary energy needs between 50 and 150 kWh/m^2.year on that basis (in reality, between 10 and 20 kWh/m^2.year...);
- Ventilation load alone would represent over 60 kWh/m^2.year in the coldest regions;
- Cost-optimal calls for balanced ventilation systems with heat recovery;
- Public, building industry and government strongly oppose such a change.

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Evolution of Minimum Requirements 1990-2020

Time interval		**1990-2006**		**2006-2012 (First EPBD)**		**2012-2016 (Recast EPBD)**		**After 2016 (Towards NZEB)**	
		Lisbon	Bragança	Lisbon	Bragança	Lisbon	Bragança	Lisbon	Bragança
U-value [W/m^2.K]	External **walls**	1.4	0.95	0.7	0.5	0.5	0.35	0.4	0.3
	External **roof/floor**	1.1	0.75	0.5	0.4	0.4	0.3	0.35	0.25
	External **window**	4.2	4.2	4.2	3.3	2.9	2.4	2.8	2.2
	Flat thermal bridges	None		2 x U-value (closest element)					
Maximum window solar gain factor **g-value**	Light inertia	0.15					0.1	0.15	0.1
	Medium and heavy inertia	0.56							
Ventilation (ACH)		None		≥ 0.6		≥ 0.4			
Renewable energy systems		None		Minimum solar energy contribution for domestic hot water (reference value 0.65 m^2/occupant)					

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Renewables are required for DHW
(since 2006)

Every new building and major renovation (dwellings and non-residential) must have solar thermal collectors to cover ca. 60% of DHW needs.

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Systems Requirements first set in 2013

Building type	Technical system		Requirement evolution			Standard
			Before 2013	2013-2015	After 2016	
Residential and non-residential buildings	Heat pumps	Cooling	None	Eurovent Label C (Example: Chiller COP ≥ 2.8; EER ≥ 2.7)	Eurovent Label B (Example: Chiller COP ≥ 3.0; EER ≥ 2.9)	EN 14511
		Heating				EN 14825
		Domestic hot water (DHW)		COP ≥ 2.3		EN 16147
	Boilers			Minimum nominal efficiency 86%	Minimum nominal efficiency 92%	-
	DHW gas heater	Power ≤ 10kW		Efficiency ≥ 82%		
		Power > 10kW		Efficiency ≥ 84%		
Residential	Domestic electric storage water heaters			Maximum stand-by heat loss		EN 60379
Non-residential	Air handling unit			Eurovent Label D Efficiency ≥ 47% Velocity ≤ 2.5 m/s Δp ≥ 125 Pa	Eurovent Label C Efficiency ≥ 57% Velocity ≤ 2.2 m/s Δp ≥ 170 Pa	EN 13053
	Pumps		Minimum EFF2 label	Minimum IE2 or IE3 class		IEC60034-30
	Fans			Minimum IE2 or IE3 class Minimum SFP 4 or 5 W/(m^3/s)		IEC60034-30 EN 13779
	Lighting		None	Maximum power (W/m^2)/100lux Example: Offices 2.5 (W/m^2)/100 lux for 500 lux		EN 12464-1 EN 15193
	Lifts			Minimum C	Minimum B	VDI 4707
	Central building management system		Mandatory if HVAC thermal power > 250 kW			EN15232

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Cost-Optimal

ok on dwellings
room for improvement on non-residential buildings

		Weighted average for primary energy levels		
		Cost-optimal levels of minimum energy performance requirements [kWh/m^2.year]	Minimum energy performance requirements in force [kWh/m^2.year]	Difference [%]
Residential	New	33.24	30.59	7.97
	Existing	52.97	52.94	0.10
Office buildings	New	137.3	192.0	- 39.5
	Existing	129.6	164.0	-26.0

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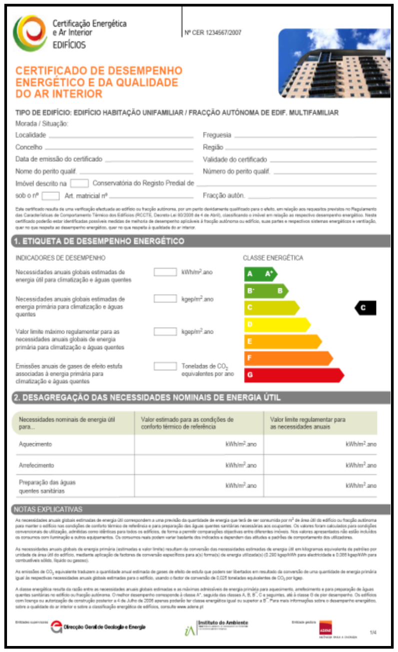
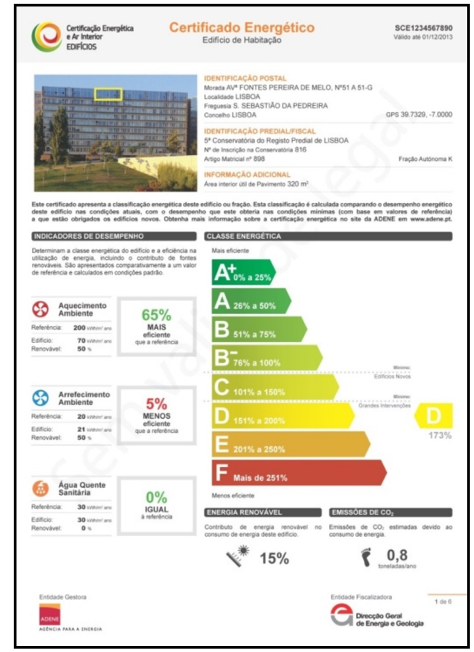
Energy Performance Certificates





