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EAA Key comments on Lot 32 Ecodesign Preparatory Study on Window products + Annexes 01.09.2014

Detailed comments from the European Aluminium Association (EAA) on tasks 0 & 1-4 reports are available upon request, and key comments are summarized below regarding Ecodesign and Energy Labelling.

Before entering into these two specific subjects, let's remind that: **(1) a holistic optimization of complete buildings is more beneficial in terms of energy and environmental savings than a component-by-component approach; (2) to be in line with the recommendations of the Construction 2020 High Level Tripartite Strategic Forum, the impact of new ecodesign or labelling measure should be assessed from the cumulative cost point of view and it should be checked whether stimulating favourable investment conditions and improving the human-capital basis of the construction sector would not be preferable.**

ECODESIGN

The EAA questions the relevance of implementing measures for windows under the Ecodesign Directive as the existing EU legislation focused on buildings and construction products is already addressing energy and environmental issues and could further be implemented.

As far as **energy efficiency during use** is concerned, energy aspects of windows are covered by the Construction Products Regulation (CPR-EU 305/2011) and the related harmonized standard hEN14351-1 that describes, among others, how to declare energy-related performance characteristics of windows. Should the preparatory study conclude that the declaration of such performance characteristics need to become compulsory across the EU, or that threshold levels should be set, the Commission could do it through *Article 3 – point 3* of the CPR, as mentioned in Task 1 § 5.1.3.

As evocated in Task 1 § 5.1.4, the Energy Performance of Buildings Directive (EPBD-2010/31/EU), in its *Article 1 - point 2 - point c – point ii*, and *Article 4 – point 1 – 2nd paragraph*, asks Members States to set minimum energy performance requirements for building elements that form part of the building envelope when replaced or retrofitted[1]. Windows fall under the definition of "building element" as they are an element of the building envelope (*Article 2 – point 9*).

Regarding **other environmental aspects across windows' lifecycle**, the upcoming development of the declaration of essential characteristics under the Basic Requirement for Construction Works nr 3 'Hygiene, health and the environment' and nr 7 'Sustainable use of natural resources' of the CPR (described in its Annex I), is meant to provide the same environmental information as the Ecodesign Directive[2].

To ensure policy coherence in case the preparatory study would conclude that declaring energy and/or environmental performance characteristics, with or without thresholds, should become mandatory across the EU, the EAA strongly recommends that the building-sector-specific and well-established Construction Products Regulation and Energy Performance of Buildings Directive should have the priority over the Ecodesign Directive.

[1] A summary of minimum energy performance requirements is provided on Task 1-table 5.2. These requirements are today limited to thermal transmittance, but they could be combined with other energy-related characteristics.

[2] The previously described *Article 3 – point 3* of the CPR could also be applied for environmental information.

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ENERGY LABELLING

Regarding Energy Labelling, in case measures would be decided for window products, the EAA recommends their scope to be limited to the cases where a holistic optimization of the whole building does not occur, i.e. to small scale residential replacement market, where final consumers, without qualified Energy Performance of Buildings (EPB) adviser, need to make self-informed decisions towards high performance fenestration solutions.

As the Energy Performance of Buildings Directive (2010/31/EU) leads to a holistic optimization of complete buildings in the case of new constructions and major renovations, the necessity of window energy labelling measures should only be investigated for small scale residential renovations, where the customer is not supported by a qualified EPB adviser who could assist him/her to assess the most '*valuable for money*' technical solution.

To progress beyond the state of the art, the EAA recommends taking all energy related parameters[3] (including climate conditions, orientations and window sizes[4]) into account, and supports the most detailed examination of boundary conditions described in Task 3 §4.5.

The EAA reminds that in more than 90% of cases across the EU, windows are made to measure (Task 2 §5.2 'market structure number 2') and consumers make their choice based on quotations received for their specific case. A comparison of window products without considering their final destination only occurs for standard windows sold in Do-It-Yourself outlets which represent less than 10% of window sales in the EU.

