

Smart Readiness Indicator (SRI)

ASSESSMENT PACKAGE: PRACTICAL GUIDE SRI CALCULATION FRAMEWORK v 4.5

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DISCLAIMER

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1 AIM OF THE SRI CALCULATION SPREADSHEET

This document provides guidance to an accompanying spreadsheet file containing a calculation model for the SRI. This spreadsheet is meant as a tool to support the SRI testing and implementation phase in EU Member States. Using this tool can by no means lead to any claims on an actual score or certificate for a building. Some of the elements comprising the calculation method (services, functionality, weightings, impact scores, etc.) can be subject to further changes in the process of policy development and implementation in various local contexts. The [SRI platform](#) is now up and running to discuss such adaptations between Member States and interested stakeholders.

2 METHODOLOGY OF THE SRI CALCULATION SPREADSHEET

The method for calculating the SRI is based on the multi-criteria assessment method defined in Commission Delegated Regulation (EU) 2020/2155¹. Background information on how the method was developed and initially tested can be consulted in the final report of the technical support studies on the SRI².

The basic structure of the methodology is a flexible and modular multi-criteria assessment method which builds on assessing the smart ready services present in a building. Services are enabled by (a combination of) smart ready technologies, but are defined in a technology neutral way. The proposed calculation methodology is structured amongst 9 technical domains and 7 impact criteria. For each of the services several functionality levels are defined. A higher functionality level reflects a “smarter” implementation of the service, which generally provides more beneficial impacts to building users or to the grid compared to services implemented at a lower functionality level.

¹ Commission Delegated Regulation (EU) 2020/2155 of 14 October 2020 supplementing Directive (EU) 2010/31/EU of the European Parliament and of the Council by establishing an optional common European Union scheme for rating the smart readiness of buildings C/2020/6930

<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32020R2155>

² S. Verbeke, D. Aerts, G. Reynders, Y. Ma, P. Waide; Final report on the technical support to the development of a smart readiness indicator for buildings; Published: 2020-09-18; ISBN 978-92-76-19197-1; DOI 10.2833/41100; Catalogue number MJ-03-20-335-EN-N

<https://op.europa.eu/en/publication-detail/-/publication/f9e6d89d-fbb1-11ea-b44f-01aa75ed71a1>



Figure 1 - Seven impact categories of the SRI

In the proposed method, the smart readiness score of a building or building unit is expressed as a percentage which represents the ratio between the smart readiness of the building or building unit compared to the maximum smart readiness that it could reach. The SRI calculation sheet helps the assessor in carrying out the assessment, calculating the intermediate scores at domain and impact level, and weight those to a final single score. More information on the methodology is being prepared by the technical support team and is made available through the website³, where material from dedicated training webinars, factsheets and case studies can be found.

	Overall SRI score (%) + SRI class						
	%		%				%
	Optimise energy efficiency and overall in-use performance		Adapt its operation to the needs of the occupant				Adapt to signals from the grid (energy flexibility)
	%	%	%	%	%	%	%
	Energy efficiency	Maintenance and fault prediction	Comfort	Convenience	Health, well-being and accessibility	Information to occupants	Energy flexibility and storage
Heating	%	%	%	%	%	%	%
Cooling	%	%	%	%	%	%	%
Domestic hot water	%	%	%	%	%	%	%
Ventilation	%	%	%	%	%	%	%
Lighting	%	%	%	%	%	%	%
Dynamic building envelope	%	%	%	%	%	%	%
Electricity	%	%				%	%
Electric vehicle charging		%		%		%	%
Monitoring and control	%	%	%	%	%	%	%

Figure 2 - Overview of the scoring matrix, containing the 7 impact criteria and 9 technical domains

³ https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/smart-readiness-indicator_en

In the preceding technical support studies, smart service catalogues for both a detailed and a simplified assessment method were elaborated in extensive consultation with stakeholders. The final report of the study also includes a proposal for weighting factors, a methodology for normalisation of the scores and a suggested triage process which details how to deal with absent services.

Both methods have a similar structure, but method A uses a reduced set of services, thus requiring less efforts and expertise to carry out the assessment. The simplified Method A was foreseen to be mainly oriented towards small buildings with low complexity (single family homes, small multi-family homes, small non-residential buildings, etc.), whereas the more detailed Method B is mainly oriented towards buildings with a higher complexity (typically large non-residential buildings, potentially large multi-family homes). Both method A and method B have been implemented in the same calculation tool, as well as the weighting factors proposed in the consolidated method of the technical support studies.

