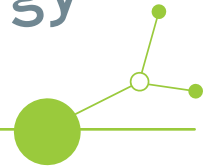


D.2.1.1 Report on current building standards and framework for energy efficiency and sustainability in CE



Version 1
30/09/2023





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This deliverable is edited by CASACLIMA with the contribution and support of EAST, REGEA, EAN, MAE, JSI.



A. Introduction

The central Europe region faces a very uneven energy transition due to unbalanced economic development, distribution of technology and finance flows. Buildings, both public and private, account for 43% of the final energy consumption in EU and have been singled out in the European Green Deal as key drivers of energy transition. Nevertheless, CE countries are confronted with low building renovation rates, lack of internal capacities of the building stock managers, difficulties in gathering data on the building performance. Policies towards climate neutrality are already in place in several CE countries, but national/regional building schemes and regulations are not always efficiently translated into concrete projects. The ambitious EU energy and climate targets require therefore appropriate and effective methodologies to support the building sector towards climate neutrality.

One of the main objectives of the MESTRI-CE project is the definition of a working methodology that will enable, also by developing specific supporting tools, the dissemination and successful application of the new European framework on energy efficiency and sustainability in buildings in the partner countries. The MESTRI-CE Sustainable Building Methodology will enhance the design of new buildings and the renovation of existing ones based on sustainability and climate-neutrality criteria harmonised at CE level. Harmonisation and upgrade of the actual building standards and of the methodologies applied to assess and report on the energy and sustainability performance of buildings are the focus of WP2 activities.

As first step, a status quo analysis on existing building standards and framework for energy efficiency and sustainability in Central Europe has been carried out. This deliverable D.2.1.1 allows for a general overview of the legislative framework on energy efficiency and sustainability in buildings currently in force in the six EU countries involved in the project and provides a first analysis and comparison of the relevant schemes, guidelines, certification systems used to assess and report on the performance of buildings.

The information gathered in this deliverable will allow us to identify, for each of the partner countries, the current building regulatory framework and which of the building assessment schemes in use, whether compulsory or voluntary, should be updated or strengthened to be in line with the actual and upcoming European framework on energy efficiency and sustainability in buildings.

The MESTRI CE Sustainable Building Methodology will act as support to the existing building standards and guidelines by integrating them with Level (s) and other European building regulations and initiatives (e.g. EU taxonomy, EPBD recast, GPP, New European Bauhaus). The Level(s) initiative, providing a common framework in Europe for sustainability indicators for buildings, both in terms of metrics to be used to analyse the building`s performance and of methodology to describe it unambiguously, will be the main reference to achieve the WP2 project`s objectives.



B. Report summary

The aim of this deliverable 1.1.2 is to collect and illustrate the first results of the work carried out in the first project period on WP2. Desk research involving all partner countries has explored the current strategic and regulatory frameworks for energy efficiency and sustainability of buildings and the standards, guidelines and certification schemes in use in Central Europe.

For each of the six CE countries represented in the MESTRI-CE project (Austria, Croatia, Germany, Italy, Poland and Slovenia) an overview has been provided by the partners regarding:

- national or regional strategies, plans and policy framework for energy efficiency and climate with a special focus on buildings
- regulatory framework and mandatory or voluntary standards and certification schemes applied at national and regional level in the field of energy efficiency and sustainability of buildings

Each project partner has also identified the schemes, standards, guidelines for the energy efficient and sustainable construction or renovation of buildings that are relevant for the respective geographical context and area of competence. The standards, guidelines or certification schemes for energy efficiency and sustainability in buildings selected for a first analysis are:

- the klimaaktiv building certification scheme for Austria
- the national mandatory standard for the energy performance certification of buildings (EPC) and the Green Deal Design Project Guidelines for Croatia
- the Passivhaus, the BNB and the DGNB building certification schemes for Germany
- the national mandatory standard for the energy performance certification of buildings (EPC), the Minimum Environmental Requirements for public buildings, the CasaClima R and the CasaClima Nature building certification schemes for Italy
- the national mandatory standard for the energy performance certification of buildings (EPC) and the Green Building Standard for Poland
- the Slovenian indicators of sustainable construction based on the Level(s) framework for Slovenia

For each analysed scheme, a table highlights its scope, the type of buildings to which it can be applied and for which type of interventions, its compulsory or voluntary application, its impact in terms of assessed/certified projects as well as other general information on the governance, the update frequency and the possibility for project partners to further develop and adapt the scheme. A second table collects basic information on the evaluation/certification process and the stakeholders involved.

The criteria/indicators used in the selected schemes to assess the sustainability performance of buildings have been analysed both in relation to the dimensions of sustainability and the thematic areas covered. In the first case the analysis shows that the environmental dimension is still the prevailing one in terms of number of indicators in use in nearly all the schemes, followed by the social dimension. More than half of the schemes, however, uses criteria/indicators that also investigate the economic dimension to assess the sustainable performance of a building.

