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National Guidelines for Residential Buildings presented as Grid of applicability in participating countries

CONCERTO INITIATIVE
Class 1

Cost-effective Low-energy Advanced Sustainable So1utions

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National Guidelines for Residential Buildings presented as Grid of applicability in participating countries

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1. PREFACE: THE CLASS 1 PROJECT

The idea of the project CLASS 1 is to use the strengthening of the energy requirements to boost and drive the technological developments and to prove the economical and environmental benefits of ultra-low energy buildings (50% below the new requirements in the Danish building regulations) integrated with biomass- and solar heating based renewable energy supply.

In this context the Scientific & Technical objectives are to:
1. Optimise the integration of low-energy building technologies with supply (renewable and conventional) and distribution (heating and electricity) technologies.
2. Advance selected technologies within the 3 areas: low-energy building, renewable energy supply and distribution
3. Improve the design, checking and verification procedures (this relates directly to the implementation of the building energy performance directive -EPBD).
4. Integrate the European ecolabel in the building projects (houses and components)
5. Demonstrate large scale implementation at close to market technical and economical conditions.

The Class 1 project is focused on the optimisation of sustainable energy systems in local communities, through an innovative integration of RE technologies with ultra low-energy buildings.
The bio-mass CHP system produces electricity and heat that are distributed directly to the use for heating in an innovative local district heating system for the dense, low-rise houses, and through the electricity network to heat the single family houses by heat pumps. Solar heating systems integrated in the network – and individual systems on the single family houses will be supplementing the CHP and taking over the in summer months when it is shut down. An advanced Building Energy Management System will control the energy supply, the thermal storages (for solar and for heating energy pulses from the CHP plant).
The Class 1 project has been designed to demonstrate that sustainable energy solutions in which integrated energy efficiency and renewable energy sources are economically viable, and technically and aesthetically acceptable.

The project also has special focus on the Indoor Environmental Quality (IEQ) to make sure that the energy savings are met without reducing the IEQ standards set out in the design specification phase. The IEQ focus is one of the areas in which the Class 1 project involves partners from other EU countries who are experts in respectively lighting and thermal comfort issues. Also trans-national cooperation is introduced for the socio-economic research part of the project, which deals with the user point of view (priorities, etc.) in the participating countries.
The Class 1 project demonstrates improvements to 6 individual technologies (windows, slab and foundation insulation systems, bio-mass gasification, local district heating distribution networks, ventilation heat recovery combined with heat-pumps and BEMS) and an innovative integration of these technologies (with solar heating) which lead to improved cost effectiveness.

2. EXISTING GUIDELINES: THE ENQUIRY

Aim of this document is to evaluate the cross applicability of existing guidelines in participating countries and how they fit with national implementation of Energy Building Performance Directive.
In order to accomplish the task, the first step was to realize an enquiry about the existence and the contents of national or local Guidelines in participating countries: Denmark, Estonia, France, Italy and Romania.

2.1. QUESTIONNAIRE

The experts of participating countries had to answer to following questionnaire.

1. Is in your Country/Region/Community available one or more Specific Design guideline(s) for Sustainable Buildings?
2. If Yes, quote the Authority / Institute that elaborates and/or propose them
3. Do they propose a design evaluation scheme (checklist, calculation method or similar)?
4. If Yes, please shortly describe it

5. Which items do they cover?

Site analysis
a. Surrounding environmental quality control (noise, pollution etc.)
b. Microclimate effects
c. ...
Low-energy housing design
d. Shape and orientation
e. Envelope / Windows / Thermal bridges
f. Thermal mass
g. Solar shading
h. Air-tightness
i. …
Plants
j. Heating system design for low-energy housing
k. Heat pumps
l. Cooling
m. Ventilation
n. Heat recovery
Renewables
o. Solar heating systems for DHW
p. Solar cells
q. …
Controls
r. Building energy management systems – BEMS
Resources
s. Rainwater harvesting
t. Water saving
u. ...
Materials
v. Recycling
w. Sustainable
x. ...

6. Does Guidelines provide information about manufacturers?

7. If Yes, on which items?
a. Windows
b. Insulations
c. Bricks
d. Systems
e. House-manufacturers
f. ….

2.2. RESULTS OF QUESTIONNAIRE

The results of this enquiry are summarized in following tables

1. Is in your Country/Region/Community available one or more Specific Design guideline(s) for Sustainable Buildings?

DK	Yes, DK has a guideline called: BPS 121: Guidelines for Environmental Management in Project Design (in Danish) from 1998. The Danish calculation method is described in SBi Guideline 213: Buildings energy consumption – a calculation method. The guideline is in Danish and is from 2006. Furthermore we have several guidelines concerning energy efficient buildings (in Danish): SBi guideline 196: The indoor Climate Guide and SBi Guideline 189; Single family houses. Insulation, moisture protection, acoustics, fire resistance, ventilation and strength. Finally, a Nordic scheme for environmental labelling of one family houses has to a certain degree been used in Denmark: Swan-labelling of small houses, see http://www.ecolabel.dk/inenglish.
ES	No, we do not have any specific design guidelines and based on the information from Estonian Ministry of Economic Affairs and Communications there are no specific design guidelines under writing. Due to Building energy efficiency Directive 2002/91/EC Minimum Requirements for Energy Efficiency have been approved and therefore mandatory to use from 01.01.08. This document gives basic inputs to certificate the accordance to requirements and calculation methods.
FR	No: but one is under writing in the SHE (Sustainable Housing in Europe) European project (cf. www.she.coop) ending in march 2009. In France we are proud of the HQE® approach worked out by our public research centre CSTB but it deals only with environmental issues and only on means (and not with performances). This should change with the energy performances needed now… For example ICEB, one of the main architects associations left the HQE association in April 2009.
IT	Yes: BRICK (1999); Energy Guideline PEC 2007); New Building Rule (In elaboration)
RO	No: Romanian authorities try now to include in her strategies the “sustainable building” concept

2. If Yes, quote the Authority / Institute that elaborates and/or propose them

DK	BPS 121 is based on an initiative from the Danish Environmental Protection Agency, the Danish Association of Consulting Engineers and the Danish Council of Practising Architects, The Danish Building Research Institute and some more partners.
ES	This issue is under the jurisdiction and competency of Estonian Ministry of Economic Affairs and Communications.
FR	For the HQE® approach most of the documents have been provided by CSTB
IT	BRICK "Municipality of Bologna" with "SOFTECH Energy Technology Environment"; Energy Guideline: Comune di Bologna in collaboration with "La Esco del sole"
RO	No

3. Do they propose a design evaluation scheme (checklist, calculation method or similar)?

DK	No, BPS 121 focuses first of all on the design process, not directly on a design evaluation scheme like BREEAM or LEED. BPS 121 includes a number of checklists for all the stages in the design process, e.g. concerning mapping and prioritizing of environmental impacts related to the building project. To a certain degree, BPS 121 does cover all the aspects mentioned in question 4, but not as a checklist for design evaluation.
ES	Yes, there are calculation rules for heating, ventilation, cooling and other technological systems
FR	No for HQE®. There are 14 targets and for getting one of the HQE certification you must do better than the national regulation for between 3 and 6 of them.
IT	No
RO	No

4. If Yes, please shortly describe it

DK	Document attached
ES	It provides calculation directions, requirements for the systems, use of free energy
FR	Document attached
IT	
RO	

5. Which items do they cover?

		Site analysis				**Low-energy housing design**			**Plants**								**Renewables**		**Controls**	**Resources**			**Materials**	
		Surrounding environmental quality control (noise, pollution etc.)	Microclimate effects	District Heating	Shape and orientation	Envelope / Windows / Thermal bridges	Thermal mass	Solar shading	Air-tightness	Heating system design for low-energy housing	Heat pumps	Cooling	Ventilation	Heat recovery	Illumination	Cooling	Solar heating systems for DHW	Solar cells	Building energy management systems - BEMS	Rainwater harvesting	Water saving	...	Recycling	Sustainable
DK																								
ES		Y	Y		N	Y	Y	N	Y	N	Y	Y	Y	Y			N	N	N	N	N		N	N
FR																								
	BRICK 1999	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y				N	N	N	Y	Y		N	N
IT	Pec 2007	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y		N	N
RO																								

6. Does Guidelines provide information about manufacturers?

DK No, BPS 121 provides environmental data for a number of construction materials, but not necessarily for specific manufacturers.