In order to support the testing and implementation phase, the SRI calculation spreadsheet allows to alter specific parts of the calculation methodology. The SRI platform is now up and running, enabling Member States and stakeholders to interact on potential adaptations of the calculation methodology and exchanges on experiences gathered from the testing or implementation phase. These optional modifications are explained in chapter 4 of this document.

It is recommended that such changes are only performed by expert users with good understanding of the underlying methodology. Organisations supporting the SRI testing or implementation process at national level might wish to predefine some elements of the calculation methodology for a particular test. The spreadsheet allows to hide some tabs and make the file password-protected before distributing the calculation sheet to the assessors taking part in the national testing or implementation process.

3 TUTORIAL ON USING THE SRI ASSESSMENT SPREADSHEET

3.1 THE “BUILDING INFORMATION” TAB

As a first step, please choose your preferred language, and the whole calculation sheet will be automatically adjusted to the selected language. In the present version, English, French and German are the available languages.

Next, start to fill out general building information.

3.1.1 Assessor information

Provide information on the assessor. The European Commission Services and the technical support team may use this information to contact assessors for collecting feedback on the SRI testing and implementation.

3.1.2 General building information

Please fill out the fields as indicated.

Field: Building type

Choose from the following options:

- **Residential**
- **Non-residential**

Field: Building usage

In case of a residential building, please choose from the following options:

- **Single family house**
- **Small multi-family house: 10 residential units or less**
- **Large multi-family house: more than 10 residential units**
- **Other: student housing, care homes...**

In case of a non-residential building: please choose from the following options:

- **Offices**
- **Educational buildings**
- **Healthcare**
- **Other**

The selected building type and usage will be used to select the appropriate weighting factors, which can for example reflect the differences in relative importance of domains such as domestic hot water or cooling depending on the use of the building.

Note that in the current version, no differentiation has been made in the default weighting factors within a building type. In other words, all non-residential buildings currently use the same weighting factors, regardless of their building usage. Similarly, all residential buildings currently use the same weighting factors. The user of the calculation spreadsheet has however the option to define custom weighting factors.

The technical support team welcomes stakeholders to provide additional sources to support the differentiation of weighting factors. Final weighting factors will be defined by the Member States and/or the European Commission as part of the implementation process.

Field: Building state

Please indicate the current state of the building:

- **Renovated:** applies to buildings that have undergone important energetic upgrades such as thermal insulation and/or upgrades to the technical building systems since the year of construction.
- **Original:** applies to building that have not undergone important energetic upgrades.

At present, the calculation method does not differentiate between existing and newly constructed buildings.

Field: Location

Please indicate the location (country) the building is located in. The appropriate climate zone will be determined automatically. 5 climate zones have been defined:

- **Northern Europe:** Denmark, Finland, Sweden, Norway, Iceland
- **Western Europe:** Austria, Belgium, France, Germany, Ireland, Luxembourg, Netherlands, United Kingdom, Liechtenstein, Switzerland
- **Southern Europe:** Greece, Italy, Malta, Portugal, Spain, Cyprus
- **North-Eastern Europe:** Czechia, Estonia, Latvia, Lithuania, Poland, Slovakia
- **South-Eastern Europe:** Bulgaria, Croatia, Hungary, Romania, Slovenia

Note: if the building is situated outside Europe, no default weighting factors are available. Please select “user-defined” under the “preferred weightings” field. Additional guidance may be found in section 3.6.

3.1.3 Methodology selection

In this part of the calculation sheet, the user can specify the settings used for the calculation. In some instances, these inputs might be predefined, e.g. as part of a national testing phase.

Field: Preferred weightings

Please choose:

- **Default**
- **User-defined**

If you wish to perform a standard assessment, please select “default”. More information on the calculation of these default weighting factors is provided in chapter 2.

If you wish to define your own weighting factors, please refer to section 3.6 for detailed instructions.

Field: Preferred assessment method

Please choose:

- **A – simplified method contains a simplified list of services**
- **B – detailed method contains the detailed list of services**
- **Custom: select the applicable services in tab ‘overview of services’**

Field: Domains present

Please indicate whether the TBS domains are present in the building or not.