With respect to the thematic areas addressed, this first analysis highlights significant differences between the selected schemes, with the national mandatory standards, the Passivhaus and the CasaClima R schemes focusing on few thematic areas (energy efficiency, emissions and IEQ) while the BNB and the DGNB schemes, the Green Deal Design Project Guidelines, the Slovenian Indicators of sustainable construction and the Italian Minimum Environmental Criteria use indicators covering a large amount of the thematic areas that contribute to the sustainable performance of buildings.



C. Country overviews

1. Austria

1.1. General overview of national energy and climate strategies/plans and policy framework

1.1.1. Long-term strategy 2050 - Austria

The Austrian government presented the "Long-term Strategy 2050 - Austria" to the European Commission in December 2019, as required by the European "Governance Regulation" (Regulation (EU) 2018/1999). This strategy outlined Austria's ambitious objective of achieving climate neutrality by 2050, excluding the utilization of nuclear energy.

[web link](#)

1.1.2. National Energy and Climate Plan (NEKP)

Concurrently, as part of the EU climate protection package, Austria developed the National Energy and Climate Plan (NEKP) to effectively realize European climate protection objectives. This comprehensive strategic plan received approval from the Austrian federal government in December 2019 and was subsequently submitted to the European Commission (BMNT, 2019a).

The NEKP is centred on the goal of reducing Austria's greenhouse gas (GHG) emissions by at least 36% by 2030, measured against the 2005 levels. To achieve this, the plan delineates specific measures and targets in key areas such as energy efficiency, renewable energies, and mobility. For instance, Austria aims to increase the share of renewable energies in its gross final energy consumption to a minimum of 46% by 2030, and also expand storage capacities to ensure a stable and secure supply of renewable energies.

The building sector receives special attention in the NEKP, with the objective of reducing greenhouse gas emissions by 3 million tons of CO₂ equivalent, as compared to the 2016 levels. To achieve this, the plan focuses on promoting building renovation, phasing out fossil fuels for heating and cooling, and expanding district heating networks.

To monitor the implementation progress and ensure the planned targets are met, Austria commits to publishing a progress report every two years. As of May 2023, the Austrian National Energy and Climate Plan is currently undergoing revision to enhance its effectiveness and align it with evolving needs and challenges.

[web link](#)

1.1.3. Austrian Energy Policy

1.1.3.1. Austrian Climate Protection Act

Apart from the European Union's climate targets, Austria has set its sights on achieving climate neutrality even earlier, by 2040. To accomplish this, Austria relies on the Austrian Climate Protection Act (Klimaschutzgesetz - KSG, 2013) to provide a solid legal framework for implementing both national and European climate objectives.

Originally adopted in 2011 to meet the EU burden-sharing decision for the 2020 climate protection targets, the KSG was subsequently amended in 2017. However, the current government program for the years 2020-



2024 includes a comprehensive revision of the KSG. The objective of this revision is twofold: firstly, to chart a clear path towards achieving the ambitious goal of climate neutrality by 2040; and secondly, to effectively integrate and execute the more stringent EU-level climate targets at the national level.

To achieve these aims, a corresponding bill is currently in the drafting process as of May 2023. This bill aims to strengthen Austria's commitment to climate action and pave the way for a sustainable, low-carbon future.

[web link](#)

1.1.3.2. Energy Efficiency Act

In Austria, alongside the Austrian Climate Protection Act (Klimaschutzgesetz - KSG), the Energy Efficiency Act (Bundes-Energieeffizienzgesetz - EEffG, 2014) plays a significant role in implementing both European and national energy policies. Enacted in 2014 and subsequently amended in 2020, the EEffG serves as the second pillar in the country's approach to energy-related matters.

To address the escalating energy efficiency standards set forth by the European Energy Efficiency Directive, the EEffG is presently undergoing a revision process. The Federal Energy Efficiency Act was amended by simple law for the period from 2023 (see BGBl. I Nr. 59/2023, promulgated on 14 June 2023, entered into force on 15 June 2023). Authorised body in Austria is the E-Control.

Regarding the buildings sector, the document proposes several key measures. It includes provisions for continuing final energy audits and energy management systems for large companies. Additionally, individual consumption meters with remote reading capabilities are outlined, aiming to enhance energy monitoring and management. To support households in adopting energy efficiency measures, the draft proposes financial assistance and increased advisory services, encouraging wider adoption of sustainable practices in homes. These measures aim to bolster energy efficiency in Austria and contribute to the nation's overall energy and climate objectives.

[web link](#)

1.2. General overview of the framework for energy efficiency in buildings at national and/or regional level

The Austrian legal framework aimed at reducing greenhouse gas emissions in the building sector encompasses crucial aspects of construction quality (applicable to both new constructions and refurbishments), heating and cooling strategies, and the utilization and production of renewable energies. This framework is closely aligned with the specifications and directives mandated by the European Union.

