Interreg Alpine Space ATLAS

European Regional Development Fund

ATLAS

Advanced Tools for Low-carbon, high-value development of historic architecture in the Alpine Space.

Assessment Scheme Including KPI for the Assessment and Benchmarking the Sustainability of Historic Buildings

Priority 3 - Liveable Alpine Space

SO3.1 - Sustainably valorise Alpine Space cultural and natural heritage

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Authors	Ahmed Khoja, Sabine Erber, Miro Kristan, Franziska Hass, Natalie Essig, Alicia Daivs
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1 Introduction

This work is a pioneer attempt toward creating a sustainable rating system for historic buildings. Although the importance of the historic and heritage buildings in achieving the transition toward sustainable, carbon neutral building stock is widely recognized, to date there is no sustainability performance rating system that exclusively targets measuring the sustainable performance such buildings. This work presents a novel rating system that aim to bridging this gap by introducing set of Key performance indicators (KPIs) that are designed to guide the stakeholders into the sustainable design and implantation of heritage buildings renovations .

To increase the rate of convergence and use of the developed system, effort was made to insure that the developed system is compatible with the existing systems in the alpine region and is complementing them. As the building requirements are getting more and more complicated, having a set of clear key performance indicators allow the transformation of set goals to measurable values that reflect the rate of achievement. Therefore the comparability of interventions rises and a project receives the opportunity of verifying its development with regard to its objectives sought during the process phases. Furthermore, the integration of key performance indicators to a project allows early interventions in terms of readjusting the targets or finding new solutions.

A full description of the developed indicators as per the main theme and topic they discuss can be found at the end of the deliverable in Annex 1. The output introduces the newly developed “Heritage value” KPIs with the aim to promote the preservation of cultural heritage in the alpine region and to help identify heritage related critical areas during renovation works.

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2 Issue: Heritage value

To ensure and promote the preservation of the building heritage value along the building's life cycle, with a focus preservation and integration of local knowledge and materials in the design and use phase the building. In this Issue the following 3 mandatory and 2 optional criteria are described, the last KPI (Integration of Integration of local knowledge) is proposed by the research team, but the research team was unable to reach an agreement on reasonable integrated assessment for this KPI. Therefore, the last KPI (Integration of Integration of local knowledge) is not integrated into the system and the research team advice that more research onto this regional specific indicator is to be done in future projects.

1 – Use of original materials

2 – Compatibility with cultural values (Recommended)

3 – Rate of reversibility of renovation solution (Recommended)

4 – Use of original structure

5 – Integration of qualified interdisciplinary team

6 – Integration of Integration of local knowledge (no agreement of the assessment system reached/ not part of the output)

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H1.1 Use of original materials

Mandatory / Recommended

Preparation/ **Design and procurement/ Commissioning and in-use**

I. Intent

To promote and increase the rate of the original materials used in the renovation of historic buildings.

II. Assessment methodology

a. Description, Boundary and scope

Maintaining the originally used materials in the course of renovating an existing historic building is one of the key principles of restoring historical buildings. However, due to energetic, comfort or economic reasons, the replacement of the original materials with other ones might be inevitable. In all cases, effort must be made to maintain as much as possible of the originally used materials and to use the same materials when the replacing the original ones is necessary due to decay, deterioration or damage. The use of other materials that differ from the original ones must be done with great care and consideration as the exposer to changing temperature, ultraviolet light, air pollution and possible built up of moisture behind joints, can risk the performance of both the original and the substitute materials. The assessment boundary for this indicator is limited to the materials used on the visible parts of the exterior fabric of the building (walls and roof).

b. Assessment method

To assess this indicator a list indicating the area in m^2 of all the original materials of the building exterior fabric (walls and roof) is to be created following the guidelines of CSN EN 16883 [1] and compared with the area of the newly used materials (materials that are different from the original) that replace original ones. Original materials that are replaced with identical materials are to be considered as part of the original materials. The rate of original materials used in the building in comparison to the new ones is expressed in % of the total area of the external surface of the building. (Doors and windows are excluded)