- **0 - This domain is absent and not mandatory**

- 1 - This domain is present;
- 2 - This domain is absent but mandatory.

When a domain is ‘absent but mandatory’, the services are taken into account in calculating the ‘maximum obtainable score’ during the normalisation process. In the spreadsheet for testing the SRI, it can be indicated whether or not an absent domain is mandatory, e.g. depending on local instructions for the SRI testing or implementation phase.

3.2 THE “OVERVIEW_OF_SERVICES” TAB

This tab gives an overview of the service list. The services that are included in the assessment method A is indicated in column J. In column K, the services included in the assessment method B are listed. In column L, users can compose their custom services list (1 = enable, 0 = disable); potentially also including newly defined services (row 60 to 104).

3.3 THE “CALCULATION SHEET” TAB

The calculation sheet is where the actual assessment takes place. Every line in the sheet represents a service of the smart service catalogue.

The assessor should indicate, in column I, whether a service is applicable to this particular building (1 = applicable, 0 = not applicable), the services that are not applicable to this particular building will be greyed out. No assessment is required for these services.

B	C	D	E	F	G	I	J	K
Code	Service group	Smart ready service	Service included in the selected method (A/B/custom): 0 - not included, 1 - included	1 - This domain is present; 2 - This domain is absent but mandatory; 0 - This domain is absent and not mandatory	TRIAGE: 1 - This service affects maximum obtainable score, even if service is not applicable in this building; 0 - This service does not affect maximum obtainable score when not present in building	Service applicable in your building? - to be assessed by the assessor: 1 - applicable; 0 - not applicable	Main functionality level as inspected by SRI assessor	share (default = 100% means applicable throughout the building)
H-1a	Heat control - demand side	Heat emission control	✓ 1	✓ 1	✗ 0	1	3	100%
H-1b	Heat control - demand side	Emission control for TABS (heating mode)	✗ 0	✓ 1	✗ 0			
H-1c	Control heat production facilities	Storage and shifting of thermal energy	✓ 1	✓ 1	✗ 0	1	1	100%
H-1d	Heat control - demand side	Control of distribution pumps in networks	✗ 0	✓ 1	✗ 0			
H-1f	Heat control - demand side	Thermal Energy Storage (TES) for building heating (excluding TABS)	✗ 0	✓ 1	✗ 0			
H-2a	Control heat production facilities	Heat generator control (all except heat pumps)	✓ 1	✓ 1	✗ 0	0		

Figure 3 - Tab calculation sheet, columns B - K

For each service to be assessed, three fields may be completed:

- **Main functionality level** (column J): please enter the functionality level of the service. A description of the different functionality levels is provided in columns O through S. Please note:
 - If the field is left blank, or the functionality level is not valid (e.g. higher than the maximum possible functionality level), a warning will be displayed in column N, and no SRI score will be calculated.
 - If the functionality level is valid, the chosen functionality level (column N-R) will turn orange, to facilitate visual validation.
- **Share of the functionality level** (column K): this field enables to test partial compliance of a building to the main functionality level. If you do not wish to test partial compliance, please keep the default value of 100%. Else, indicate the percentage of net surface area of the building that complies with the main functionality level. For further instructions on partial compliance, refer to section 3.5 or the final report of the technical support studies.
- **Optional: additional functionality level** (column L): if the share of the functionality level (column K) is set to less than 100%, please provide the functionality level that applies to the remaining surface area.
- **Estimated assessment time** (column X): for feedback purposes, please provide the time required to determine this functionality level, including the time needed for visual inspection and/or the time needed to look up technical data.
- **Optional: assessor comments** (column Y): please provide comments if desired. This may include, but is not restricted to:
 - Notes
 - Clarifications
 - Difficulties encountered while attempting an assessment
 - Notification that ordinal scores were altered

After having completed the assessment, the total SRI score will be displayed in the top right corner. More detailed scores are available in the tab 'Results'.