ES No

FR No but in the Factor 4 project we provided sheets on energy efficient technologies with economic data

IT No

RO No

7. If Yes, on which items?

	a.	b.	c.	d.	e.	f.
DK	Windows	Insulations	Bricks	Systems	House-manufacturers	….
ES						
FR						
IT						
RO						

3. NATIONAL GUIDELINES SUMMARIES AND APPLICABILITY EVALUATION

After the enquiry, guidelines of three countries (DK, IT and RO) were summarized and their applicability was evaluated by experts from other countries.

In following tables the evaluation of applicability of each item of each guideline is reported: experts were then requested to assess the applicability of principle of each item to the situation of their own country in a scale from 1 (poor or null applicability) to 10 (fully applicable). The judgment is then affected not only by national regulations, but by climate and/or socio economic assessment.

In some cases, where the specific requirement (i.e. envelope transmittance or similar) were reported, the assessment of applicability should be intended only regarding the principle and not the reported values.

In order to point out the applicability of the different items of each guidelines in other participating countries, the table cells have been highlighted with different colors, with the following “traffic light” color code:

- Very low or null applicability (1-3)
- Low applicability (4-5)
- Threshold applicability (6)
- Good applicability (7-8)
- Very good applicability (9-10)

3.1. DANISH GUIDELINE

						Principle and masures applicability			
Action	Item	Guideline summary	Constraints and suggested measures	Reference to national codes and norms/standards	Reference to guidelines and other sources	FR	IT	EE	RO
District Heating and CHP network	District Heating	District heating is a good solution for new settlements in order to have more efficient heating and DHW systems, avoiding local combustion emissions at building level. In new settlements the connection to an existing available District Heating network is compulsory except for Low Energy Class 1 and 2 houses	The heating system including the heating coils and similar shall be dimensioned with a supply temperature of max 70 °C and a return temperature of max 40 °C at the dimensioning outdoor temperature	Building Regulations 2008 (Danish Enterprise and Construction Authority - EBST) DS 469 Heating systems with water as the heating medium		6	10	8	9
	CHP	In new settlements District Heating Systems can be conveniently combined with a Micro Cogeneration system. The Building Regulation apply to small scale CHP plants (combined heat and power) with an output not exceeding 120 kW	When determining the energy demand, account may also be taken of the use of mini CHP plants (combined heat and power). Small-scale CHP plants must be designed and built for energy-efficient operation	Building Regulations 2008 (Danish Enterprise and Construction Authority - EBST)		5	7	2	8
Building Envelope	Building Orientation	Building orientation can substantially contribute in heating loads reductions and in a better summer comfort, avoiding the installation of air conditioning systems.	Avoid excess temperature (in the calculatuon of energy consumption the energy for dealing with high room temperature by standard AC is added even if NOT installed)	Building Regulations 2008 (Danish Enterprise and Construction Authority - EBST)	EBST homepage - example collection - www.ebst.dk SBi guideline 196: The Indoor Climate Guide	6	10	7	10

						Principle and masures applicability			
Action	Item	Guideline summary	Constraints and suggested measures	Reference to national codes and norms/standards	Reference to guidelines and other sources	FR	IT	EE	RO
Building Envelope	Building envelope Thermal insulation Energy demand	A better builing envelope can reduce the heating and cooling energy demand. Building envelope components have to accomplish with maximum values of transmittance. Energy demand of the building can not exceed a fixed value	U-value (W/m^2°K) of building envelope components can not exceed following values: external walls=0.40; roof=0.25; ground-on-slab floor=0,30; windows (frames included)=2.0. Furthermore for buildings and for low energy buildings there a total energy performance framework i.e. energy supply for heating, ventilation, cooling and DHW and lighting for non-residential buildings. A low energy performance framework for residential buildings, student halls of residence/dormitories, hotels etc., i.e. a building whose total demand for energy supply for heating, ventilation, cooling and domestic hot water per m² of heated floor area does not exceed 35 kWh/m²/year plus 1100 kWh/year divided by the heated floor area may be classified as a class 1 low energy building	Building Regulations 2008 (Danish Enterprise and Construction Authority - EBST)	Energy Agency homepage. Furthermore guidelines from Stenløse municipiality on www.Stenloesesyd.dk and www.class1.dk/en/publications/reports/	10	10	10	10
Building Envelope	Building Geometry	Buildings with same volume (V) but different external surfaces area (S) have different Energy Performance. Energy Demand decreases if the ratio S/V decreases as well	The optimum design is necessary to fulfil the energy frame requirements	Building Regulations 2008 (Danish Enterprise and Construction Authority - EBST)		5	10	8	8
Building Envelope	Sunspaces and Passive systems	Sunspaces and passive solar devices, integrated in the building envelope, shall be included in the calculation		Building Regulations 2008 (Danish Entreprise and Construction Authority - EBST)		8	6	3	8
Building Envelope	Airtightness	Air tightness can significantly contribute to energy efficiency of the building: involuntary and non necessary air changes increase energy consumption during heating season.	Air changes through leakage in the building envelope may not exceed 1.5 l/s/m² of the heated floor area when tested at a pressure of 50 Pa. The result of the pressure test must be expressed as the average of measurements using overpressure and underpressure. For buildings with high ceilings, in which the surface area of the building envelope divided by the floor area is greater than 3, air changes may not exceed 0.5 l/s per m² of the building envel.	Building Regulations 2008 (Danish Enterprise and Construction Authority - EBST)	SBi Direction 214 The airtightness of the thermal envelope) (in Danish) 2007	7	5	4	2