- Design and procurement

In the Design and procurement phase the indicator is measured as percentage by comparing the area of the building exterior fabric with original materials to the area of newly used materials (materials that are different from the original) of the building exterior fabric (walls and roof) as per the proposed design. (Doors and windows are excluded)

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$$\text{Use of original materials } [\%] = \frac{\text{Area of the building exterior fabric with newly used materials}}{\text{Area of the building exterior fabric with original materials} *} \times 100$$

* Original materials that are replaced with identical materials are to be considered as part of the original materials

- Commissioning and in-use

In the Commissioning and in-use phase the indicator is determined exclusively on the basis comparing the building exterior fabric area that retained its original materials to the area of newly used materials (materials that are different from the original) of the building exterior fabric (walls and roof) as per the as built drawings or on-site measurements (Doors and windows are excluded). The results are expressed as percentage %

$$\text{Use of original materials } [\%] = \frac{\text{Area of the building exterior fabric with newly used materials}}{\text{Area of the building exterior fabric with original materials} *} \times 100$$

* Original materials that are replaced with identical materials are to be considered as part of the original materials

c. Data requiremnt

Information/Attribute	Unit	Use in stage	Data type	Data source
Area of the building exterior fabric that retained its original materials	m^2	Design and procurement/ Commissioning and in-use	Measured	Design drawings/ on site survey / as built drawings
Area of the building exterior fabric with newly used materials	m^2	Design and procurement / Commissioning and in-use	Measured	Design drawings/ on site survey / as built drawings

d. Benchmarks

Benchmark	Use in stage	Unit	Restriction
80%	Design and procurement	[%]	[Building type/ Region in which the Benchmark is not applicable]
80%	Commissioning and in-use	[%]	[Building type/ Region in which the Benchmark is not applicable]

III. References and standards

1. CSN EN 16883 Conservation of cultural heritage - Guidelines for improving the energy performance of historic buildings

Mandatory / **Recommended**

Preparation/ Design and procurement/ Commissioning and in-use

I. Intent

To insure the compatibility of the retrofitting intervention with the original cultural values of the building.

II. Assessment methodology

a. Description, Boundary and scope

Historic buildings encompass a wealth of cultural values that are manifested in their design, the choice of materials and motives and structure of the building. These inherited cultural values extended beyond the boundaries of the buildings as they become a part of the collective memory of a specific place and / or region. The value of historic buildings is more than its use value; it reflects knowledge, heritage, and traditions. Therefore, it becomes a visual reflection of past events that gave shape to its current state. Thus, a delicate balance between the environmental, social and economic requirements has to be struck and the inherited cultural values must be maintained. Therefore, effort must be made to ensure that the renovation interventions are to a great degree compatible with original cultural values that the building reflects. This is done through engaging a multidisciplinary team in the early stages of the building throughout its design and commissioning phase. The multidisciplinary team task is to ensure that the building's original identity is maintained without compromising the new environmental, social and economic requirements. The assessment boundary for this indicator includes all the interior and exterior architectural features of the building to be renovated.

b. Assessment method

The assessment of this indicator is done in all three phases: in the “Preparation phase”, a building conservation specialist is to create a report assessing the interior and exterior architectural features of the building in term of their historical significance and thier preservation worthiness following the guidelines of CSN EN 16883 [1]. Moreover, the report should include intervention suggestion that would allow preserving the architectural features and meeting the renovation targets. In the “Design and procurement” and the “Commissioning and in-use” phase the indicator is assessed by evaluating the compatibility degree of the retrofitting interventions with the building’s cultural values. The evaluation is to be done by a conservation specialist in cooperation with the building owner and the architect by indicating on a scale that ranges from 0 to 100 the retrofitting interventions' degree of compatibility with the building’s cultural values.

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- Preparation phase:

In the “Preparation phase”, a building conservation specialist is to create a report assessing the interior and exterior architectural features of the building in term of their historical significance and preservation worthiness following the guidelines of CSN EN 16883 [1]. Moreover, the report should include intervention suggestion that would allow for preserving the architectural features and meeting the renovation targets. The indicator is assessed based on the following scale.