To effectively implement the EU Building Efficiency Directive (EPBD), Austria employs a combination of laws enacted by the federal government and the individual federal states. The responsibility for building codes and related regulations lies primarily with the federal states. Acting as a coordination platform in the construction domain, the Austrian Institute for Building Technology (OIB) has formulated guidelines to align with the EU directives at the national level. These guidelines serve to ensure the consistent application of the EU's requirements within Austria's building sector, promoting energy efficiency and sustainable practices throughout the country.



1.2.1. National/regional regulations and standards for energy efficiency in buildings

1.2.1.1. OIB Guideline 6 Energy Saving and Thermal Insulation

OIB Guideline 6 (Österreichisches Institut für Bautechnik - OIB, 2019), issued by the Austrian Institute for Building Technology (OIB) in 2019, focuses on energy conservation and thermal insulation in the construction sector. This guideline outlines the minimum requirements that must be adhered to for both new constructions and significant renovations. It provides comprehensive specifications for enhancing the energy efficiency of the building envelope, along with stipulations for building services engineering.

The current version of OIB Guideline 6 is the 2019 edition, which serves as the basis for ensuring energy-efficient building practices in Austria. Notably, work is already underway to update and further improve this guideline, reflecting the ongoing commitment to stay at the forefront of energy-saving measures and advancements in thermal insulation technologies. [web link](#)

Meanwhile, the OIB Directive no. 6 was amended (2023), but will not come into effect before 2024. Minor changes have been made in the Directive concerning the heat protection in summer and crediting of renewable electricity requirements.

1.2.1.2. Energy Performance Certificate Template Act (EAVG)

In addition to the beforementioned measures, the Energy Performance Certificate Submission Act (EAVG, 2012) governs the preparation and submission of energy performance certificates for buildings whenever they are rented, sold, or leased. Initially implemented in 2008, this act has undergone multiple revisions, especially to accommodate the incorporation of new stipulations from the EU Energy Performance of Buildings Directive (EPBD). Through this regulatory framework, Austria aims to ensure transparency and awareness regarding the energy efficiency of buildings, enabling potential buyers, renters, and lessees to make informed decisions with regard to the energy performance of the properties.

[web link](#)

1.2.1.3. National Long Term Renovation Strategy (LTRS).

The issue of building renovation holds significant importance at the EU level and is firmly established in all member states through the requirement to present a national long-term renovation strategy (LTRS) in accordance with the EPBD (Mikulits, Thoma, Stadler, 2020). This strategic document conducts a comprehensive evaluation of existing national instruments and measures aimed at promoting cost-optimal deep renovation of buildings, addressing energy poverty, and fostering the integration of smart technologies in building practices.

Within the LTRS, a well-structured roadmap outlines a series of measures and measurable progress indicators that align with the long-term objective of reducing EU greenhouse gas emissions by 80-95% by 2050, relative to the levels recorded in 1990. Additionally, the LTRS delves into an analysis of mechanisms to facilitate investment mobilization, ensuring streamlined access to funding support.

Initially released by the OIB in April 2020, the LTRS is scheduled for updating every three years. As part of the National Energy Efficiency Action Plan, the revised strategy will be subsequently submitted to the EU Commission, underscoring Austria's commitment to promoting sustainable building practices and achieving ambitious climate goals at both the national and EU levels.



1.2.1.4. Renewable Heat Act (EWG)

A significant portion of the heating and cooling demand in Austria's buildings is still met using fossil fuels. To address this issue and reduce CO₂ emissions from the building sector, Austrian policymakers are striving to transition to renewable energy sources. The Renewable Heat Act (EWG) has been introduced to regulate this shift from old fossil fuel-based heating systems to modern and environmentally friendly alternatives.

The proposed draft of the Renewable Heat Act (EWG, 212/ME, 2022) includes several important provisions. According to the draft, the installation of gas heating systems in new buildings should be prohibited from January 1, 2023. Moreover, a more ambitious goal is set for 2035, by which all climate-damaging oil and coal heating systems must be replaced. Looking ahead to 2040, the ultimate objective is to convert all heating systems in Austria to operate solely on renewable energies.

Currently, the draft law is undergoing a review process to ensure its feasibility and effectiveness in achieving the desired transition to sustainable heating solutions for the country.

[web link](#)

1.2.1.5. Renewable Expansion Act (EAG)

The shift towards renewable energy sources for heating and cooling demands a substantial expansion effort. To facilitate this transition, the Renewable Expansion Act 2021 (EAG, 2021) was enacted, replacing the Green Electricity Act. This new legislation lays down the legal framework to accomplish the ambitious objective of achieving 100 percent electricity generation from renewable sources on a balance sheet basis by 2030.