- EPCs are well implemented since 2007
- Upgraded in 2015
- Energy Rating required in advertisements (if there is an EPC…)
- The national database is well designed and used for policy making
- But… their quality is very questionable – the average cost is under 100 € - there is no political will to enforce quality and training of the Qualified Experts.

Implementation of the EPBD
major tendencies in the EU
1 – best practices

- Clear indication of the NZEB level in the issued EPCs;
- Clear administrative procedures requiring a valid EPC as part of the documents needed to obtain a use license (or a construction permit);
- Clear requirement for the presence of an EPC during transactions (sales, rent);
- Combine EPBD and EED in terms of qualifications for issuing EPCs (energy auditors required);
- On-line check of an EPC before it can be issued;
- On-line publication of the list of public buildings and their EPCs;
- Clear guidelines for inclusion of required energy efficiency in advertisements and no advertisement without the rating;
- Combine boiler & AC EPBD inspections with other required safety and F-gas inspections;
- Subsidy schemes for rehabilitation of existing buildings towards NZEB with a required EPC before and after the works.

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Implementation of the EPBD
major tendencies in the EU
2 – bad practices

- EPCs exist and are required by Law, but nobody really checks;
- EPC quality not checked plus lax requirements and training of QEs, means that EPCs are really almost useless;
- Low-cost or free, self-produced EPCs are possible in a few MS – the reputation of EPCs as a worthless piece of paper;
- Very poor TBS requirements in all but less than a handful of MS;
- Lack of compliance checks for legal minimum requirements, EPC quality, EPC display, inclusion of energy labels in advertisements, mandatory inspections – or a make-believe compliance check that really produces nothing useful;
- Assume 100% compliance success because the law so requires and nobody would dare break the Law…;
- Lack of sanctions, or define sanctions that are so absurd – prison, expulsion for life as QE as the only possible penalty - that they simply never apply;
- Rather high allowable primary energy needs for NZEB residential buildings (>100 kWh/m^2.year) that do not seem to meet the objective "low energy needs… covered by RES".

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Implementation of the EPBD
major tendencies in the EU
3 – loopholes

- Advertisements with energy indicators only if there is an EPC.
  In contrast with good practices by other MS where publication without the energy rating is simply not allowed;
- EPC display in public buildings only if an EPC already exists;
- Most proofs of equivalence for alternative measures for inspections are a nice exercise of imagination…

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Conclusions (PT)

- Portugal has upgraded its Thermal Regulations for buildings to beyond "cost-optimal" in terms of envelope;
- Cost-optimal calculated on the basis of an unrealistic heating/AC use pattern by most of the population;
- 90% of the population lives in the mild climate zones, but the cold northeast (I3) is just as cold as Paris...
- There is a huge general resistance (unwillingness) to move from natural ventilation (or simple extraction) to required balanced ventilation with heat recovery – not cost-effective under common use patterns;
- Renewables for DHW are now a standard for new construction and major renovations;
- Discussions with the EC over the use of heat pumps (and balanced ventilation) are ongoing...

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Conclusions (EPBD)

- The EPBD has always aimed at very ambitious goals;
- The upcoming revision should take stock of its current status of implementation and take a more realistic stand;
- NZEBs by 2020 still look as a distant mirage in most MSs;
- EPCs need to gain their correct role: a rating but not a replacement for an audit for renovation decisions – they are not (correctly) accepted by banks;
- Inspections schemes are simply not working in most MS – regular preventive maintenance and monitoring large systems may be more effective;
- Financial schemes for renovation need to be scaled up by several orders of magnitude – NZEB goals shall never be reached otherwise.

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Common EPCs for Non-Residential

- The new scheme has been postponed until the set of CEN standards is ready it should be published in 2016;
- The latest version is built upon national reference buildings;
- This solution shall not solve the its main objective: compare buildings from on a common basis anywhere in Europe;
- This is very important for large building owners (ex., a hotel chain; a property fund; international stores, etc.,…)
- Buildings are a very complex issue… with lots of vested interests… and with very powerful lobbies…

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