Conservation specialist report					
100	**80**	**60**	**40**	**20**	**0**
The report include an assessment of the interior and exterior architectural features and intervention suggestions	The report include an assessment of the exterior architectural features only with intervention suggestions	The report include an assessment of the interior architectural features only with intervention suggestions	The report include an assessment of the interior **and** exterior architectural features without intervention suggestions	The report include an assessment of the interior **or** exterior architectural features without intervention suggestions	No assessment report is created

Table 1: Compatibility with cultural values assessment scale in the Preparation phase

- Design and procurement

The indicator is assessed by evaluating the degree of compatibility of the proposed retrofitting interventions with the building’s cultural values. The evaluation is to be done by conservation specialist in cooperation with the building’s owner and architect by indicating on following two scales the proposed design compatibility degree with the building cultural values.

Degree of interior retrofitting interventions compatibility with the building cultural values					
50	**40**	**30**	**20**	**10**	**0**
Excellent Compatibility	Very good Compatibility	Good Compatibility	Marginal Compatibility	Poor Compatibility	No Compatibility

Table 2: Compatibility with cultural values assessment scale in the Design and procurement phase

Degree of exterior retrofitting interventions compatibility with the building cultural values					
50	**40**	**30**	**20**	**10**	**0**
Excellent Compatibility	Very good Compatibility	Good Compatibility	Marginal Compatibility	Poor Compatibility	No Compatibility

Table 3: Compatibility with cultural values assessment scale in the Design and procurement phase

- Commissioning and in-use

The indicator is assessed by evaluating the degree of compatibility of the realized retrofitting interventions with the building’s cultural values. The evaluation is to be done by conservation specialist

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in cooperation with the building owner and the architect by indicating on following two scales the realized interventions compatibility degree with the building's cultural values.

Degree of interior retrofitting interventions compatibility with the building cultural values					
50	**40**	**30**	**20**	**10**	**0**
Excellent Compatibility	Very good Compatibility	Good Compatibility	Marginal Compatibility	Poor Compatibility	No Compatibility

Table 4: Compatibility with cultural values assessment scale in the Commissioning and in-use phase

Degree of exterior retrofitting interventions compatibility with the building cultural values					
50	**40**	**30**	**20**	**10**	**0**
Excellent Compatibility	Very good Compatibility	Good Compatibility	Marginal Compatibility	Poor Compatibility	No Compatibility

Table 5: Compatibility with cultural values assessment scale in the Commissioning and in-use phase

c. Data requiremnt

Information/Attribute	Unit	Use in stage	Data type	Data source
Indicator evaluation results as per table 1	Number	Preparation phase	Number	Conservation specialist report
Indicator evaluation results as per table 2&3	Number	Design and procurement	Number	Design drawings/ Conservation specialist report
Indicator evaluation results as per table 4&5	Number	Commissioning and in-use	Number	As built drawings / Site survey / Conservation specialist report

d. Benchmarks

Benchmark	Use in stage	Unit	Restriction
100 points	Preparation phase	Number	[Building type/ Region in which the Benchmark is not applicable]
100 points	Design and procurement	Number	[Building type/ Region in which the Benchmark is not applicable]
100 points	Commissioning and in-use	Number	[Building type/ Region in which the Benchmark is not applicable]

III. References and standards

1. CSN EN 16883 Conservation of cultural heritage - Guidelines for improving the energy performance of historic buildings

H1.3 Rate of reversibility of renovation solutions

Mandatory / **Recommended**

Preparation/ **Design and procurement/ Commissioning and in-use**

I. Intent

To reduce material waste and to promote circular economy and increase the rate of preservation of original building features.