Among its various provisions, the EAG streamlines the process of expanding photovoltaic (PV) systems on buildings and empowers the formation of energy communities. These measures are designed to make it easier for individuals and communities to adopt renewable energy technologies and actively participate in the renewable energy ecosystem. [web link](#)

1.2.2. Other voluntary assessment methods or certification schemes exceeding national mandatory standards

Beyond the legal framework, other instruments in Austria support the implementation of highly efficient buildings and the switch from fossil to renewable energy sources. For example:

- The klimaaktiv initiative offers several instruments for promoting energy-efficient construction and renovation, especially in the building sector. For example, it offers consulting services and opportunities for quality assurance for sustainable new construction and building renovation. In addition, the klimaaktiv building standard was developed to make the sustainability of a building measurable and comparable. Numerous practice-oriented continuing education opportunities are also offered for the area of construction and renovation.
- The development of an Austrian action plan for sustainable public procurement (naBe action plan)¹ was adopted in Austria in 2010 as part of an initiative of the European Commission. This plan provides for the public sector to assume a special exemplary role by fulfilling certain criteria in its procurements. For example, public buildings (new construction and refurbishments) are to achieve at least the klimaaktiv building standard silver in the future. On June 23, 2021, the federal government adopted an updated naBe action plan (including naBe core criteria).

¹ see <https://www.nabe.gv.at/>, retrieved on 23.02.2023



- Numerous funding streams are offered by the federal and state governments to support energy retrofits and the conversion of heat generation to renewable energy sources. For example:
 - > As part of the renovation offensive, thermal renovation in private residential buildings is promoted by the "renovation check"², with funds made available annually for this purpose by the Austrian federal government. Companies and municipalities can also apply for subsidies for this purpose.
 - > The "Get out of oil and gas" promotion campaign³ is also a successful initiative to support the switch from fossil-fuelled space heating systems to sustainable heating systems for private homes as well as for businesses and municipalities. Due to its great success in previous years, the "Get out of oil and gas" funding campaign will be continued in 2023 and 2024.

1.3. General overview of the framework for building sustainability at national and/or regional level

1.3.1. National/regional regulations and standards for sustainable buildings

1.3.1.1. Grants and subsidies for building sustainability

Subsidies for buildings are granted from the state of Austria via the KPC institution and also from the federal states itself. As "building sustainability" is a broad term this point gives an overview of the subsidies available at national or regional level. Below are some examples of provincial and state subsidies in Austria that focus on sustainable buildings:

- Subsidies for energy-efficient buildings: Many subsidies offer financial support for the construction or renovation of buildings that meet or exceed high energy efficiency standards. These subsidies can take the form of grants or low-interest loans. E.g., the KPC offers for residential buildings higher grants if the value for heating energy demand meets the klimaaktiv minimum criteria.
- Renewable energy subsidies: Some federal states offer specific subsidies for the use of renewable energy in buildings, such as solar energy, biomass or geothermal energy. This can help to reduce the energy consumption of buildings and improve their sustainability. For non-residential buildings that meet sustainable building standards (klimaaktiv "gold", Passivhouse Standard) a supplement of 5 % of the eligible costs can be awarded.
- Subsidies for green building materials: There may be specific subsidy programs that target green building materials and practices. These include, for example, subsidies for the use of environmentally friendly building materials. E.g., in KPC subsidy for residential buildings if insulation material made from renewable raw materials is used (at least 25 % of all insulated surfaces), the maximum subsidy increases by 50 %.
- Subsidies for sustainable mobility: Some federal states could also offer subsidy programs that focus on sustainable mobility around buildings, such as the expansion of cycle paths or the use of electric vehicles.

The klimaaktiv Building Standard is referenced in various subsidies and guidelines for sustainable construction and renovation in Austria, which contributes to its successful dissemination and implementation. Some of the current subsidies and guidelines in which the klimaaktiv building standard is implemented as a quality mark for sustainable buildings are listed below:

² see <https://www.umweltfoerderung.at/privatpersonen/sanierungsscheck-ein-zweifamilienhaus-und-reihenhaus-2021/2022>, retrieved on 23.02.2023

³ see <https://www.umweltfoerderung.at/privatpersonen/raus-aus-oel-und-gas>, retrieved on 23.02.2023



- Sanierungsbonus (renovation bonus) 23/24: the Sanierungsbonus subsidy promotes thermal renovation in private housing for multi-storey buildings older than 20 years. Eligible for funding is comprehensive renovation according to the klimaaktiv standard and the renovation of individual building components such as windows.
- Municipal Investment Act 2023 (KIG 2023): the Federal Government's Municipal Investment Act 2023 stipulates that municipal buildings must be constructed to the klimaaktiv Silver Standard in order to receive funding.
- Mustersanierung (model renovation) - increased funding for klimaaktiv Gold: within the framework of the model renovation, comprehensive renovation projects of operational or public buildings are promoted. Buildings that meet the klimaaktiv Gold standard receive an additional 5% of the eligible costs.
- Criterion in housing subsidies in selected countries: in the housing subsidies in the provinces of Tyrol, Carinthia, Styria and Vorarlberg, there is either the highest subsidy level or a bonus if the klimaaktiv standard is achieved. In other provinces, individual criteria of the housing subsidy are compatible with the klimaaktiv criteria and can be verified.
- TOP tourism promotion for hotel buildings by the ÖHT: the TOP tourism promotion by the Austrian Hotel and Tourism Bank (ÖHT) includes the achievement of the klimaaktiv Silver Standard for hotel buildings.