The EAA therefore recommends an energy rating system[5] where labels for customized packages of window products would be given a higher importance than standard energy labels as we know them today for household appliances that only apply to single products and are based on average conditions.

By "customized package of window products", we mean a set of products consisting of windows, with solar shading devices[6] when necessary, customized for each orientation of a pre-defined renovation project. Automations may also be considered.

Labels for customized packages of windows products should indicate the energy efficiency class for heating, cooling and daylight potential and be based on the product fiche[7] containing a customized energy calculation taking into account all energy related parameters (essential characteristics, product geometry, installation's location). This would allow the consumer to choose easily the best performing solution for his/hers specific case.

It should be underlined that a too simplified window energy balance calculation not taking into consideration climatic conditions, orientations and window sizes could lead towards uniform products across the EU that would not correspond to local needs, would not be the most cost efficient for consumers and would not be optimal to reach the EU climate and energy targets[8].

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[3] See Annex B: Recommended energy related parameters

[4] See Annex C: Detailed analysis on climate conditions orientations and window sizes

[5] See Annex A: Window energy labelling options based on different market channels

[6] Shading devices reduce solar gains in cooling season and reduce heat losses during nights in winter

[7] See Annex D: Proposal for product fiches and label for a customized package of window products

[8] 2020 package, 2030 framework, 2050 roadmap

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ANNEX A

Window Energy Labelling options based on different market channels

In case no EPB adviser is involved, the European Aluminium Association recommends applying two different solutions adapted to the two main sales channels.

A.1 Energy Rating for a customized package of window products

Solution corresponding to scenario 2 and 3 in **Task 2 §5.2**, when one or more window products are intended to be replaced knowing their final destination, like it is the case for more than 90% of vertical windows sales. In this case, the climate condition of the project and the orientation of each window that will be replaced are known. Together with windows' geometry (size and frame fraction) and relevant essential characteristics, the window professional who is installing the windows, should rate the performance of the complete investment, combining the optimal set of necessary components (framing members, infills and shading devices) to offer the best possible price/performance ratio.

How such a rating could be calculated by a window professional in the product fiche is explained with an example in Annex D.

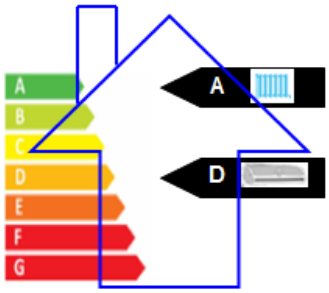
The format used to communicate the rating to the consumer would need further discussion with European Commission services and other stakeholders, but we would recommend using a very simple label like the one shown below.

Project XYZ

Customer's, project's and window professional's details

[Table of proposed windows, shading devices and their characteristics]

Overall rating of the small scale residential windows replacement project



The energy efficiency of the customized package of window products provided above may not correspond to its actual energy efficiency once installed in a building, as this efficiency is influenced by further factors such as the thermal performance of the other construction products used in the building (e.g. insulation's thickness, thermal mass) as well as dimensioning and exact orientation of the products in relation to the different types of rooms. Consumers are therefore invited to consult a qualified Energy Performance of Buildings adviser.

Figure A.1: Example of label for a customized package of window products (windows & shading devices) for a specific renovation project, to be used only for small scale residential replacement.