						Principle and masures applicability			
Action	Item	Guideline summary	Constraints and suggested measures	Reference to national codes and norms/standards	Reference to guidelines and other sources	FR	IT	EE	RO
Plant	Ventilation	Single-family houses may be ventilated by natural or mechanical ventilation. A fresh air supply of 0.35 l/s/m2 corresponds to an air change of 0.5 times per hour with a room height of 2.5 m. The floor area counted is the net area	Each habitable room as well as the dwelling as a whole must have a fresh air supply of no less than 0.35 l/s/m². Indoor air must be removed by extractors from kitchens, bathrooms, lavatories, utility rooms etc. Natural ventilation may be used in single-family houses. In dwellings in multi-storey buildings, a minimum fl ow of 20 l/s must be extracted from kitchens, and a minimum flow of 15 l/s from bathrooms and lavatories. An extractor hood with mechanical extraction must be installed above the cooker in all dwellings in blocks of fl ats and single-family houses. Fresh air must be supplied to the habitable rooms either through fresh air vents, automatically controlled windows or by mechanical forced air supply			8	7	5	8
Plant	Daylighting	Working areas, occupable rooms in institutions, teaching rooms, dining areas and habitable rooms must have sufficient daylight for the rooms to be well lit. Windows must be made, located and, where appropriate, screened such that sunlight through them does not cause overheating in the rooms, and such that nuisance from direct solar heat gain is avoided	In working areas, the daylight can usually be taken to be sufficient if the glazed area of side lights corresponds to a minimum of 10% of the floor area or, in the case of roof lights, no less than 7% of the floor area, assuming that the light transmittance of the glazing is no less than 0.75. The 10% and 7% are guidelines assuming a normal location of the building and a normal layout and fitting out of the rooms. If the type of window is not known at the time of design, the clear frame area can be converted to the glazed area by multiplying the clear frame area by a factor of 0.7. The glazed area must be increased in proportion to any reduction in light transmittance (for example solar control glazing) or reduced light ingress to the windows (for example nearby buildings). Daylight may similarly be deemed to be adequate when calculation or measurement can demonstrate that there is a daylight factor of 2% at the workplaces	Building Regulations 2008 (Danish Enterprise and Construction Authority - EBST)	By og Byg Guidelines 203, ”Beregning af dagslys i bygninger” [Calculation of daylight in buildings] and SBi Guidelines 219, “Dagslys i rum og bygninger, 2007” [Daylight in rooms and buildings, 2007]	9	7	5	10

						Principle and masures applicability			
Action	Item	Guideline summary	Constraints and suggested measures	Reference to national codes and norms/standards	Reference to guidelines and other sources	FR	IT	EE	RO
Plant	Natural Ventilation	Simple strategies can help in providing efficient natural ventilation, useful for avoiding adoption of mechanical cooling systems	In new buildings all rooms where a continuous stay is foreseen have to be provided of openings directly connected with an external healthy areas	Building Regulations 2008 (Danish Enterprise and Construction Authority - EBST)		10	10	1	10
Plant	High efficiency boilers	Installation of high efficeincy boilers (i.e. condensing boilers) save energy for building heating	On CE marking, gas-fired boilers must have a fuel use efficiency of no less than 96% at full load and 104% at 30% part load. The fuel use efficiency is measured at 70°C at full load and at 0°C at part load. On CE marking, oil fired boilers must have a fuel use efficiency of no less than 91% at both part and full load	Building Regulations 2008 (Danish Entreprise and Construction Authority - EBST)		10	10	10	8
Plant	High efficiency conditioning systems	High efficiency air conditioning systems should be installed only after other passive solutions (i.e building orientation, insulation etc.) have been considered				10	10	7	7
Plant	Mechanical forced ventilation	Mechanical forced ventilation regulate temperature and humidity control over the rate of airflow delivered	Ventilation installations must be installed, fully commissioned and handed over as stated in DS 447 Code of practice for mechanical ventilation installations. Ventilation installations must be installed such that they do not constitute a fire hazard. Installations must comply with DS 428, the Danish Society of Engineers' Code of practice for technical measures for fire protection in ventilation systems for buildings. Ventilation installations must incorporate heat recovery with a temperature efficiency of no less than 65%. For ventilation installations with a constant air volume, the power consumption for air movement may not exceed 2,100 J/m³ fresh air. For installations with a variable air volume, the power consumption for air movement may not exceed 2,500 J/m³ fresh air at a maximum output and at maximum pressure drops. For extraction systems without mechanical fresh air supply, the specific power consumption for air movement may not exceed 1,000 J/m	Building Regulations 2008 (Danish Enterprise and Construction Authority - EBST) DS 447 Code of practice for mechanical ventilation installations. DS 428, the Danish Society of Engineers' Code of practice for technical measures for fire protection in ventilation systems for buildings		8	7	10	2

						Principle and masures applicability			
Action	Item	Guideline summary	Constraints and suggested measures	Reference to national codes and norms/standards	Reference to guidelines and other sources	FR	IT	EE	RO
Plant	Low temperature floor heating systems	Low temperature floor heating systems are used in many new buildings	If combined with condensation boilers or heat pumps (low temperature distribution systems) a high efficiency is obtained. Also relevant for district heating			9	8	10	2
Plant	High efficiency heat pumps	Heat pump is a machine that moves heat from one location (the 'source') to another location (the 'sink' or 'heat sink') using mechanical work	Heat pumps must be made and installed so as to avert any danger of fire, explosion, poisoning and health hazards	Building Regulations 2008 (Danish Enterprise and Construction Authority - EBST) DS 469 Heating systems with water as the heating medium		8	8	8	5
Plant	Thermostats and radiator valves to prevent overheating	Thermostats or radiator valves allow to maintain the right value of the internal temperature, avoiding unnecessary overheating in case of solar and/or internal gains	Electric and air heating systems in buildings must incorporate automatic regulation of heat transfer according to the heat demand. The system must also be fitted with time and temperature control of heat transfer to the rooms. The code of practice (DS 469) contains, inter alia, functional requirements for the control and regulation of heat emitters	Building Regulations 2008 (Danish Enterprise and Construction Authority - EBST) DS 469 Heating systems with water as the heating medium		10	10	10	8
Plant	Heat meter and accounting systems	In building with central heating system, heat meter systems allow a control and the right distribution of heating energy bill amongst the owners	Compulsory in new buildings and in case of refurbishment of heating plant			5	n.a.	10	10
Plant	Cooling demand assessment	Cooling systems must incorporate automatic regulation of the cooling or heating output according to the demand. Cooling systems must also be fitted with time and temperature control of cooling output to the rooms		DS/EN 378 series on refrigerating systems		10	10	10	10
Plant	Lighting control systems	The use of ligting control is necessary to fulfil the energy frame requirements for offices and institutions	The calculation of electricity for movement sensors and light control sensors is already standard in the calculation method			10	10	9	9

						Principle and masures applicability			
Action	Item	Guideline summary	Constraints and suggested measures	Reference to national codes and norms/standards	Reference to guidelines and other sources	FR	IT	EE	RO
Plant	Lighting systems efficiency standards	Working areas and shared access routes must have artificial lighting as necessary. For the types of working areas covered by the DS 700 series, Artificial lighting in workrooms, these standards must be used		Building Regulations 2008 (Danish Enterprise and Construction Authority - EBST) Danish Standards: DS 700 Artificial lighting in workrooms, DS 703 Directions for lighting in hospitals, DS 704 Lighting – Defi nitions, DS 705 Artifi - cial lighting in dental consulting rooms, DS 707 Sports lighting – Semi-cylindrical illumination, DS/EN 12193 Light and lighting – Sports lighting		8	8	8	8
Plant	Water accounting and use saving	Plumbing systems must be designed to avoid unnecessary water consumption, including waste of water	Installation of individual meters in order to control and reduce the water consumption	Building Regulations 2008 (Danish Enterprise and Construction Authority - EBST)	"Rørcenteranvisning 002 Ressourcebesparende vandinstallationer i boliger" [the Pipe Centre guidance 002 Resource-saving plumbing systems in dwellings]	10	10	10	8
Plant	Rainwater recovery systems	Rainwater systems in which rainwater from roofs is used for WCs and washing machines in dwellings and similar buildings must be designed in accordance with the executive order on water quality and inspection of water supply systems issued by the Ministry of the Environment and Energy		Building Regulations 2008 (Danish Enterprise and Construction Authority - EBST)		5	10	7	1
Plant	Thermal solar heating systems	Solar heating systems should be arranged to achieve maximum energy usage	Good orientation and slope of solar collectors are crucially important to their performance. Production of domestic hot water causes a great reduction in the energy need	Building Regulations 2008 (Danish Enterprise and Construction Authority - EBST)		10	10	3	8