B	C	D	K	L	M	N	O	P	Q	R	S
Code	Service group	Smart ready service	share (default = 100% means applicable throughout the building)	Optional: additional functionality level in part of the building	Share of additional functionality level	Warnings	Functionality level 0 (as non-smart default)	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
H-1a	Heat control - demand side	Heat emission control	100%		0%		No automatic control	Central automatic control (e.g. central thermostat)	Individual room control (e.g. thermostatic valves, or electronic controller)	Individual room control with communication between controllers and to BACS	Individual room control with communication and occupancy detection
H-1b	Heat control - demand side	Emission control for TABS (heating mode)			0%						
H-1c	Control heat production facilities	Storage and shifting of thermal energy	100%		0%		None	HW storage vessels available	HW storage vessels controlled based on external signals (from BACS or grid)		
H-1d	Heat control - demand side	Control of distribution pumps in networks			0%						
H-1f	Heat control - demand side	Thermal Energy Storage (TES) for building heating (excluding TABS)			0%						
H-2a	Control heat production facilities	Heat generator control (all except heat pumps)			0%						

Figure 4 Tab calculation sheet, columns B -D & K-S

3.4 THE “RESULTS” TAB

Various types of results are displayed in the “results” tab:

- **Total SRI score:** the total SRI score, taking into account domain weightings and impact weightings.
- **Impact scores:** the impact scores for each impact criterion, taking into account domain weightings.
- **Domain scores:** the domain scores for each domain, taking into account impact weightings.
- **Detailed scores:** the detailed scores for each domain and each impact criterion, which results in a matrix for 9 domains and 7 criteria.
- **Aggregated scores:** the aggregated scores for 3 key functionalities.



Figure 5 - Example of scoring results

Disclaimer: please note that the presentation of results does not reflect the final intended presentation/format of the SRI, but is merely provided for testing purposes. Research on the proper format is ongoing and any feedback on this can be send to support@smartreadinessindicator.eu.

3.5 OPTIONAL: INCLUDE MULTIPLE FUNCTIONALITY LEVELS

In some cases, a building will not comply fully with a given functionality level. For instance, control of artificial lighting power based on daylight levels may be installed in the open office space, but not in corridors. There are two ways to implement this in the SRI calculation:

- By default, it is assumed that the selected functionality level applies to the *entire building*. Therefore, the highest functionality level that applies to the entire surface area of the building should be selected. Alternatively, one might also indicate the functionality level that applies to the most relevant share of the building (e.g. a service present throughout a dwelling apart from the attic and corridors).
- Optionally, a split-up can be made, where up to two different functionality levels may be defined to include such partial compliance in the calculation.

The share of each functionality level is determined using the **net surface floor area**.

Note that at this moment the calculation only accommodates the definition of two functionality levels per service.

To illustrate the process of entering partial compliance, the example of daylight correction will be used. It is assumed that 60% of the building is equipped with automatic dimming (functionality level 3) and the remaining 40% is equipped with manual (central) controls (functionality level 0).

Please follow these steps in the tab “calculation”:

- In the field “**Main functionality level**” (column J), set the functionality level of the first zone of your building, in this case “3”.
- In the field “**Share of the functionality level**” (column K), set the percentage of net surface floor area of the building that complies with the main functionality level, in this case 60%.
- In the field “**additional functionality level**” (column L), set the functionality level of the remaining surface area, in this case “0”. The share of this functionality level will be calculated automatically, and is displayed in column M.

3.6 OPTIONAL: MODIFY WEIGHTING FACTORS

To alter the weighting factors manually in the calculation sheet, please do the following:

- In the tab “**building information**” under the section “general building information”, please set the preferred weighting factors to “**user-defined**”.
- In the tab “**weightings**”, please provide the desired **weighting factors**. There are two types of weightings:
 - **Domain weightings** (cells B9 to H17): these weighting factors are used to aggregate domain scores to impact scores. Please make sure that the sum of each column is exactly 100%.
 - **Impact weightings** (cells B22 to H22): these weighting factors are used to aggregate the impact scores to a single SRI score. Please make sure that the sum is exactly 100%.

For additional information on the calculation of weighting factors please refer to section 4.4 of this document, or to the final report of the second technical SRI study.

Please note that some of the weighting factors are set to zero, both for the default and user-defined weightings. For these domains, no services contribute to the given impact criterion; hence no weight should be attributed to these services.

An example of user input on custom weighting factors is shown in Figure 6.