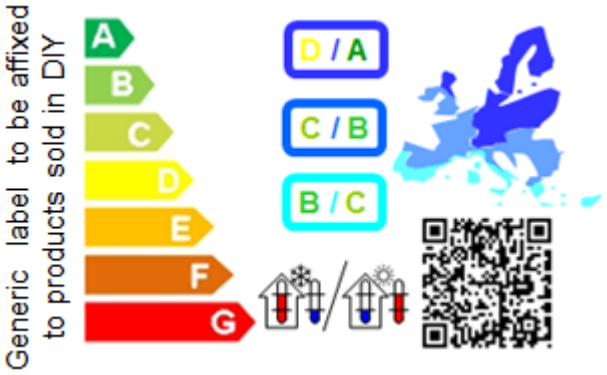
Note 1: The image of a house intends to show that the label corresponds to the performance of a package of window products for a specific project and NOT for single window units sold in DIY outlets.
Note 2: A single window customized for a specific project could also be rated with the same energy label format.
Note 3: EAA does not exclude that a window professional could also be qualified as EPB adviser. Should it be the case, EAA does not recommend window energy labelling measures to apply.

A.2 Energy Label offered for products that are being sold via the DIY channel

In case windows are being sold through the Do-It-Yourself channel, which represent less than 10% of window sales in EU (the situation being however different for roof windows), where customers have to make self-informed decisions without involving a window professional, a standard label could be affixed to the window products, indicating ratings for three or more average climate conditions, and based on an average orientation mix.

Window professional's details

[Table of proposed window, shading device (if any) and their characteristics]

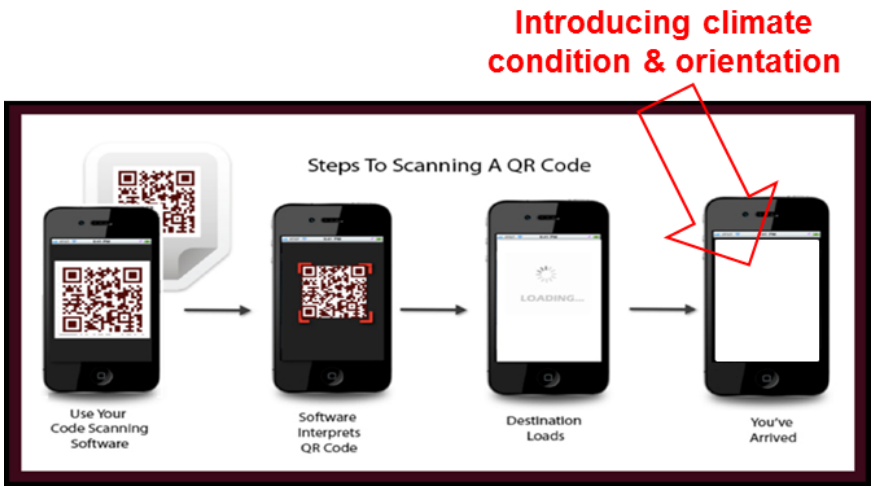


The energy efficiency of the window product provided above may not correspond to its actual energy efficiency once installed in a building, as this efficiency is influenced by further factors such as the thermal performance of the other construction products used in the building (e.g. insulation's thickness, thermal mass) as well as dimensioning and exact orientation of the products in relation to room's type. Consumer is therefore invited to consult a qualified Energy Performance of Buildings adviser.

Figure A.2.a: Window energy label affixed to a window product offered in a DIY outlet (to be used only for small scale residential replacement, when a window professional is not involved).

However, a complementary solution should be developed. As already underlined in the context of the revision of the Energy Labelling Directive, QR codes (as included in Figure A.2.a) should be allowed to be used for complementary information.

These would allow orienting customers to a web based software where they could obtain a customized energy rating for their particular case, based on the climate they live in and the orientation where the window product will be installed, as illustrated on the next page.



Window professional's details

[Table of proposed window, shading device (if any) and their characteristics]

[Climate condition & orientation]

The energy efficiency of the window product provided above may not correspond to its actual energy efficiency once installed in a building, as this efficiency is influenced by further factors such as the thermal performance of the other construction products used in the building (e.g. insulation's thickness, thermal mass) as well as dimensioning and exact orientation of the products in relation to room's type. Consumer is therefore invited to consult a qualified Energy Performance of Buildings adviser.