						Principle and masures applicability			
Action	Item	Guideline summary	Constraints and suggested measures	Reference to national codes and norms/standards	Reference to guidelines and other sources	FR	IT	EE	RO
Plant	Photovoltaic Systems	Solar cell arrays should be arranged to achieve maximum energy usage	Good orientation and slope of solar cell panels are crucially important to their performance. The location of the inverter in solar cells connected to the grid and its ambient temperature also have a great impact on its performance	Building Regulations 2008 (Danish Enterprise and Construction Authority - EBST)		10	10	1	5
Design evaluation	Design process	The report includes a number of checklists for all the stages in the design process, e.g. concerning mapping and prioritizing of environmental impacts related to the building project.	Checklists are available		BPS 121: Guidelines for Environmental Management in Project Design (in Danish)	10	10	10	10

3.2. ITALIAN GUIDELINE

					Principle applicability			
Action	Item	Guideline summary	Constraints and Suggested Measures	Reference to National codes	DK	FR	EE	RO
District Heating and CHP network	District Heating	District heating is a good solution for new settlements in order to have more efficient heating and DHW systems, avoiding local combustion emissions at building level. In new settlements the connection to an existing available District Heating network is complusory.	Efficiency of distribution network > 85% Price of thermal kWt can not be higher than the correspondent price of thermal kWh locally produced with natural gas	Legge 10/91; Piano Energetico Regione Emilia Romagna	8	6	8	9
	CHP	In new settlements District Heating Systems can be conveniently combined with a Micro Cogeneration system	Overall efficiency > 70% for Power < 1 MWe	Dlgs 20/2007	7	5	2	8
			Overall efficiency > 75% for Power > 1 MWe		7	5	2	
			Efficiency of heat distribution network > 90%		10	5	2	
Building Envelope	Building Orientation	Building orientation can substantially contribute in heating loads reductions and in a better summer comfort, avoiding the installation of air conditioning systems.	Main axis of the building have to be oriented in E-W direction, with maximum deviation of 45°. Compulsory for new buildings if technically possible	Legge 10/91; Dlgs 192/05; Dlgs 311/06 Regolamento edilizio tipo Regione Emilia Romagna	7	6	5	10
Building Envelope	Heat Islands reduction	Heat island effect has to be controlled by mean of an adequate design of external building surfaces and of surroundings (Urban Layout) This phenomena may cause an increasing of local air and mean radiant temperatures during day and nighttime. Heat islands have secondary effects like ozone generation. Heat islands may occur in presence of dark coloured surfaces (walls and pavements), big surfaces treated with concrete and asphalt and scarcity of vegetation and wet surfaces.	1. Control of albedo of external surfaces and pavements helps in reducing the surface temperatures	Dlgs 192/05; Dlgs 311/06;PER Regione Emilia Romagna	n.a.	n.a.	n.a.	8
			2. Vegetation may have a positive effect on microclimate, helping the shadowing of built surfaces. Green roof technology is suggested if acces for maintenance can be guaranteed.		n.a.	6	n.a.	
			3. Double skin of reflecting (or non absorbent) material on vertical surfaces, in particular on east and west facades.		n.a.	n.a.	n.a.	
			4. Shading devides for glazed surfaces		n.a.	5	n.a.	
			5. Shadowing of parking: at least the 50% of parking area sould be protected by means of trees		n.a.	5	n.a.	

					Principle applicability			
Action	Item	Guideline summary	Constraints and Suggested Measures	Reference to National codes	DK	FR	EE	RO
Building Envelope	Building envelope Thermal insulation	A better building envelope can reduce the heating and cooling energy demand. Building envelope components have to accomplish with maximum values of transmittance and energy demand of the building can not exceed the values fixed by the Italian regulation in relation to S/V ratio.	In climate area of North Italy (Zona E), in residential buildings, Uvalue (W/m2°K) of building envelope components can not exceed following values: opaque vertical=0,34; roof=0,30; floor=0,33; windows (frames included)=2,2; glazing=1,7. Regulation of Energy performance of building, fixes values in terms of Primary Energy for Heating, variable between 34 and 116 kWh/m2a, according the local value of DD and the value of parameter S/V. In BEU (Bacini Energetici Urbani, areas where the energy efficiency is promoted) the maximum value of Energy Demand for Heating can not exceed 30 kWh/m2 a. If the roof is tilted and directly connected with a living area it has to be a ventilated roof. A bonus of 25 cm of the walls thickness, over the foreseen 30 cm, in terms of buildable volume, is awarded if useful for improve the level of insulation or thermal mass	Dlgs 192/05; Dlgs 311/06;PER Regione Emilia Romagna	9	10	10	10
Building Envelope	Building Geometry	Buildings with same volume (V) but different external surfaces area (S) have different Energy Performance. Energy Demand decreases if the ratio S/V decreases as well.	In case of residential buildings the S/V ratio should not exceed the value of 0,6. For all other typology it can not exceed 0,4. Compulsory in case of new buildings in BEU (zones where the Energy Efficiency is promoted).	Legge 10/91; Dlgs 192/05; Dlgs 311/06 PER Regione Emilia Romagna ; Regolamento edilizio tipo Regione Emilia Romagna	10	4	8	8
Building Envelope	Sunspaces and Passive systems	Sunspaces and passive solar devices, integrated in the building envelope, are considered as technical volumes. They can be added to the overall volume of the building, and are not calculated as part of the authorized volume.	In new and existing buildings the closure of terraces or loggias, is authorized if finalized to energy efficiency, certified with a technical report. Technical report has to evaluate the achieved energy saving that have to be at least of 25%. Structures of closure have to be transparent, except the frames structure, and adequate shading systems have to be foreseen. Volume of the system can not exceed the 10% of the entire building volume	Legge 10/91; Dlgs 192/05; Dlgs 311/06 PER Regione Emilia Romagna ; Regolamento edilizio tipo Regione Emilia Romagna	5	6	3	8

					Principle applicability			
Action	Item	Guideline summary	Constraints and Suggested Measures	Reference to National codes	DK	FR	EE	RO
Plant	Daylighting	Daylighting exploitation is recommended in Non Residential building and advisable in residential building. Special care in designing openings and windows in relation to building orientation is requested.	For new residential buildings glazed surfaces of living rooms, kitchens, dining room etc. have to be oriented in a range of ±45° from the south.	Legge 10/91; Dlgs 192/05; Dlgs 311/06 PER Regione Emilia Romagna ; Regolamento edilizio tipo Regione Emilia Romagna; Regolamento Edilizio Comune di Bologna	7	8	5	8
Plant	Natural Ventilation	Simple strategies can help in providing efficient natural ventilation, useful for avoiding adoption of mechanical cooling systems	In new buildings all rooms where a continuous stay is foreseen have to be provided of openings directly connected with an external healthy areas.	Legge 10/91; Dlgs 192/05; Dlgs 311/06 PER Regione Emilia Romagna ; Regolamento edilizio tipo Regione Emilia Romagna; Regolamento Edilizio Comune di Bologna	10	9	1	8
Plant	High efficiency boilers	Installation of high efficeincy boilers (i.e. condensing boilers) is a good solution to save energy for building heating. In new buildings with more than 4 domestic dwelling, the use of high efficiency centralized heating systems is compulsory	Minimum boiler efficiency natural gas: > 91 + logPn % oil: > 93 + 2 logPn % Mean overall global heating season efficiency: > 75 + 3log Pn %	DPR 412/93 e succ., DPR 15/11/96 n. 660, Dlgs 192/05, Dlgs 311/06, PER Emilia Romagna, Regolamento Edilizio Tipo Regione Emilia Romagna, Regolamento edilizio Comune di Bologna	8	10	8	8
Plant	high efficiency conditioning systems	High efficiency air conditioning systems (with inverter) are a good solution for save energy for summer cooling, both in existing and new buildings. They should be installed only after other passive solutions (i.e building orientation, insulation etc.) have been considered. In large buildings, the conditioning system should be centralized	ERR > 4,5	2002/31/CE directive (Energy Consumption of Air Conditioners for Domestic Use), Dlgs 192/05, Dlgs 311/06, PER Emilia Romagna, Regolamento Edilizio Tipo Regione Emilia Romagna	6	5	10	7
Plant	summer conditioning with absorbing cooling systems	Reduction of electricity loads for summer conditioning, using absorbing cooling devices, that through a chemical cycle, produce cold from a heat source (combustion, CHP, solar etc.). This solution should be evaluated when a CHP system is foreseen, in order to increase its operating hours	A high temperature heat source is needed: > 90 °C Efficiency of this system is lower (0,6 - 0,7) of traditional compression conditioning tecnology	Dlgs 192/05, Dlgs 311/06, PER Emilia Romagna, Regolamento Edilizio Tipo Regione Emilia Romagna	3	2	2	7