II. Assessment methodology

a. Description, Boundary and scope

The introduction of new structural or architectural elements to the historic building during the course of renovation might be some times inevitable, as the newly refurbished building needs to meet new environmental, social and technical requirements. However, from the preservation as well as from the environmental point of view, such interventions need to be surgical in nature and carefully planned to ensure that the renovation interventions are appropriate to meet the current user demands as well as the requirements of future generations. Any technical, structural or architectural component has a limited service life after which it is required to be replaced. The ability to reverse these interventions and to easily dismantle them serves both, the heritage preservation goals as well as the sustainability targets, in the long run. As the dismantled materials can be treated as a resource in the future and the original historical aspects of the building can be retained. The assessment boundary for this indicator includes the exterior and interior features of the building.

b. Assessment method

The assessment of the rate of reversibility of the renovation solution is made by evaluating the ease of the disassembly of the new intervention and the feasibility of the disassembly. The evaluation is made by the project architect, whereby the ease of disassembly and the feasibility of the disassembly set a representative value on a scale that ranges from 0 to 80 and 0 to 20 respectively. This is to be made for the building's interior interventions and exterior interventions.

- Design and procurement

In the Design and procurement phase the indicator is measured by evaluating the ease of disassembly and the feasibility of the disassembly of the interior interventions and exterior interventions based on the proposed design as per the following scale:

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Ease of disassembly				
80	**60**	**40**	**20**	**0**
Very easy	Disassembly requires little effort (such as unscrewing bolts)	Disassembly requires moderate effort (such as tearing up roof shingles)	Disassembly requires high effort (such as removal of epoxy flooring)	Disassembly requires very high effort (such as removing steel from reinforced concrete)

Table 6: Ease of disassembly assessment scale in the Design and procurement phase

Feasibility of disassembly		
20	**10**	**0**
Disassembly or separation on-site possible with simple tools	Disassembly or separation no-site possible with high demand on man and machine power	Disassembly or separation on-site unfeasible

Table 7: Feasibility of disassembly assessment scale in the Design and procurement phase

The assessment is to be carried for the interior interventions and exterior interventions separately with each item given a separate assessment score and then the overall average score of the both assessments is to be assigned for the indicator. The assessment of each item would be made in relation to the overall area of the intervention of that item. For example if 50% area of the interventions done in the interior of the building is very easy to disassemble (8) and the other 50% require moderate effort (4), then for assessing the ease of disassembly for the interior interventions 6 points would be given. Linear interpolation can be used.

- Commissioning and in-use

In the Commissioning and in-use phase the indicator is measured by evaluating the ease of disassembly and the feasibility of the disassembly of the interior interventions and exterior interventions based on the realized project as per the following scales:

Ease of disassembly				
80	**60**	**40**	**20**	**0**
Very easy	Disassembly requires little effort (such as unscrewing bolts)	Disassembly requires moderate effort (such as tearing up roof shingles)	Disassembly requires high effort (such as removal of epoxy flooring)	Disassembly requires very high effort (such as removing steel from reinforced concrete)

Table 8: Ease of disassembly assessment scale in the Commissioning and in-use phase

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Feasibility of disassembly		
20	**10**	**0**
Disassembly or separation on-site possible with simple tools	Disassembly or separation no-site possible with high demand on man and machine power	Disassembly or separation on-site unfeasible

Table 9: Feasibility of disassembly assessment scale in the Commissioning and in-use phase

The assessment is to be carried for the interior interventions and exterior interventions separately and with each item given a separate assessment score and then the overall average score of the both assessments is to be assigned for the indicator as in the Design and procurement phase.

c. Data requiremnt

Information/Attribute	Unit	Use in stage	Data type	Data source
Assessment results of the Feasibility of disassembly and Ease of disassembly for the interior and exterior interventions	Number	Design and procurement/ Commissioning and in-use	Number	Assessment report
Area of the interior and exterior interventions	m^2	Design and procurement / Commissioning and in-use	Measured	Design drawings/ on site survey / as built drawings

d. Benchmarks

Benchmark	Use in stage	Unit	Restriction
100 Points	Design and procurement	Number	[Building type/ Region in which the Benchmark is not applicable]
100 Points	Commissioning and in-use	Number	[Building type/ Region in which the Benchmark is not applicable]

III. References and standards

1. DGNB criteria "Ease of recovery and recycling" https://www.dgnb-system.de/en/buildings/new-construction/criteria/ease-of-recovery-and-recycling/index.php

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H1.4 Use of original structure

Mandatory / Recommended

Preparation/ Design and procurement/ Commissioning and in-use

I. Intent

To reduce material waste and to increase the preservation of the original building structure.