User-defined							
DOMAIN WEIGHTINGS							
	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	11.1%	12.5%	16.7%	11.1%	0.0%	14.3%	12.5%
Domestic hot water	11.1%	12.5%	16.7%	11.1%	0.0%	14.3%	12.5%
Cooling	11.1%	12.5%	16.7%	11.1%	0.0%	14.3%	12.5%
Ventilation	11.1%	12.5%	16.7%	11.1%	40.0%	14.3%	12.5%
Lighting	11.1%	0.0%	16.7%	11.1%	0.0%	0.0%	0.0%
Electricity	11.1%	12.5%	0.0%	11.1%	0.0%	14.3%	12.5%
Dynamic building envelope	11.1%	12.5%	16.7%	11.1%	60.0%	14.3%	12.5%
Electric vehicle charging	11.1%	12.5%	0.0%	11.1%	0.0%	0.0%	12.5%
Monitoring and control	11.1%	12.5%	0.0%	11.1%	0.0%	14.3%	12.5%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
IMPACT WEIGHTINGS							
	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
	14.3%	14.3%	14.3%	14.3%	14.3%	14.3%	14.3%

Figure 6 – Example of user input on custom weighting factors

3.7 OPTIONAL: ADD EXTRA SERVICES

Step 1: update “overview_of_services” tab

This sheet contains a list of all 54 smart ready services and their functionality levels. 27 services included in the assessment method A are indicated in column J (1 = used in method A, 0 = not used in method A).

A list of 45 extra services (5 per domain) are placed in this tab (from row 58 onwards). The user can use these rows to define their extra services in the corresponding domain. While adding a service, the user should not modify column A and column B, but only provide descriptive text of this particular service and functionality levels in column C to column I. In column L, the user can toggle on or off whether the newly introduced service should be incorporated in the custom service catalogue used in the calculation methodology. In case it is included therein, column N is used to indicate whether the service is always to be weighted into the maximum obtainable score or solely in case the service is indicated as being present⁴.

Step 2: update impact scores in “H” “DHW” “C” “V” “L” “DE” “E” “EV” “MC” tabs

These are the tabs for storing the impact score of individual services in each domain. While adding a service, please don’t forget to add impact scores in the corresponding tabs for that specific service by using the same service code. For these extra services, the impact scores are set to 0 as default values, and the user can alter the impact scores to the desired values when adding extra services.

⁴ The user is referred to the ‘triage process’ in the final report of the technical support studies for more information on this topic.

4 ANNEX: MODIFICATIONS TO THE METHODOLOGY

Some of the elements of the calculation spreadsheet can be altered for testing purposes. It is suggested that these changes are restricted to expert users with detailed understanding of the underlying methodology. The SRI platform is now up and running, which brings together EU Member States and interested stakeholders. Discussions on potential alterations to the calculation methodology (e.g. adjustments to scores, weighting factors or service catalogues) can be discussed in the framework of this SRI platform.

This annex provides more details to the expert users wishing to change these settings in the SRI calculation spreadsheet, including altering the service catalogues, impact scores, weighting factors and language settings.

4.1 ADJUSTING SCORES

For each functionality level of a smart service, the calculation method requires impact scores for each of the impact criteria. The calculation spreadsheet contains the scores suggested by the technical support studies on the SRI. A user can test the impact of alternative scoring matrices by adjusting the values in the spreadsheet. The scores are defined in the tabs containing the information on each domain; e.g. tab H for heating, tab DHW for domestic hot water.

Negative scores are allowed. In the default configuration of the scores, the following negative scores are implemented:

- Tab EV: For the service EV-16 “EV Charging Grid balancing” and the impact criterion “Energy flexibility and storage”, a negative score (-2) is allocated to the functionality level 0 “Not present (uncontrolled charging)”. Indeed, uncontrolled charging is worse, in terms of energy flexibility, than no EV charging at all.
- Tab MC: For the service MC-29 “Override of DSM control” and the impact criteria “Comfort”, “Maintenance and fault prediction” and “Information to occupants”, negative scores (respectively -2, -1 and -2) are allocated to the functionality level 1 “DSM control without the possibility to override this control by the building user (occupant or facility manager)”. Indeed, the absence of this possibility is worse than no DSM control for those impact criteria.

4.2 ADJUSTING SERVICE CATALOGUES

By default, the services catalogues of the method A and B as consolidated by the technical support studies have been implemented in the calculation spreadsheet. Next to these default service catalogues of method A and B, users of the tool can introduce other services and/or remove some of the services from the catalogues for testing purposes. Row 58 to row 102 of the tab ‘overview-of-services’ contain placeholders to name these services and define the service levels. Column L is foreseen to toggle the services on or off in the custom services list.