Figure A.2.b: Customized energy rating displayed on the mobile device of the customer for a window product offered in a DIY outlet (to be used only for small scale residential replacement, when a window professional is not involved)

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ANNEX B

Recommended energy related parameters

On the list below are defined all energy related parameters that should be taken into account in order to present the thermal performance of any window product:

Essential characteristics

Thermal transmittance	U_{win}		hEN14351-1
	$U_{win,sh}=\frac{1}{\Delta R_{Shutter}+\frac{1}{U_{win}}}$	ΔR_{sh}: Additional thermal transmittance of the shutter	Heating season during night EN ISO 10077-1
Total solar energy transmittance	$g_{win}=g_{gl} * F_f$	F_f: Frame fraction	Solar gains depend mainly[9] on the transparent area of the window g_{gl}: hEN 14351-1
	$g_{tot}=g_{win} * F_c$	F_c: Shading coefficient, where applicable	Reduction of solar gains by considering shading device
Air leakage	$L_{4\sim6}$Pa		Air leakage at a pressure difference of 4~6 Pa hEN14351-1 basis
Light transmittance	$\tau_{win}=\tau_{gl} * F_f$	F_f: Frame fraction	Necessary for the definition of the Daylight Potential ISO 18292
	$\tau_{tot}=\tau_{gl} * F_c$	F_c: Shading coefficient, where applicable	

Product geometry

Product's sizes (Height and width)	2 dimensions for windows and door-height windows	• **Window:** 1,23m x 1,48m • **Door-height window:** 1,48m x 2,18m	There is a significant difference between windows and door height windows Annex E hEN14351-1
Frame fraction	$F_f=\frac{A_{gl}}{A_{win}}$	A_{gl}: Glazing's surface A_{win}: Window's surface	Transparent area *vs* non transparent one

Installation's location

Climate condition	3 climate conditions	• Northern European: **Mostly Heating** • Central European: **Heating** & cooling • Southern European: **Cooling** & heating	It is important to introduce climate conditions, because by such a way customer is able to understand the importance of the declared potentials for the location of product application
Orientation	4 coordinates	• **East** • **South** • **West** • **North**	window products may be installed on the same building, but technical requirements on different orientations are not identical to offer indoor comfort with less energy

[9] There is a request by France in CEN/TC 89 to develop a European Norm taking into consideration solar gains from the non-transparent window surfaces, according to XP P 50-777 that is applied in France.

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ANNEX C

Detailed analysis on climate conditions, orientations and window sizes

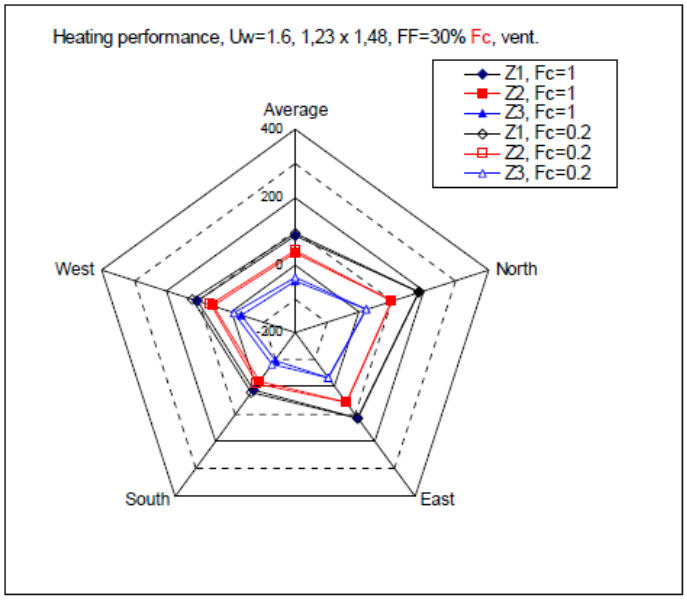
Why are these parameters essential?