1.3.1.2. Cross-sector initiatives

Beyond the legal framework, numerous cross-sector initiatives have been launched in Austria to pave the way for achieving Austria's climate targets:

- klimaaktiv (BMK, 2023): the initiative was launched in 2004 on behalf of the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW) and within the framework of the Austrian Climate Strategy. Klimaaktiv acts in the fields of renewable energy (heat, energy wood, Nawaro market, QM heating plants), energy saving (hints and knowledge for companies and households), mobility (support and knowledge for companies, communities and households) as well as building and renovation. Furthermore, klimaaktiv Bildung develops and organizes courses for professionals in cooperation with continuing education and training providers.
- The e5 program⁴ for energy-efficient municipalities supports Austrian municipalities in structured and sustainable climate protection work. Participating municipalities receive tools and support under the program to set and achieve their energy and climate protection targets.
- The "Climate and Energy Model Regions" (KEM) program⁵ provides financial support for municipalities to implement concrete measures that contribute to the reduction of emissions. The focus is on making optimal use of local renewable energy resources.
- The Climate and Energy Fund, in cooperation with the Federal Ministry for Climate Action (BMK), initiated the "Climate Change Adaptation Model Regions" (KLAR!) funding programme in autumn 2016. The aim of the programme is to give regions and municipalities the opportunity to prepare for climate change, to minimise the negative consequences of climate change by means of adaptation measures and to use the opportunities that arise.⁶

⁴ see <https://www.e5-gemeinden.at/e5-programm/das-e5-programm>, retrieved on 23.02.2023

⁵ see <https://www.klimafonds.gv.at/call/klima-und-energie-modellregionen-2023/>, retrieved on 09.08.2023

⁶ see <https://klar-anpassungsregionen.at/>, retrieved on 14.08.2023



- The goals and measures of the Biodiversity Strategy Austria 2030+ were based on six overarching, six overarching goals and four essential prerequisites. The overarching goals are:
 - > improvement of the status and trends of species and habitats,
 - > effective protection in protected areas and networking of ecologically valuable habitats,
 - > the restoration of ecosystems that are particularly important for biodiversity and ecosystems, the reduction of land use and fragmentation,
 - > consideration of biodiversity in all areas of society and in the economy and the strengthening of global aspects. The concept of the bioeconomy includes on the one hand the sources of raw materials and on the other hand the use of these bio-based raw materials. The aim is to achieve an economic form that harmonises technology and ecology and interacts with the requirements and developments of the European research and economic area. These goals can only be achieved if, in addition to decarbonising the energy system, fossil raw materials are largely replaced in all products of daily use. The aim of the national bioeconomy strategy is to identify concrete measures to further establish the bioeconomy in Austria in order to bring lasting growth impulses for biobased products, bioenergy and the associated technologies and services.

1.3.2. Other voluntary assessment methods or certification schemes for sustainable buildings

1.3.2.1. National initiative - Austrian Green Planet Building

The "Austrian Green Planet Building" is an award system for energy-efficient and sustainable construction based on the klimaaktiv building standard of the Federal Ministry for Climate Protection, Environment, Mobility, Innovation and Technology (BMK) in Austria. It was developed to present Austrian quality in sustainable building internationally and to award buildings abroad in which Austrian companies and technology have made a significant contribution to the planning and implementation.



Figure 1: Austrian Green Planet Building Logo (<https://www.agpb.at/>)

The criteria of the "Austrian Green Planet Building" are applicable worldwide and are based on energy efficiency, sustainability, health and user comfort as well as the avoidance of environmentally harmful building materials. The aim is to award buildings that stand out for their high quality of execution and make a contribution to climate protection.

The award system awards 4 to 6 stars, with four stars being awarded to a building that meets the highest energy efficiency and sustainability requirements. Five stars are possible if the passive house standard is also achieved, and six stars are awarded if the building even has a neutral or positive energy balance.

The "Austrian Green Planet Building" award is given exclusively to buildings abroad in which Austrian companies and architectural and planning offices were significantly involved. The umbrella brand of the BMK in cooperation with the Austrian Federal Economic Chamber (WKO) is intended to make these achievements communicable worldwide and to further strengthen international interest in Austrian know-how and technology in the field of sustainable and energy-efficient building.

Further information on the "Austrian Green Planet Building" can be found on the website <https://www.agpb.at/>.