If new services are introduced, the table with impact scores also needs to be filled out in the corresponding tabs, e.g. tab ‘H’ for a new service introduced in the ‘heating’ domain.

4.3 MULTI-LANGUAGE SUPPORT

The current version of the spreadsheet is in English, French and German. The structure allows supporting other languages.

For the end-user, the language can be selected in the tab ‘Building Information’ in the top row.

Expert users can introduce translations in the tab ‘LINK’ (note: this tab is hidden by default).

4.4 ADJUSTING WEIGHTING FACTORS

Final weighting factors will be defined by the Member States and/or the European Commission as part of the implementation process. The weighting factors proposed in the technical study on the SRI (and in this calculation sheet) are implemented by default, but the user has the option to test the impact of weighting factors that differ from the ones suggested in the consolidated methodology of the technical support studies. Users can define such alternative weightings in the tab 'Weightings'.

Two types of weighting factors exist:

- Weighting factors for domains (vertical aggregation)
- Weighting factors for impact criteria (horizontal aggregation)

The remainder of this section provides more instructions on setting such custom weighting factors.

4.4.1 Weighting factors for domains

A two-step approach is applied to aggregate the scores of the individual services to a single impact score for each impact criterion. First, the ordinal scores of the individual services are aggregated to a domain score. Second, the domain scores are aggregated to a single impact score. Different approaches can be envisioned for defining the weighting factors for domains.

For the aggregation of services to the domain level, equal weighting is assumed. In other words - each service within a domain is assumed to be equally important.

The aggregation of domain scores for a single impact score accounts for the relative importance of the domains in relation to the impact criteria. In the final report of the second technical support study, a mixed approach is suggested. It consists in using weighting factors based on an energy balance wherever deemed relevant, for instance when the impact of a domain is dependent on the climatic zone or building type, and supplementing those with equal or fixed weighting factors elsewhere. If none of the services of a given domain have an impact on the examined impact criterion, the weighting factor for this domain is forced to zero for this impact criterion. A summary of the approach is illustrated in Figure 7, taking as example impact scores of the service catalogue of method B.