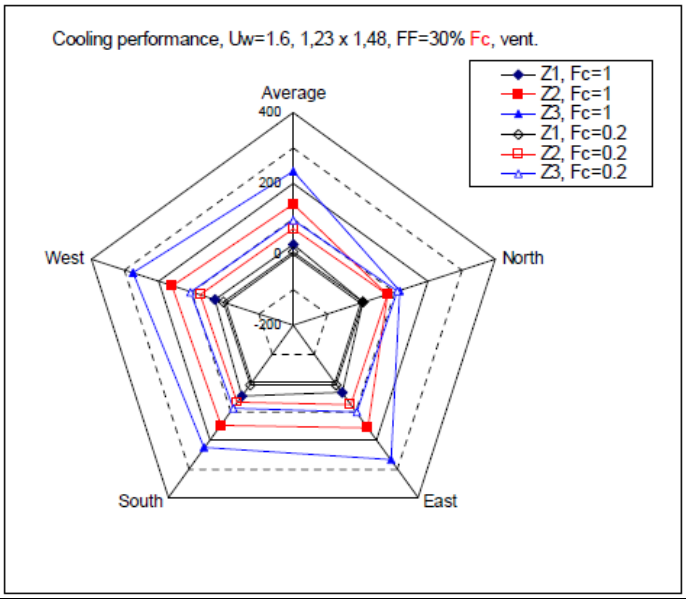
- **Climate conditions**: contrary to most product groups for which an energy label or CO_2 label exists today, the ranking of windows' products may differ according to climate conditions. In other words, when comparing different window products, the best in class is not automatically the same across all climates. On top of this, in order to secure the best price/performance ratio for consumers, a rating differentiated per climatic conditions would prevent unnecessary components/performance increasing the costs of window solutions without environmental advantage (e.g. very low thermal transmittance in South of Europe).
- **Orientations**: heating and cooling performances of the same window product differ significantly depending on the orientation where it is installed, calling for a different product optimization. Such a differentiated product optimization is missing today and the opportunity to change the situation should not be missed, to both protect European consumers and reduce energy consumption across the EU.
- **Window sizes**: Products with the same performance characteristic offer different solar gains and heat losses based on their dimensions. That is why more than one window sizes need to be used while ranking windows' products thermal efficiency.

To quantify the impact of these three key parameters, the European Aluminium Association has commissioned different studies whose results are presented below.

C.1 Climate conditions and orientations

On the following two graphs, it can be observed that the same product performs quite differently when installed on different climate conditions or orientations.





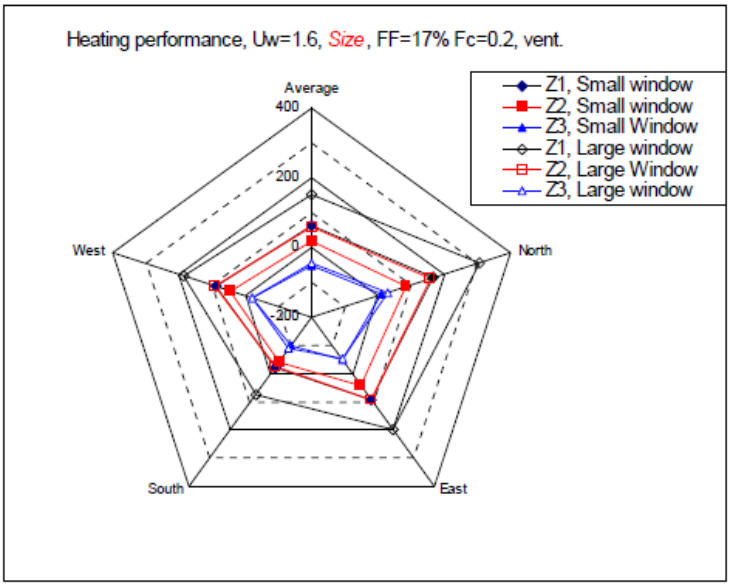
Orientation	Average		North		East		South		West	
Performance	Heat	Cool	Heat	Cool	Heat	Cool	Heat	Cool	Heat	Cool
Z1, Fc=1	85	29	183	9	115	33	8	34	103	31
Z2, Fc=1	34	143	100	80	56	158	-24	148	52	159
Z3, Fc=1	-50	234	21	112	-35	269	-101	229	-35	278
Z1, Fc=0,2	92	8	183	8	116	8	19	7	117	8
Z2, Fc=0,2	41	74	100	78	57	75	13	70	63	75
Z3, Fc=0,2	-36	98	21	106	-34	103	-83	88	-9	102