1.3.2.2. National initiative - klimaaktiv building standard

klimaaktiv is the climate protection initiative of the Federal Ministry for Climate Protection, Environment, Energy, Mobility, Innovation and Technology (BMK). With the development and provision of quality standards, the education and training of professionals, with advice, information and a large partner network, klimaaktiv complements climate protection funding and regulations.

klimaaktiv



Figure 2: klimaaktiv building logo (www.klimaaktiv.at)

The klimaaktiv - building and renovation program track is applicable to residential buildings and public buildings (private and non-private residential or non-residential buildings). It provides an assessment catalogue with several criteria in the fields of location, energy efficiency, health and user comfort, avoidance of environmentally harmful construction material and high construction quality. Declarable buildings that are conditioned in any form (heated or cooled) can be evaluated on the basis of the klimaaktiv- criteria set and subsequently declared. Currently, more than 1350 declared klimaaktiv-buildings are in the database. The represented buildings are very well documented with photos. Furthermore, there is a short description, technical data from the energy performance calculation or PHPP (passive house planning package) calculation, information about the owner, the planners, as well as a description of the qualities of the building on the basis of achieved points of declaration following the criteria-set available. The platform is for public use and open to everybody.

The klimaaktiv building standard is freely available to all interested parties according to the open-source principle. Any person or company can register on klimaaktiv's declaration platform "baudock" and carry out a building assessment according to the klimaaktiv standard. The qualities and minimum requirements are precisely defined, and the results of each klimaaktiv building declaration are published transparently.

The klimaaktiv building assessment is free of charge, as the costs for checking the building data entered and publishing the klimaaktiv buildings are borne by the Federal Ministry for Climate Protection.

There are three stages of building declaration under klimaaktiv to ensure the quality of a building from planning to use:

- Declaration in planning
- Declaration during completion
- Declaration during use

Through these different stages, the quality requirements of the klimaaktiv building standard can be taken into account and verified for each property in all phases - from planning to use. This enables real estate operators, developers, municipalities and cities to demand the desired quality already in the tendering and awarding phase. Since more than fifteen years, the programme is very successful in Austria.



These subsidies and requirements show the commitment of the public sector and other institutions to promote sustainable and energy-efficient construction and renovation and to establish the klimaaktiv building standard as a guideline for such projects. This promotes sustainable development in the building sector and strengthens the contribution to climate protection.

Various real estate developers, builders and institutions have incorporated klimaaktiv's quality criteria into their corporate goals and guidelines. This can be seen, for example, in the case of the BIG Group and its subsidiary ARE, which have introduced a mandatory minimum sustainable standard for all new buildings and general renovations since January 2020. The Holistic Building Program (HBP) ensures that all their projects must at least meet the klimaaktiv SILBER standard. This reduces CO₂ emission levels, avoids climate-damaging building materials and promotes the phase-out of fossil fuels.

The klimaaktiv criteria also play a role in the area of financial products. For real estate funds awarded the Ecolabel 49 - Sustainable Financial Products, the requirement is that the properties in question must comply with the basic criteria (klimaaktiv bronze) of the klimaaktiv building standard.

The School Development Programme 2020 (SCHEP 2020) will invest considerable funds in Austria's schools in the coming years, ensuring compliance with ecological standards in new buildings and renovations by prescribing the HBP standard of BIG and thus the klimaaktiv building standard as minimum standards.

klimaaktiv also plays a role in the area of public procurement. The Sustainable Public Procurement Action Plan (naBe) requires the achievement of the klimaaktiv Silver Standard as a prerequisite for building construction projects.

Not only large institutions, but also municipalities and property developers rely on klimaaktiv. Many municipalities cooperate with klimaaktiv regional partners and have already decided to apply the klimaaktiv building standard to their own buildings. Several property developers have committed themselves to construct and renovate their buildings exclusively according to klimaaktiv criteria.

These examples show that klimaaktiv is recognised and applied as a quality label for sustainable construction and renovation by government agencies as well as by companies and institutions in Austria.

1.3.2.3. National initiative -ÖGNB - ASBC

The Austrian Sustainable Building Council (ÖGNB) was initiated and founded in Austria in January 2009, by a number of renowned and independent institutions in the field of sustainable building. Membership is open to all who are interested, to institutions and businesses seeking to participate actively in supporting the Austrian building industry in compliance with sustainable building.

The structure for the assessment system is designed in close consultation with klimaaktiv Construction and Renovation. In addition, a considerable number of insights gained from scientific projects of the R&D Programme, House of Tomorrow/Plus are included, which is the most extensive R&D initiative in the field of sustainable building in Europe. The ASBC also collaborates closely with policy makers, specialists and building-relevant institutions from science, business and administration.

The ASBC uses the Total Quality Building (TQB) assessment scheme which was designed as "open standard" and made freely available to those interested and to businesses and institutions. This assessment tool has several modules. Using a user-friendly editing system, TQB can continually be adapted and further developed - only very little maintenance and programming efforts required. Designed in 2002, TQB has been a comprehensive building assessment scheme ever since, which is referred to as the second-generation building assessment system. The TQB content is fully compatible with international norms (e.g.