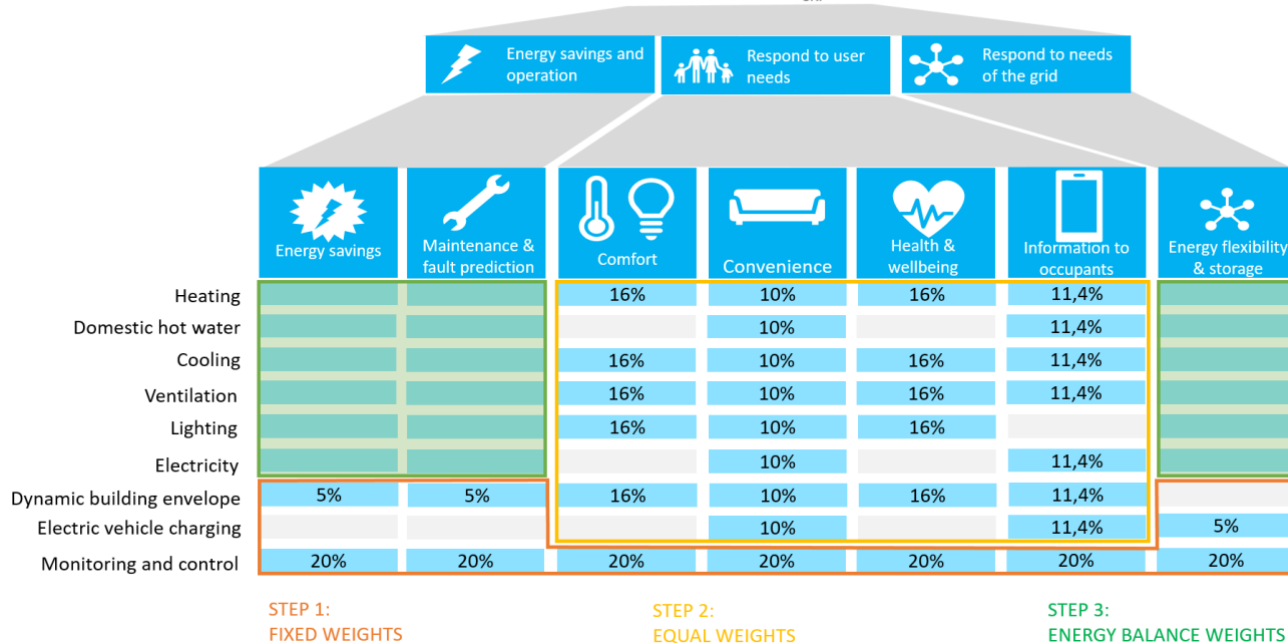


Figure 7 – Summary of the weighting factor mixed approach

Two approaches can be envisioned to derive weighting factors based on the energy balance:

- The use of statistical building stock data;
- The use of a building-specific energy balance, for instance from EPC calculations.

The calculation sheet includes a set of default weighting factors, derived from statistical data. The methodology and sources for deriving these weighting factors is provided below. For the purpose of this testing phase, the weighting factors may be altered manually in the calculation sheet, for instance if the assessor is in the possession of a more relevant or specific energy balance (e.g. EPC calculations).

4.4.1.1 Derivation of default domain weighting factors

In a first step, fixed weights are assigned to the domain “monitoring and control” for all impact criteria, and to the domains “electric vehicle charging” and “dynamic building envelope” for the impact criteria “energy savings”, “maintenance and fault prediction” and “energy flexibility and storage”.

The second step assigns equal weightings to the relevant domains for the impact criteria “comfort”, “convenience”, “health and wellbeing” and “information to occupants”.

Finally, energy balance weightings are assigned to the impact criteria “energy savings”, “maintenance and fault prediction” and “energy flexibility and storage” for the remaining domains. This is foreseen in order to take into account the specific geographical and building context influencing the relative importance of the domains. The data used for the determination of the energy balance weighting factors is the Building Stock Observatory (BSO): <https://ec.europa.eu/energy/en/eu-buildings-database>

Regarding the building context, the default weighting factors currently distinguish between:

- Residential buildings
- Non-residential buildings

Although a break-down of non-residential buildings into various building types (offices, healthcare, educational...) is desirable, insufficient data is currently available to quantify this breakdown. Stakeholders in possession of such data are invited to provide this information to the technical support team.

Regarding the geographical context, 5 climate zones have been defined: Northern Europe, Western Europe, Southern Europe, North-Eastern Europe and South-Eastern Europe. The assessor is asked to indicate the location (country) of the building. The climate zone will be attributed automatically.

To determine the weighting factor for a climate zone, national statistical data from the BSO is used and a weighted average is calculated using the population of the respective countries.

The building stock observatory data distinguishes between the following end-uses:

- Space heating
- Space cooling
- Water heating
- Lighting

For more information, please consult the final report of the technical support studies.

4.4.1.2 Domains “heating” and “ventilation”

Additional operations are needed to obtain a weighting factor for the domain "ventilation", as it is not included in the BSO energy balance. The energy demand related to controlled ventilation consists of two components: the (auxiliary) electricity demand for fans and the contribution of ventilation to the energy demand for space heating (= ventilation losses).

The total energy demand for space heating may be calculated as follows:

$$Q_H = Q_T + Q_V - \eta * (Q_S + Q_I)$$

Where

Q_H is the total energy demand for space heating (W)

Q_T are transmission heat losses (W)

Q_V are the ventilation heat losses (W)

η is the utilization factor for free heat gains

Q_S are the solar gains (W)

Q_I are the internal heat gains (W)

And

$$Q_T = (U * A) * \Delta T = H_T * \Delta T$$

$$Q_V = (c_p * \rho * v) * \Delta T = H_V * \Delta T$$

Where

U is the overall heat transmission coefficient (W/m²K)

A is the area of the exposed surface (m²)

ΔT is the temperature difference (K)

c_p is the specific heat of air (J/kgK)

ρ is the density of air (kg/m³)

v is the volume flow rate (m³/s)

H_T is the transmission loss coefficient (W/K)

H_V is the ventilation loss coefficient (W/K)

To attribute a share of the energy demand for space heating to the "heating" domain, and a share to the "ventilation" domain, the ratio of the transmission loss coefficient and the ventilation loss coefficient will be used. Abstraction has been made of the heat gains.