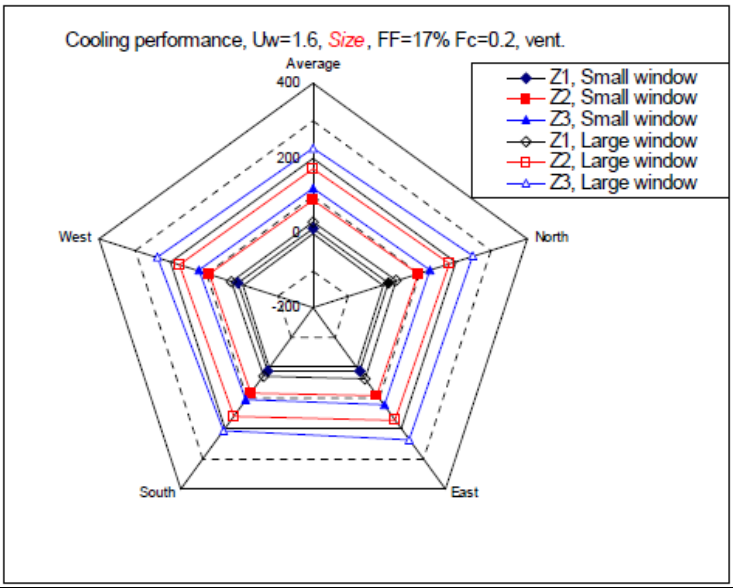
Figure/Table C.1: Heat Balance for Heating and Cooling season for the same window product with (Fc=0,2) and without (Fc=1) shading device. Values expressed in KWh/year.

Note: Z1, Z2 & Z3 refer to the three different climate conditions studied (see Annex C.3)
Z1: **Mostly Heating**
Z2: **Heating** and Cooling
Z3: **Cooling** and Heating

C.2 Climate conditions and window sizes

On the following two graphs, it can be observed that two windows having the same energy related characteristics but different sizes (small windows versus large door-height windows) have significantly different thermal performance.





Orientation	Average		North		East		South		West	
Performance	Heat	Cool	Heat	Cool	Heat	Cool	Heat	Cool	Heat	Cool
Z1, Small	63	11	166	11	92	11	-23	10	90	11
Z2, Small	20	89	87	95	40	91	-42	84	44	91
Z3, Small	-51	118	12	128	-49	124	-100	106	-23	123
Z1, Large	150	30	306	32	201	34	22	27	186	31
Z2, Large	61	170	160	182	92	175	-26	160	92	174
Z3, Large	-45	228	30	246	-50	239	-89	205	-23	238

Figure/Table C.2: Heat Balance for Heating and Cooling season for the same window product having small (1,23m x 1,48m) and large (1,48m x 2,18m) size according to Annex E of hEN14351-1. Values expressed in KWh/year.

Note: Z1, Z2 & Z3 refer to the three different climate conditions studied (see Annex C.3)
Z1: **Mostly Heating**
Z2: **Heating** and Cooling
Z3: **Cooling** and Heating

C.3 Further technical information

Basics:

Taking into consideration all the characteristics mentioned on the previous Annex on this study, a reference room simulating a room from a residence was used to identify the thermal balance of the window products. Five out of Six surfaces of the room are adiabatic (the one in which the window is installed is not) and the heat balance is done twice with and without the window to allow identifying the net thermal gains/losses of the window. More details are available.