II. Assessment methodology

a. Description, Boundary and scope

The original structure of a historic building is not just a historical asset to the building owner but also a capital asset. A structure that is in good condition has already demonstrated it's ability to withstand the test of time. Provided that the structure is well maintained, it can serve for many more years in the future. It is understandable that some changes to the floor layout of the building are needed, however such interventions must be done with great care to ensure that this changes are made without jeopardising the integrity of the original structure and that the parts of the original structure which are in good shape will be retained to serve as long and safely as possible. This serves both the economic, environmental and social objectives of preserving the historical buildings. Where possible, the repair work needs to be minimal, sensible, reversible and with the same materials used in the original one [2]. The assessment boundary for this indicator encompasses the load baring structural elements of the building and the assessment is to be done in the "Preparation", the "Design and procurement" and the "Commissioning and in-use" phase.

b. Assessment method

To assess the rate of the original structure still in use, firstly in the preparation phase, an assessment report about the condition and preservation worthiness of the existing original building structure is needed. The report is to be made by a conservation specialist in collaboration with a structural engineer following the guidelines of the CSN EN 16096 and EN 16883 standards [1,3]. The assessment should highlight the building's structural elements that are safe for further use, the ones that require repair and the structural elements that are not safe for further use or that require replacement. In the "Design and procurement" as well as in the "Commissioning and in-use" phases, the assessment of the indicator is made by calculating the rate of the original structure that was declared safe for further use to the rate of the new structure. The structural parts that are repaired to their original state are to be counted as part of the original structure. Newly added areas of the building are excluded from this assessment.

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- Preparation phase:

In the “Preparation phase”, a building conservation specialist in collaboration with a structural engineer is to create a report about the condition and preservation worthiness of the existing original building structure. The report shall include an assessment of the building structural elements that are safe for further use, the ones that require repair and the structural elements that are not safe for further use or that require replacement as per the guidelines of the CSN EN 16096 and EN 16883 [1,3] . The evaluation of the indicator is to be done via the following scale.

Assessment report of the building structure	
100	**0**
An Assessment report about the condition of building structure flowing the guidelines of the CSN EN 16096 and EN 16883 standard is available	No assessment report about the condition of building structure is made

Table 10: rate of the original structure still in use assessment scale in the Preparation phase

- Design and procurement

In the “Design and procurement phase” the rate of the original structure still in use is measured by dividing the area of the newly added structure by the area that preserved its original structure as per the proposed design using the following formula:

$$\text{Use of original structure}[\%] = \frac{\text{Area of newly used structure in the building}}{\text{Area of the building original structure } *} \times 100$$

* The areas of the structure that are replaced or repaired with identical structure as to the original one are to be considered as part of the original structure.

- Commissioning and in-use

The commissioning and in-use rate of the original structure still in use is measured by dividing the area of the newly added structure by the area that preserved its original structure as per the realized project using the following formula: a:

$$\text{Use of original structure}[\%] = \frac{\text{Area of the newly used structure in the building}}{\text{Area of the building original structure } *} \times 100$$

* The areas of the structure that are replaced or repaired with identical structure as to the original one are to be considered as part of the original structure

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c. Data requiremnt

Information/Attribute	Unit	Use in stage	Data type	Data source
Assessment report about the condition of building structure	n/a	Preparation phase	Report	Assessment report
Area of the newly used structure in the building	m^2	Design and procurement / Commissioning and in-use	Measured	Design drawings/ on site survey / as built drawings
Area of the building original structure	m^2	Design and procurement / Commissioning and in-use	Measured	Design drawings/ on site survey / as built drawings

d. Benchmarks

Benchmark	Use in stage	Unit	Restriction
100 Points	Preparation phase	Number	[Building type/ Region in which the Benchmark is not applicable]
xx%	Design and procurement	[%]	[Building type/ Region in which the Benchmark is not applicable]
xx%	Commissioning and in-use	[%]	[Building type/ Region in which the Benchmark is not applicable]