					Principle applicability			
Action	Item	Guideline summary	Constraints and Suggested Measures	Reference to National codes	DK	FR	EE	RO
Plant	mechanical forced ventilation	Mechanical forced ventilation regulate temperature and humidity control over the rate of airflow delivered.	air turnover rate > 0,25 Vol/h for higher turnover rate, compliance with UNI 10229; heating recover > 40%	Dlgs 192/05, Dlgs 311/06, PER Emilia Romagna, Regolamento Edilizio Tipo Regione Emilia Romagna, Regolamento locale d'Igiene, Regolamento Edilizio Comunale	5	7	6	2
Plant	Low temperature radiant panel heating systems	suggested in new buildings and in floor renovations.	Need to be combined with condensation boilers or heat pumps (low temperature distribution systems)	Dlgs 192/05, Dlgs 311/06	8	9	10	2
Plant	High efficiency heat pumps	Heat pump is a machine that moves heat from one location (the 'source') to another location (the 'sink' or 'heat sink') using mechanical work. This technology is reccomanded when in buildings not connected to the gas or district heating grid.	heat pump efficiency > 90 + 3 log Pn. Efficiency is calculated in terms of primary energy, and the conversion factor is 0,36 Wh el / Wh Pr. En.	Dlgs 192/05, Dlgs 311/06, PER Emilia Romagna	8	9	8	5
Plant	Thermostats and radiator valves to prevent overheating	Thermostats or radiator valves allow to maintain the right value of the internal temperature, avoiding unnecessary overheating in case of solar and/or internal gains.	Installation of radiator valves is compulsory in new buildings and in heating plant renovations.	Legge 10/91, DPR 412/93, DPR 511/99, Dlgs 192/05, Dlgs 311/06	10	10	10	8
Plant	heat meter and accounting systems	In building with central heating system, heat meter systems allow a control and the right distribution of heating energy bill amongst the owners.	Compulsory in new buildings and in case of refurbishment of heating plant.	Legge 10/91, DPR 412/93, DPR 511/99, Dlgs 192/05, Dlgs 311/06	10	3	10	10
Plant	cooling demand assessment	Cooling demand have to be assessed in Non Residential Buildings, but some evaluation and constraints (that in this case are only recommendations) can be valid for residential building as well.	Thermal inertial of the building have to be at least of 230 kg/m2 (effective mass available for thermal storage/floor area). Solar Gain have to be limited in cooling season at a g-value of 0,15. This goal can be achieved with the adoption of solar shading device properly located on south, east and west facades.	Dlgs 192/05, Dlgs 311/06	5	5	6	10
Plant	lighting control systems	Lighting control systems like timers or presence identification systems can substantially contribute in reducing energy onsumption for lighting	Compulsory in Non residential buildings and in common parts (like stairs and corridors) of Residential buildings.	Dlgs 192/05, Dlgs 311/06	n.a.	9	9	9

					Principle applicability			
Action	Item	Guideline summary	Constraints and Suggested Measures	Reference to National codes	DK	FR	EE	RO
Plant	lighting systems efficiency standards	In lighting systems design the reference technical normative is the UNI 10380	Recommended in new buildings and adviceable in refurbishment.	Dlgs 192/05, Dlgs 311/06		n.a.		8
Plant	water accounting and use saving	Installation of individual meters in order to control and reduce the water consumption	Compulsory in new buildings in BEU areas, recommended in major refurbishment	Legge 10/91, DPR 412/93; Dlgs 192/05, Dlgs 311/06	10	10	10	8
Plant	rainwater recovery systems	Installation of rainwater harvesting systems	Compulsory in BEU areas (Bacini Energetici Urbani, areas where the energy efficiency is promoted)		n.a.	8	7	1
Plant	thermal solar heating systems	In new buildings,thermal solar heating systems, dimensioned to cover at least 50% of annual Domestic Heating Water, should be compulsory.	Solar collector have to be installed on south roof pitches.	Legge 10/91, Dlgs 192/05, Dlgs 311/06	6	8	3	8
Plant	Photovoltaic Systems	Installation of a photovoltaic systems (> 0,2 kW) in new buildings is a good practice	Photovoltaic modules have to be installed on south roof pitches.	Legge 10/91, LR 26/04, Dlgs 387/03, DM 28/07/05, Dlgs 192/05, DM 06/02/06, Dlgs 311/06, DM 19/02/2007, Legge Finanziaria 2007 (n. 296/06)	6	5	1	5

3.3. ROMANIAN GUIDELINE

					Principle and masures applicability			
Action	Item	Guideline summary	Constraints and suggested measures	Reference to national codes and norms/standards	FR	IT	EE	DK
District Heating and CHP network	District Heating	District heating is a strategical option of the Romanian Goverment Also, for new settlements district heating is a good solution in order to have more efficient heating and DHW systems, avoiding local combustion emissions at building level. In new settlements the connection to an existing available District Heating network is compulsory.	- Efficiency of distribution network min 80% - low prices or at least equal with thoose offered by individual alternative solutions; - energetic efficiency per year of production units will be at least 80% and at least 70% at the units that will use biomass as principal resource. - the temperature of termic agent for heating must assure normal termic comfort in spaces used as house. - the temperature of hot water is between 55 - 60 Celsius degrees.;	- Government decision no. 882/2004 - National strategy regarding suppling the localities with thermic energie throught central production and distribution sistems - Law no. 325/2006 regarding public service of supply with thermic energie	6	8	6	8
	CHP	Reabilitation of existing District Heating Systems promoting Micro Cogeneration system. In new settlements District Heating Systems can be conveniently combined with a Micro Cogeneration system. The Building Regulation apply to small scale CHP plants (combined heat and power) with an output not exceeding 100 kW	- When determining the energy demand, account may also be taken of the use of mini CHP plants (combined heat and power). - theoretical about 80-85% of the heating delivered during one year can be produced in cogeneration. - for new buildings with an area of over 1000 square metres it is compulsory to elaborate an economic study regarding the problem of heating in cogeneration sistem. - 26 towns benefit in the central heating by cogeneration plants installed before 1989.	- Government decision no 219/2007 regarding promoting of cogeneration based of the request of available thermic energie - Law number 372/ 2005 regarding energetic performance of the buildings.	4	8	2	7