Climate conditions:

After doing a detailed project on climate conditions across Europe[10], the EAA is of the opinion that Europe needs to be separated to three Climate conditions which will allow citizens choose the best products for their residence when they replace their windows.

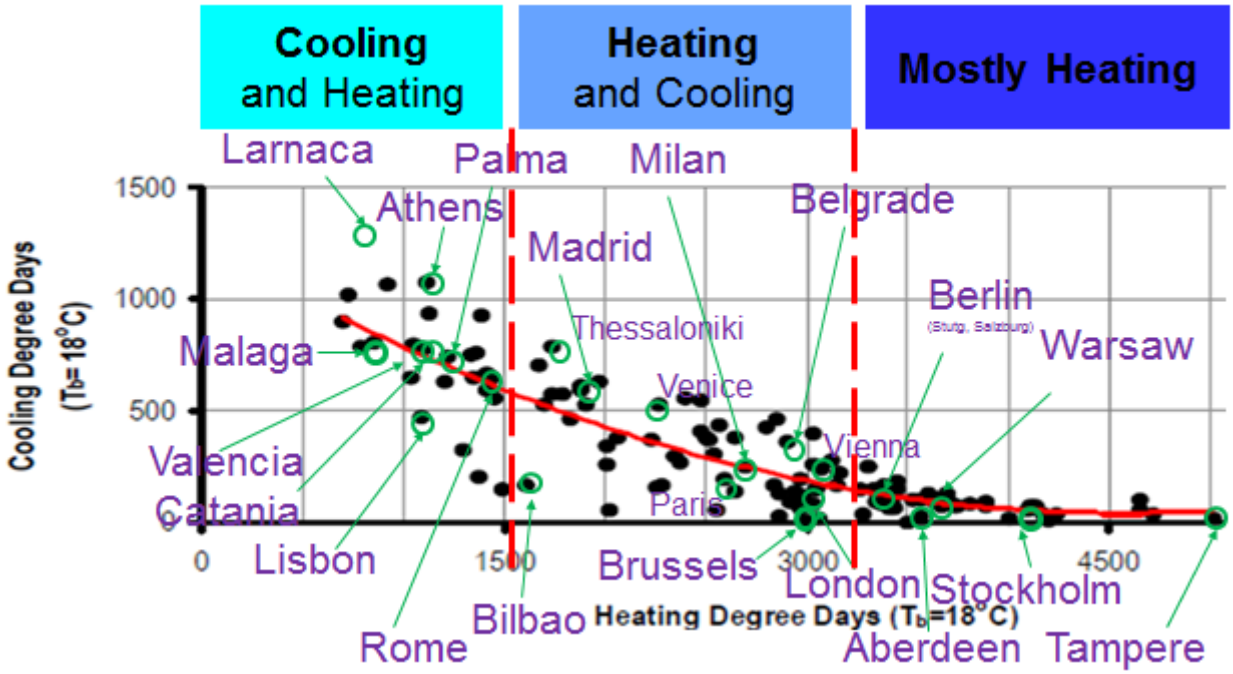


Figure C.3.a: Presentation of selected European cities based on their average Cooling Degree Days (CDD) and Heating Degree Days (HDD).

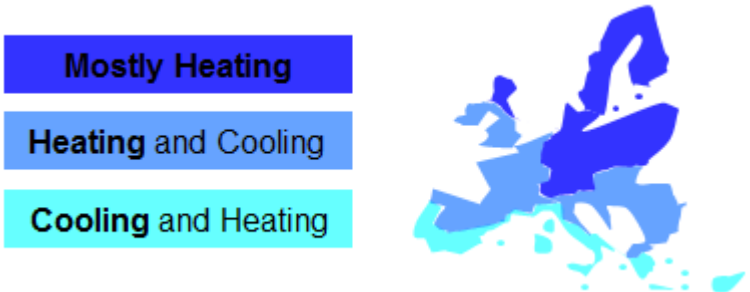


Figure C.3.b: Macroscopic presentation of three climate conditions for the Union market.