CEN TC350), these are currently being developed. TQB provides a comprehensive solution for building assessment in Austria, both in terms of content and technology. The TQB building declaration is fee based.⁷

For testing purposes, the TQB assessment tool is open for public both for residential buildings and office buildings.

The Austrian Sustainable Building Council's goal is to support the idea of an Open Source Community in the field of sustainable building, and to differentiate itself clearly from high-cost franchise concepts.

The amount of certified projects (15.02.2020) was 358 buildings.

1.3.2.4. National initiative - ÖGNI

The Austrian initiative ÖGNI was founded in September 2009 as a cooperation partner of the DGNB. The aim is to promote sustainable building in Austria more consistently. The focus is on environmentally friendly and resource-saving handling as well as economic efficiency and socio-cultural added value.

The certification process consists of five steps:

- Preparation and registration
- Submission
- Conformity assessment
- Result and award
- Presentation of the project

Depending on the fulfilment of the criteria, certifications ranging from bronze to silver and gold to platinum can be awarded. The assessment of these criteria considers the fields of ecology, economy, socio-cultural and functional aspects, technical criteria, process quality and location, each with different weightings. The criteria were developed throughout Europe in different working groups.

The certification system consists of various criteria catalogues that contain individual criteria with different weightings depending on the use of the building. The renovation usage profile serves as a way to close the gap between new and existing buildings. This system application can be used to certify buildings on which renovation measures have already been carried out and which are protected as historical monuments. The requirements are based on those for new buildings, but also take into account the special features of renovation projects - the focus is on core renovations. In addition to ecological and economic aspects, user comfort - for example in acoustic, thermal and visual terms, which has a major influence on the performance and motivation of workers - plays an important role.⁸

⁷ Source: www.oegnb.net

⁸ ÖGNI Systembroschüre 2023
COOPERATION IS CENTRAL



1.4. Overview and first analysis of the most relevant standards /guidelines /certification schemes for energy efficiency and sustainability in buildings

1.4.1. klimaaktiv

1.4.1.1. General information

	klimaaktiv
Scope	Certification scheme
Building types assessed	All
Type of intervention	New construction, refurbishment, refurbishment in historic preservation
Type of use	Voluntary
Main target users	Designers, consultants, investors, public policy makers and procurers, end users
Country	Austria
Developer	Federal Ministry for Climate Protection, Environment, Energy, Mobility, Innovation and Technology (BMK)
Year of first publishing/launching	2004
Number of assessed buildings	1492
References	Criteria Catalogue residential Criteria Catalogue non-residential
Update frequency	Annual and required updates. According to new guidelines (OIB Richtlinie 6) for buildings in Austria
Possibility for the PPs to develop/adapt/update the scheme	EAST is in the consortium of klimaaktiv buildings and can influence the development of the criteria (in next updates)

Table 1- General info on the Austrian certification scheme klimaaktiv



1.4.1.2. Assessment process

	klimaaktiv
Project stage at which the assessment is performed/ referred to	Three options are available: Declaration in planning; Declaration during completion; Declaration during use
Assessor	Open for all
Additional qualification required for assessors	Building sector education background is an advantage
Methodology to assess the building performance	Points for categories (Location: 150 max; Energy and supply: 550 max; Components and Construction: 150 max; Comfort and health: 150 max)
Validation of the assessment	Validated by the provincial plausibility checking agency for klimaaktiv (for Styrian province EAST performs the plausibility check). Check is free.
Certification (yes/no) and labelling (yes/no)	Certification (yes) and labelling (yes)
Certification levels	Bronze (500) - Silver (750) -Gold (900)
Certification body	ÖGUT - Österreichische Gesellschaft für Umwelt und Technik
Short description of the verification/validation process	Self-declaration with plausibility check by regional klimaaktiv partner. Certification granted by ÖGUT.