					Principle and masures applicability			
Action	Item	Guideline summary	Constraints and suggested measures	Reference to national codes and norms/standards	FR	IT	EE	DK
Building Envelope	Building Orientation	Building orientation can substantially contribute in heating loads reductions and in a better summer comfort, avoiding the installation of air conditioning systems.	it is recommended that the buildings should be orientated to South - South East at 18 degrees to East situation that it is convenient for Romania because the ligh and termic radiation are at maximum level and the solar protection is easier to realise.	- Law number 372/ 2005 regarding energetic performance of the buildings.	6	8	2	7
Building Envelope	Heat Islands reduction		1. For now it is a fact less known and approached in Romania. 2. the legislation recommends to take into account decreasing the reflection effects that can be produced by: - external unbuilded environment - vegetation, pavement, water areas. - solar protection elements that are arranged outside. 3. it is compulsory to use marterials and colours that should reflect at least on 30% from the surface. Shadowing of parking: at least the 50% of parking area sould be protected by means of trees		3	9	n.a.	n.a.
Building Envelope	Building envelope Thermal insulation Energy demand	A better builing envelope can reduce the heating and cooling energy demand. Building envelope components have to accomplish with maximum values of transmittance. Energy demand of the building can not exceed the value fixed by Romanian regulation	U-value ($W/m^2°K$) For the new buildings/rehabilitated buildings: external walls = 0.67 / 0.71; roof = 0.29 / 0.33; ground-on-slab floor=0,30; windows (frames included) =1.8 / 2.5 Energy demand for the new buildings should not exced 50kWh/mp, and for rehabilitated buildings 100kWh/mp	- Law number 372/ 2005 regarding energetic performance of the buildings. The order number 157/2007 for approving technical regulation "calculation methodology of energetic performance of the buildings "	10	10	8	10

					Principle and masures applicability			
Action	Item	Guideline summary	Constraints and suggested measures	Reference to national codes and norms/standards	FR	IT	EE	DK
Building Envelope	Building Geometry	Buildings with same volume (V) but different external surfaces area (S) have different Energy Performance. Energy Demand decreases if the ratio S/V decreases as well	The optimum design is necessary to fulfil the energy frame requirements	-Law number 372/ 2005 regarding energetic performance of the buildings. The order number 157/2007 for approving technical regulation "calculation methodology of energetic performance of the buildings "	5	9	8	8
	Sunspaces and Passive systems	Sunspaces and passive solar devices, integrated in the building envelope, shall be included in the calculation		- Law number 372/ 2005 regarding energetic performance of the buildings.	n.a.	7	3	5
Building Envelope	Airtightness	Air tightness can significantly contribute to energy efficiency of the building: involuntary and non necessary air changes increase energy consumption during heating season.	the air flow capacity for a medium size multifamily building, that correspond to a pressure difference inside/outside of 50 Pa doesn't have to exceed the value of 1.6l/s/m².	- The order number 157/2007 for approving technical regulation "calculation methodology of energetic performance of the buildings "	9	7	4	7
Plant	Ventilation	Single-family houses may be ventilated by natural or mechanical ventilation. A fresh air supply of 0.35 l/s/m2 corresponds to an air change of 0.5 times per hour with a room height of 2.5 m. The floor area counted is the net area	in the buildings that will be used as dwelling it is assured natural ventilation. There are used less the mechanical and climate installations.	- The order number 157/2007 for approving technical regulation "calculation methodology of energetic performance of the buildings "	10	10	2	10
Plant	Daylighting	Working areas, occupable rooms in institutions, teaching rooms, dining areas and habitable rooms must have sufficient daylight for the rooms to be well lit. Windows must be made, located and, where appropriate, screened such that sunlight through them does not cause overheating in the rooms, and such that nuisance from direct solar heat gain is avoided	It is recommended that the building should be orientated in a position that it is necessary to assure the maximum of natural light. The ratio between the surface of the windows and the surface of the floor it is different in accordance with the destination of the building. In offices, medical consulting room, reading hall the ratio is between 1/5 to 1/7, in school rooms, laboratories, kindergartens the ratio is between 1/3 to 1/4, in dwelings the ratio is 1/6 to 1/8, in administrative buildings the ratio is between 1/6 to 1/10	- The order number 157/2007 for approving technical regulation "calculation methodology of energetic performance of the buildings "	6	8	2	7

					Principle and masures applicability			
Action	Item	Guideline summary	Constraints and suggested measures	Reference to national codes and norms/standards	FR	IT	EE	DK
Plant	Natural Ventilation	Simple strategies can help in providing efficient natural ventilation, useful for avoiding adoption of mechanical cooling systems	It is recommended that the building should be orientated in a position that it is necesary to assure the maximum of natural ventilation.	- The order number 157/2007 for approving technical regulation "calculation methodology of energetic performance of the buildings "	5	9	1	8
Plant	High efficiency boilers	Installation of high efficeincy boilers (i.e. condensing boilers) is a good solution to save energy for building heating	because in Romania it was used the central district heating sistem the individual plants are used especialy in the single dwelings, new builted. Most of this plants are from european market and the information regarding the technical characteristics are given directly by sellers or by installations firms.		9	9	7	9
Plant	High efficiency conditioning systems	High efficiency air conditioning systems should be installed only after other passive solutions (i.e building orientation, insulation etc.) have been considered			5	8	7	5
Plant	Summer conditioning with absorbing cooling systems				2	8	n.a.	3
Plant	Mechanical forced ventilation	Mechanical forced ventilation regulate temperature and humidity control over the rate of airflow delivered	in dwelings the mechanical ventilation sistems are not so used. It begun to introduce this sistem in new buildings used as offices, administrative offices and hotels.		7	7	2	6
Plant	Low temperature floor heating systems	Low temperature floor heating systems are used in many new buildings	If combined with condensation boilers or heat pumps (low temperature distribution systems) a high efficiency is obtained. Also relevant for district heating		10	8	10	7
Plant	High efficiency heat pumps	Heat pump is a machine that moves heat from one location (the 'source') to another location (the 'sink' or 'heat sink') using mechanical work	Heat pumps must be made and installed so as to avert any danger of fire, explosion, poisoning and health hazards		7	8	8	8

					Principle and masures applicability			
Action	Item	Guideline summary	Constraints and suggested measures	Reference to national codes and norms/standards	FR	IT	EE	DK
	Thermostats and radiator valves to prevent overheating	Thermostats or radiator valves allow to maintain the right value of the internal temperature, avoiding unnecessary overheating in case of solar and/or internal gains	In new buildings and the ones that were rehabilitated the static elements should be with taps with thermostat and the heating instalations should be with equipments with clocks wich can be programmed. Electric and air heating systems in buildings must incorporate automatic regulation of heat transfer according to the heat demand. The system must also be fitted with time and temperature control of heat transfer to the rooms.	- The order number 157/2007 for approving technical regulation "calculation methodology of energetic performance of the buildings "	9	10	10	10
	Heat meter and accounting systems	In building with central heating system, heat meter systems allow a control and the right distribution of heating energy bill amongst the owners	Compulsory in new buildings and in case of refurbishment of heating plant	- The order number 157/2007 for approving technical regulation "calculation methodology of energetic performance of the buildings "	6	10	10	9
	Cooling demand assessment	Cooling systems must incorporate automatic regulation of the cooling or heating output according to the demand. Cooling systems must also be fitted with time and temperature control of cooling output to the rooms	In the new buildings and the ones rehabilitated there are no conditions regarding using authomatic sistems for heating according to the termic energie needs.	- The order number 157/2007 for approving technical regulation "calculation methodology of energetic performance of the buildings "	9	8	10	5
	Lighting control systems	The use of ligting control is necessary to fulfil the energy frame requirements for offices and institutions	Recommended in new buildings and adviceable in refurbishment.	- The order number 157/2007 for approving technical regulation "calculation methodology of energetic performance of the buildings "	9	9	9	9
	Lighting systems efficiency standards	Working areas and shared access routes must have artificial lighting as necessary. For the types of working areas covered by the DS 700 series, Artificial lighting in workrooms, these standards must be used			9	8	8	8
	Water accounting and use saving	Plumbing systems must be designed to avoid unnecessary water consumption, including waste of water	Installation of individual meters in order to control and reduce the water consumption		7	8	10	8