Note: There may be 'isles' of different climate conditions within the three main climate conditions that are presented above, due to local specifies (e.g. high mountain, lake, stream etc).

[10] http://www.buildup.eu/sites/default/files/content/task_3_report.pdf

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ANNEX D

Proposal for product fiche and label for customized packages of window products

Let's assume that a customer in Brussels ('**Heating** and Cooling' climate condition) is willing to replace 10 windows on his/her house, without intending to make any further thermal improvement on the building. It would make sense that consulted window professional(s) would propose the best technical-economical window package for the specific case of that customer. To do so, each window professional would need to identify the location of the building, the size and orientation of each window unit and optimize each of them accordingly (U_{win}, g_{win}, L, Shading devices). Based on that, a total energy rating of the offer should be given to the customer, as illustrated below

Window ID	Type	Size						Orient
		(WxH, m^2)	Pieces	Width	Height	Surface	% share	
1	Tilt/turn	1,10x1,30	1	1,10	1,30	1,43	9	South
2	Tilt/turn	1,10x1,30	1	1,10	1,30	1,43	9	North
3	Tilt/turn	1,10x1,30	1	1,10	1,30	1,43	9	South
4	Tilt/turn	1,00x0,80	2	1,00	0,80	1,60	10	East
5	Tilt only	1,30x0,40	1	1,30	0,40	0,52	3	East
6	Roof window	0,90x0,90	2	0,90	0,90	1,62	10	East
7	Sliding	1,40x2,20	1	1,40	2,20	3,08	20	South
8	Sliding	2,00x2,20	1	2,00	2,20	4,40	28	East
					Total	**17,85**	**100**	

Window ID	Offered window product performances					
	U_{win}	g_{win}	L	f_f	ΔRsh	FC
1	1,6	0,6	Class 4	30%		0,2
2						
3						
4						
5						
6						0,2
7				17%		
8						

Window ID	Size type for calculations[11]	Surface m^2	Thermal Balance[12]		Thermal Balance per m^2	
			Heating	Cooling	Heating	Cooling
1	1,23x1,48	1,8204	-13	70	-7	38
2	1,23x1,48	1,8204	100	80	55	44
3	1,23x1,48	1,8204	-24	150	-13	82
4	1,23x1,48	1,8204	39	193	21	106
5	1,23x1,48	1,8204	39	193	21	106
6[13]	1,23x1,48	1,8204	30	85	16	47
7	1,48x2,18	3,2264	-26	160	-8	50
8	1,48x2,18	3,2264	92	175	29	54

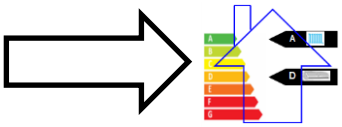
[11] Sizes according to hEN14351-1 Annex E, Table E.1, §4.12

[12] Calculations done by a simulation tool

[13] As EAA did not study roof windows, declared values are purely illustrative

Window ID	Thermal Balance per m^2		% share
	Heating	Cooling	
1	-8	33	9
2	56	38	9
3	-15	71	9
4	30	78	10
5	30	78	3
6	22	87	10
7	-10	42	20
8	28	100	28

Project's Thermal Balance	
Heating	**Cooling**
14	**60**



(see Figure A.1)

The energy efficiency of the customized package of window products provided above may not correspond to its actual energy efficiency once installed in a building, as this efficiency is influenced by further factors such as the thermal performance of the other construction products used in the building (e.g. insulations' thickness, thermal mass) as well as dimensioning and orientation of the products in relation to the different types of rooms. Consumers are therefore invited to consult a qualified Energy Performance of Buildings adviser.