III. References and standards

1. CSN EN 16883 Conservation of cultural heritage - Guidelines for improving the energy performance of historic buildings
2. Michael, F., Structures and Construction in historic building conservation. 2007, Wiley-Blackwell.
3. CSN EN 16096 Conservation of cultural property - Condition survey and report of built cultural heritage

H1.5 Integration of qualified interdisciplinary team

Mandatory / Recommended

Preparation/ Design and procurement/ Commissioning and in-use

I. Intent

To ensure that the renovation measures do not negatively impact the historical value of the building.

II. Assessment methodology

a. Description, Boundary and scope

When dealing with improving the energy performance of historic buildings, the basics of conservation must be always taken into account even when the building is protected through heritage protection laws. In contrast with renovating modern buildings, the successful renovation of historical buildings requires specific examinations and documentation to ensure that the renovation does not negatively impact the historical value of the building. The cultural value of the building must be carefully assessed in terms of its national, regional and local cultural significance. Such assessments underline the authenticity, integrity and the cultural-historical importance of the building and enable the definition of characteristic features which should be preserved. Thus, any intervention can be planed and implemented based on informed decisions. Achieving this goal requires that a qualified interdisciplinary team is engaged throughout the planning and realization of the renovation work at the historical building [1]

b. Assessment method

The assessment of this indicator is based on the number and qualification of the interdisciplinary team engaged during the preparation, design and commissioning of the renovation project. This assessment is based on the recommendations of the EN 16883 conservation of cultural heritage guidelines [1].

- Preparation phase:

During the”Preparation phase” the assessment is based on the existences of the qualified professionals as per the following scale:

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Integration of qualified interdisciplinary team					
100	**80**	**60**	**40**	**20**	**0**
Specialist in conservation planning and cultural-historical significance evaluation + Specialist in building energy performance + Specialist in Indoor air hygiene + Specialist in property management + Specialist in economic feasibility of projects	Specialist in conservation planning and cultural-historical significance evaluation + Specialist in building energy performance + Specialist in Indoor air hygiene + Specialist in property management	Specialist in conservation planning and cultural-historical significance evaluation + Specialist in building energy performance + Specialist in Indoor air hygiene	Specialist in conservation planning and cultural-historical significance evaluation + Specialist in building energy performance	Specialist in conservation planning and cultural-historical significance evaluation	No Integration of qualified interdisciplinary team

Table 11: Integration of qualified interdisciplinary team assessment scale in the Preparation phase

- Design and procurement

Similar to the assessment scale used in the Preparation phase, the assessment in the Design and procurement phase is made as per the following scale:

Integration of qualified interdisciplinary team					
100	**80**	**60**	**40**	**20**	**0**
Specialist in conservation planning and cultural-historical significance evaluation + Specialist in building energy	Specialist in conservation planning and cultural-historical significance evaluation + Specialist in building energy	Specialist in conservation planning and cultural-historical significance evaluation + Specialist in building energy	Specialist in conservation planning and cultural-historical significance evaluation + Specialist in building energy	Specialist in conservation planning and cultural-historical significance evaluation	No Integration of qualified interdisciplinary team

performance + Specialist in Indoor air hygiene + Specialist in property management + Specialist in economic feasibility of projects	performance + Specialist in Indoor air hygiene + Specialist in property management	performance + Specialist in Indoor air hygiene	performance		

Table 12: Integration of qualified interdisciplinary team assessment scale in the Design and procurement phase

- Commissioning and in-use

Similar to the assessment scale used in the previous phases, the assessment in the Commissioning and in-use phase is made as per the following scale:

Integration of qualified interdisciplinary team					
100	**80**	**60**	**40**	**20**	**0**
Specialist in conservation planning and cultural-historical significance evaluation + Specialist in building energy performance + Specialist in Indoor air hygiene + Specialist in property management + Specialist in economic feasibility of projects	Specialist in conservation planning and cultural-historical significance evaluation + Specialist in building energy performance + Specialist in Indoor air hygiene + Specialist in property management	Specialist in conservation planning and cultural-historical significance evaluation + Specialist in building energy performance + Specialist in Indoor air hygiene	Specialist in conservation planning and cultural-historical significance evaluation + Specialist in building energy performance	Specialist in conservation planning and cultural-historical significance evaluation	No Integration of qualified interdisciplinary team