					Principle and masures applicability			
Action	Item	Guideline summary	Constraints and suggested measures	Reference to national codes and norms/standards	FR	IT	EE	DK
	Rainwater recovery systems	Rainwater systems in which rainwater from roofs is used for WCs and washing machines in dwellings and similar buildings must be designed in accordance with the executive order on water quality and inspection of water supply systems issued by the Ministry of the Environment and Energy	not used in Romania		6	8	7	5
	Thermal solar heating systems	Solar heating systems should be arranged to achieve maximum energy usage	Good orientation and slope of solar collectors are crucially important to their performance. Production of domestic hot water causes a great reduction in the energy need. It is a solution that begun to be used The program Green House support the instalation and using of heating solar sistems.	- Government decision no.1.069/2007 - Romanian energetic strategy for the period of time between 2007-2020.	9	8	3	7
	Photovoltaic Systems	Solar cell arrays should be arranged to achieve maximum energy usage	Good orientation and slope of solar cell panels are crucially important to their performance. The location of the inverter in solar cells connected to the grid and its ambient temperature also have a great impact on its performance		9	8	1	6
Design evaluation	Design process	The report includes a number of checklists for all the stages in the design process, e.g. concerning mapping and prioritizing of environmental impacts related to the building project.			10	9	10	10

4. EVALUATION OF RESULTS OF APPLICABILITY ASSESSMENT

The evaluation of results of assessment from national experts was elaborated dividing the answers in above mentioned 5 classes:

Very low or null applicability (1-3)
Low applicability (4-5)
Threshold applicability (6)
Good applicability (7-8)
Very good applicability (9-10)

Then the frequency of each class was represented in following histograms. Moreover, in order to summarize the level of applicability of guidelines, in general and for each action categories (DH, Envelope, Plants), the mean vote and the standard deviation (in order to validate the consensus degree) were reported in following tables.

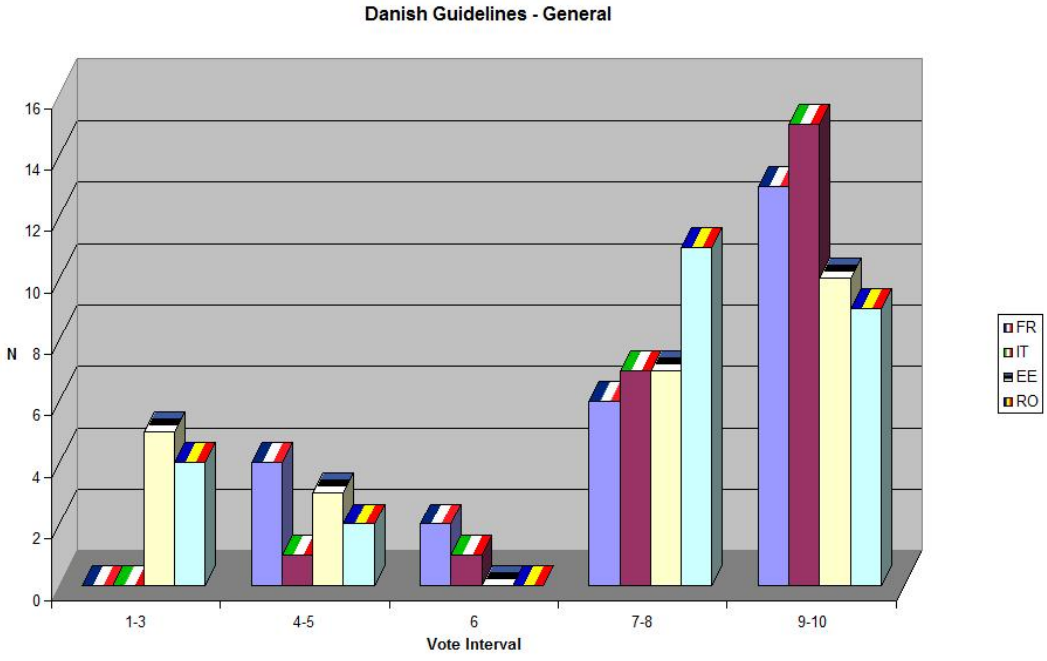
4.1. DANISH GUIDELINES

In general the Danish guidelines received good marks from all the other national experts (84% of marks higher than 6 by France, 96% by Italy, 68% by Estonia and 77% by Romania).

Applicability can be understood only on technical issues or regarding both economic and technical issues and sometimes as regarding also social issues, as it has been done in the answers from France. There is also answers on what has been done or is done up to now and what are the tenders (and market trends). France answered on tenders for the next years.

Analyzing the marks related to the different categories (District Heating, Building Envelope an Building Plants), the low marks are related only:

- to the District Heating, by France and Estonia, because now in France they only build few houses and so it is not possible to build a new district heating for only few housing (it is not cost efficient). Further more social owners don't want to be connected anymore to district heating because of the rent calculation and this is an important problem not yet solved. Last the next regulation should forbid electric heating and promote district heating with wood in France.
- and to the Building Envelope (low mark only from the Estonian Expert).



DANISH GENERAL

	FR	IT	EE	RO
vote >= 6	84%	96%	68%	77%
vote >=7	76%	92%	68%	77%
Mean vote	8.28	8.88	7.04	7.38
st dev	1.93	1.60	3.13	2.80

DISTRICT HEATING

	FR	IT	EE	RO
vote >= 6	50%	100%	50%	100%
vote >=7	0%	100%	50%	100%
Mean vote	5,50	8,50	5,00	8,50
st dev	0,71	2,12	4,24	0,71

BUILDING ENVELOPE

	FR	IT	EE	RO
vote >= 6	88%	88%	38%	89%
vote >=7	75%	75%	38%	89%
Mean vote	7,88	8,13	5,38	8,22
st dev	1,81	2,10	2,88	2,54