The following assumptions were made for these coefficients. The numbers were taken from the impact assessment, and assume newly constructed buildings (> 2010).

	H _T	H _V
North	78,0	48,9
West	80,6	48,9
South	168,4	48,9
North-East	82,7	48,9
South-East	93,2	48,9

For Northern Europe - for example - the energy demand for space heating will be divided as follows:

- 39% for "ventilation" (= 48,9 / (78,0 + 48,9))
- 61% for "heating" (= 78,0 / (78,0 + 48,9))

Little detailed information is available on the share of the electricity demand for fans within the total electricity demand of a building. At this moment, the contribution to the electricity demand is neglected in the default weighting factors.

4.4.1.3 Domain "cooling"

Many buildings across Europe do not have a mechanical cooling system. This means that the national energy consumption for cooling should only be applied to those buildings equipped with a mechanical cooling system.

Two types of data were used to determine the weighting factor for cooling:

- The annual, national energy consumption for space cooling: the building stock observatory: <https://ec.europa.eu/energy/en/eu-buildings-database>
- The share of buildings equipped with mechanical cooling installations, broken up by country and by building type (residential or non-residential): https://heatroadmap.eu/wp-content/uploads/2018/11/HRE4_D3.2.pdf

To determine the weighting factor for a climate zone, national data is weighted using the population of the respective countries. Countries with no data on the energy consumption for space cooling have been excluded from the calculation, to avoid a negative impact on the weighting factors.

4.4.2 Weighting factors for Impact Criteria

To obtain a single SRI score, the 7 impact scores must be aggregated. Different options to define weighting factors for the aggregation are discussed in the final report of the second technical SRI study. The study team envisions the following approach:

- equal weight for the EPBD key functionalities (33.3%)
- equal weights within each EPBD key functionality:

- 33% for “energy performance and operation”, divided into 16.7% each for “energy savings” and “maintenance & fault prediction”;
- 33% for “needs of the occupant”, divided into 8.3% each for “comfort”, “convenience”, “health and well-being” and “information to occupants”;
- 33% for “energy flexibility and storage”.

These suggested weighting factors are illustrated in Figure 8.

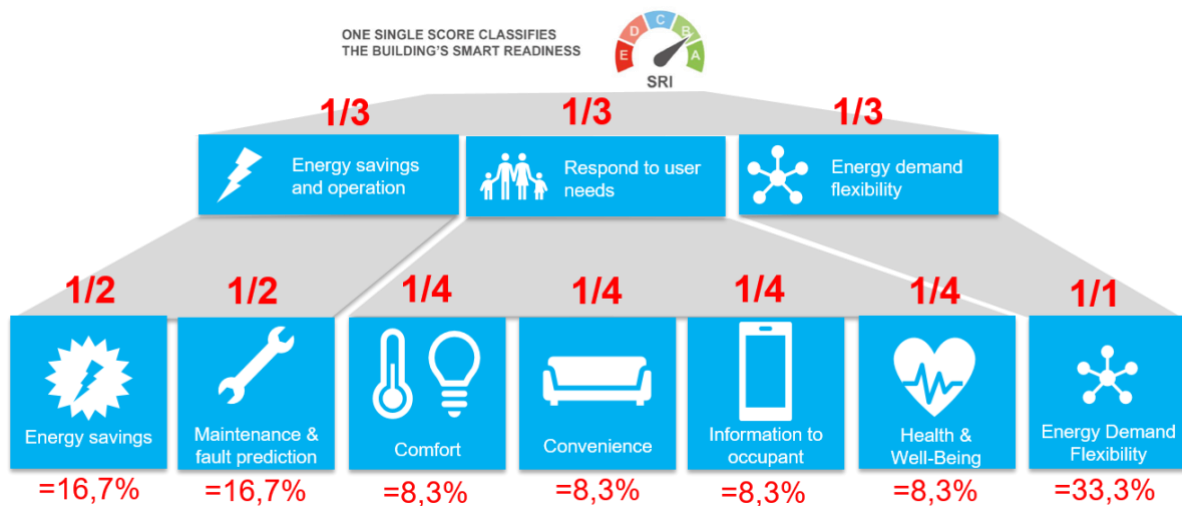


Figure 8 - Weighting factors for impact criteria proposed in the consolidated method