Table 13: Integration of qualified interdisciplinary team assessment scale in the Commissioning and in-use phase

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c. Data requiremnt

Information/Attribute	Unit	Use in stage	Data type	Data source
Evidence of integrating the required team	n/a	Preparation phase	Documents	Contracts
Evidence of integrating the required team	n/a	Design and procurement / Commissioning and in-use	Documents	Contracts
Evidence of integrating the required team	n/a	Design and procurement / Commissioning and in-use	Documents	Contracts

d. Benchmarks

Benchmark	Use in stage	Unit	Restriction
60 point	Preparation phase	[#]	[Building type/ Region in which the Benchmark is not applicable]
60 point	Design and procurement	[#]	[Building type/ Region in which the Benchmark is not applicable]
60 point	Commissioning and in-use	[#]	[Building type/ Region in which the Benchmark is not applicable]

III. References and standards

1. CSN EN 16883 Conservation of cultural heritage - Guidelines for improving the energy performance of historic buildings

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3 Annex 1

3.1 An overview of the ATLAS KPIs

Issue	Category	Criterion	Indicator	Use	KPI source
Energy & Emissions	Energy	Primary energy demand	Annual primary energy demand per useful internal floor area	(Mandatory)	EUSALP
		Delivered energy demand	Annual delivered energy demand per useful internal floor area	(Mandatory)	EUSALP
		Renewable energy in primary energy consumptions	Primary energy demand of the building that is met by renewable sources on total primary energy demand	(Mandatory)	EUSALP
		Renewable energy in final thermal energy consumptions	Share of renewable energy in final thermal energy consumptions	(Mandatory)	EUSALP

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		Renewable energy in final electric energy consumptions	Share of renewable energy in final electric energy consumptions	(Mandatory)	EUSALP
	Environmental impact	Embodied non-renewable primary energy (product stage)	MJ of embodied primary non-renewable energy per area	(Recommended)	EUSALP
		Global warming potential	CO_2 equivalent emissions per useful internal floor area per year	(Mandatory)	EUSALP
Materials	Materials	Materials from renewable sources	Weight of materials from renewable sources on total weight of materials	(Recommended)	EUSALP
		Recycled materials	Weight of recycled materials on total weight of materials	(Recommended)	EUSALP
		Construction and demolition waste		(Recommended)	EUSALP
Water	Water	Water consumption	Water consumption per occupant per year	(Recommended)	EUSALP

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		Net potable water consumption	Potable water consumption per occupant per year	(Recommended)	EUSALP
Indoor environmental quality	Indoor air quality	Quality of air - ventilation	Ventilation rate	(Mandatory)	EUSALP
		Quality of air - CO2 concentration	CO2 concentration	(Mandatory)	EUSALP
		TVOC from construction materials	TVOC concentration	(Mandatory)	EUSALP
		Formaldehyde from construction materials	Formaldehyde concentration	(Mandatory)	EUSALP
		Thermal comfort	% Time outside the thermal comfort range	(Recommended)	EUSALP
Life cycle cost	Life cycle cost	Life cycle cost in the operational stage	Life cycle annual cost per usable floor area	(Recommended)	EUSALP
Heritage value	Heritage preservation	Use of original materials	Rate of use of original materials	(Mandatory)	ATLAS

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		Compatibility with cultural values	Degree of compatibility with original cultural values	(Recommended)	ATLAS
		Rate of reversibility of renovation solutions	Rate of reversibility of renovation solution	(Recommended)	ATLAS
		Use of original structure	Local knowledge is used in planning / construction of the project	(Mandatory)	ATLAS
		Integration of qualified interdisciplinary team	A preservation specialist is included in the planning / construction of the project	(Mandatory)	ATLAS