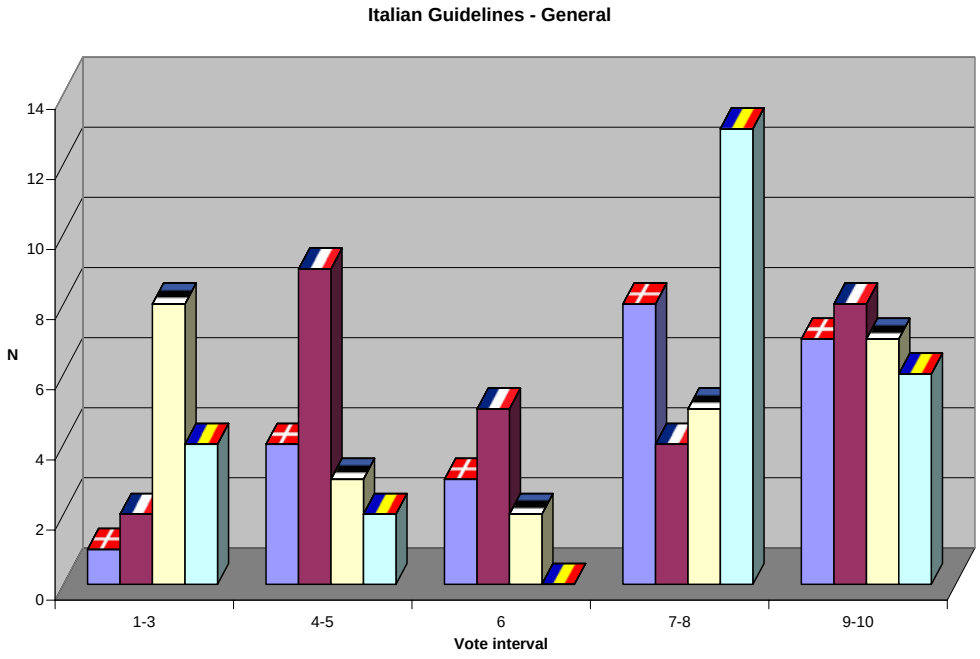
PLANTS

	FR	IT	EE	RO
vote >= 6	86%	100%	86%	64%
vote >=7	86%	100%	86%	64%
Mean vote	8,79	9,31	8,07	6,50
st dev	1,81	1,11	2,84	3,01

4.2. ITALIAN GUIDELINES

France and Estonia gave low marks to the Italian guidelines (respectively, 61% and 56% of marks higher than "6"). In particular, the French and Estonian low marks are related to the Italian district heating guidelines (only 25% of marks higher than 6), for the same reason explained above (tax regulation, number of housing built and electric heating penetration).

In particular, the French and Estonian low marks are related to the Italian district heating guidelines (only 25% of marks higher than 6), moreover the Estonian Expert gave low marks to the Italian Building Envelope guidelines.



ITALIAN GENERAL

	DK	FR	EE	RO
vote >= 6	78%	61%	56%	76%
vote >=7	65%	43%	48%	76%
Mean vote	7,39	6,64	6,00	7,08
st dev	2,06	2,26	3,29	2,69

DISTRICT HEATING

	DK	FR	EE	RO
vote >= 6	100%	25%	25%	100%
vote >=7	100%	0%	25%	100%
Mean vote	8,00	5,25	3,50	8,50
st dev	1,41	0,50	3,00	0,71

BUILDING ENVELOPE

	DK	FR	EE	RO
vote >= 6	71%	70%	29%	88%
vote >=7	71%	30%	29%	88%
Mean vote	7,57	6,50	5,14	7,75
st dev	2,15	1,90	3,02	2,49

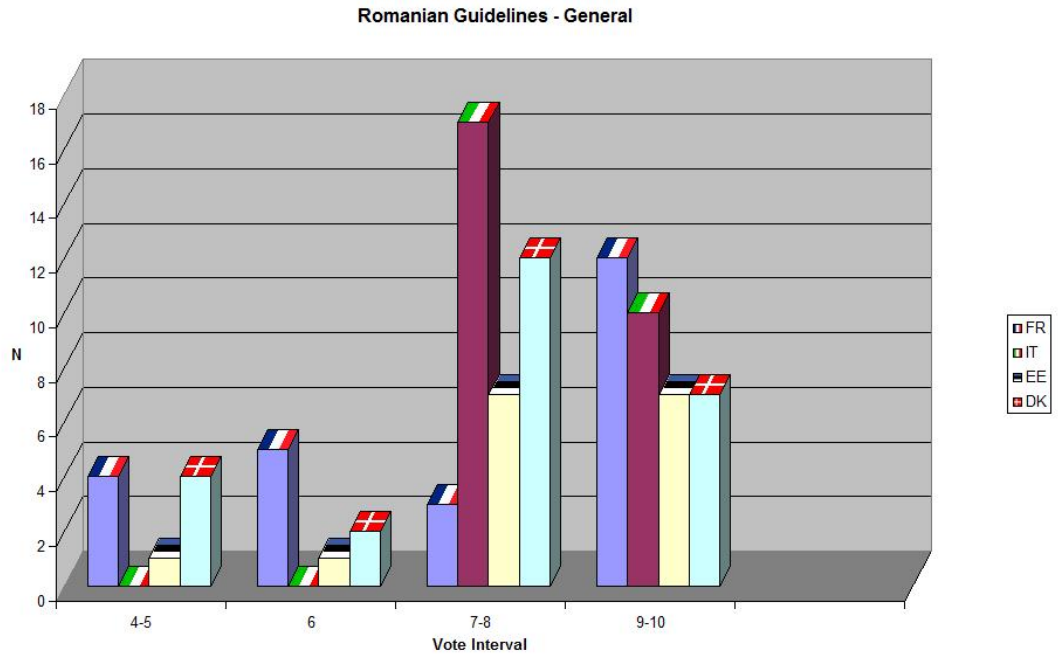
PLANTS

	DK	FR	EE	RO
vote >= 6	75%	64%	79%	67%
vote >=7	50%	64%	64%	67%
Mean vote	7,08	7,14	7,14	6,53
st dev	2,27	2,68	3,16	2,90

4.3. ROMANIAN GUIDELINES

The Romanian guidelines received good marks from the Italian and the Danish national expert (respectively, 100% and 95% of marks higher than "6"), while the Estonian expert gave lower marks.

In particular there has been a low mark by the Estonia Expert to the Romanian district heating guidelines and to the building envelope.



ROMANIAN GENERAL

	FR	IT	EE	DK
vote >= 6	77%	100%	60%	81%
vote >=7	58%	100%	56%	73%
Mean vote	7.53	8.41	6.00	7.38
st dev	2.13	0.89	3.39	1.83

DISTRIC HEATING

	FR	IT	EE	DK
vote >= 6	50%	100%	50%	100%
vote >=7	0%	100%	0%	100%
Mean vote	5.00	8.00	4.00	7.50
st dev	1.41	0.00	2.83	0.71

BUILDING ENVELOPE

	FR	IT	EE	DK
vote >= 6	63%	100%	25%	88%
vote >=7	38%	100%	25%	88%
Mean vote	6.75	8.56	3.75	7.75
st dev	2.60	1.13	2.76	1.67

PLANTS

	FR	IT	EE	DK
vote >= 6	87%	100%	79%	73%
vote >=7	73%	100%	79%	60%
Mean vote	7.53	8.33	7.29	7.00
st dev	2.13	0.82	3.12	1.96

5. CONCLUSIONS

a) In general, the Danish guidelines have been evaluated to have a good applicability in all the other countries.

b) All the national experts gave similar marks to all the different possible actions, with the exception of the Estonian that gave low marks to the applicability of some particular interventions (e.g. CHP systems, Sunspaces and Passive systems, Photovoltaic Systems, thermal solar heating systems, Natural and Mechanical forced ventilation).

c) The summer conditioning with absorbing cooling systems have been considered not applicably in Denmark, France, Estonia. That can be explained because in Estonia and in Denmark there is a low solar radiation and the low summer cooling demand, but in France (only in DOM TOM and not in the metropolitan area), solar cooling should have a good potential and are under experimentation.

d) The items that had a general consensus (vote >7) from all experts were the following:

- Building envelope and thermal insulation
- High efficiency boilers
- High efficiency conditioning systems
- Thermostats and radiator valves to prevent overheating
- Cooling demand assessment
- Lighting systems efficiency standards and control systems
- Water accounting and use saving
- Low temperature floor heating systems
- High efficiency heat pumps
- Design process check

e) As it can be noticed in “Reference to National codes”, all the guidelines proposed by the Danish, Italian and Romanian experts fit with the national implementation of EPBD in the related country.