Table 2- Assessment process of the Austrian certification scheme klimaaktiv

1.4.1.3. Dimensions of sustainability covered

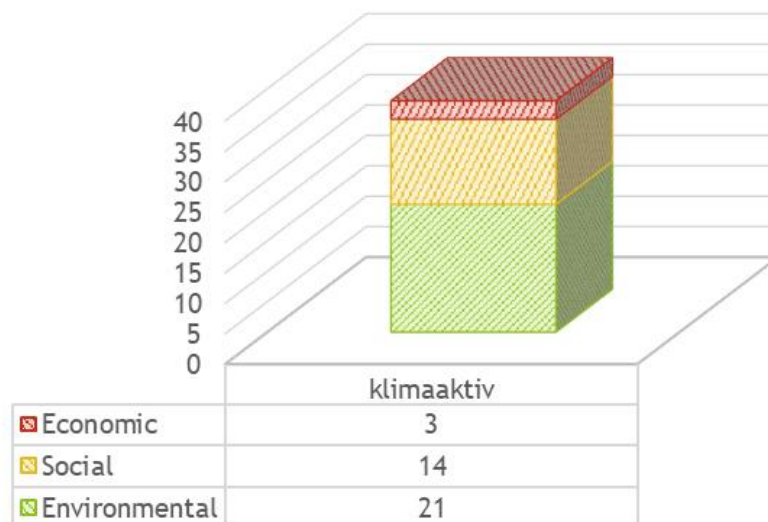
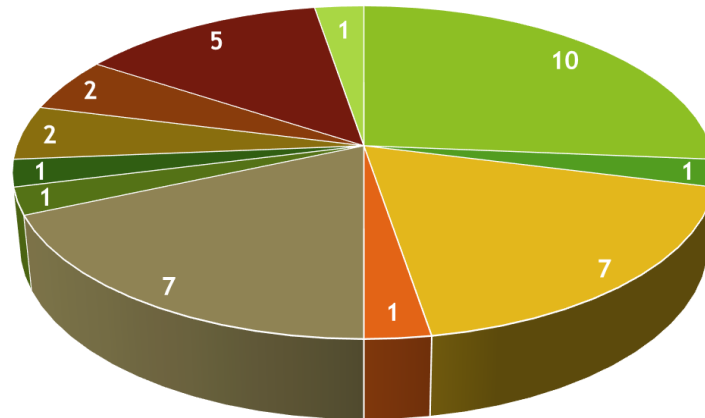


Figure 3 - Dimensions of sustainability covered and number of related indicators of the Austrian certification scheme klimaaktiv



1.4.1.4. Thematic areas covered



Energy	LCC
Emissions	Management
Materials	Transport
Waste	Site
Water - no metrics	Accessibility
IEQ	Adaptability - no metrics
Adaptation & resilience to climate change	Biodiversity - no metrics

Figure 4 - Thematic areas covered and number of related indicators of the Austrian certification scheme klimaaktiv



2. Croatia

2.1. General overview of national energy and climate strategies/plans and policy framework

Long-term strategy for national building stock renovation by 2050 (LTRS) was developed in 2020. It obliges owners to regularly update their energy certificates and sets out the numerous regulations, decisions, and ordinances. Another relevant regulation is formulated in the Energy Efficiency Act (EEA) which transposes the EED directive in the national context and as of lastly introduced modifications in 2021 defines requirements for National Energy Efficiency Plan, national Programmes of energy renovations, as well as adequate energy monitoring and verification.

The energy renovation rate of buildings between 2014 and 2020 equalled 0.7% of floor area, i.e., 1.35 mil. m² per year, which was slightly increased in 2021 and 2022 to 1%. Regarding energy efficiency, during the 2001 - 2016 period, Croatia reported about 1.41 Mtoe of cumulative (technical) final energy savings mainly related to the residential sector (39%), industry (36%), and transport (17%).

The long-term plan to increase from the current 0.7% annually (1 350 000 m²) to 3% in 2030, to stand at 3.5% between 2031 and 2040 and 4% between 2041 and 2050. This uptake of energy renovation rate should be contributed to on-going (and planned) different national Programmes for energy renovations based on EU Funds (NRRP, ERDF, EBRD) implemented by the Environmental Protection and Energy Efficiency Fund (EPEEF).

There are several National Programs for energy renovation of buildings in Croatia divided per building typology (public sector buildings, family houses, multi-apartment buildings, buildings with the status of cultural heritage). Programs foresee several categories of renovation and define them as follows:

- Integral energy renovation - includes a combination of several energy renovation measures, and necessarily includes one or more measures on the building envelope that achieve savings in the annual required heat energy for heating ($Q_{H,nd}$) of at least 50% compared to the state before the renovation;
 - > Integral energy renovation can exceptionally include only one measure on the envelope if it results in a saving of the annual required thermal energy for heating ($Q_{H,nd}$) on an annual level of at least 50% compared to the state before the renovation
- Deep renovation - includes energy efficiency measures on the envelope and technical systems and results in savings of the annual required thermal energy for heating ($Q_{H,nd}$) and primary energy (E_{prim}) on an annual level of at least 50% compared to the state before the renovation
- Comprehensive renovation includes optimal measures to improve the existing condition of the building and, in addition to energy renovation of the building, includes measures such as:
 - > increasing safety in case of fire,
 - > measures to ensure healthy indoor climate conditions and
 - > measures to improve the fulfilment of the basic requirements of the mechanical resistance and stability of the building, especially to increase the seismic resistance of the building, and may also include other measures that improve the fulfilment of the basic requirements for the building.

All national programmes have been introduced to utilize financial funds from various available funding mechanisms under the Resilience and Recovery Facility (RRF) and European Research and Development Fund (ERDF), European Structural investment Fund (ESIF) which were transposed in the Croatian legislation through Operational programme Competitiveness and Cohesion.



2.2. General overview of the framework for energy efficiency in buildings at national and/or regional level

2.2.1. National/regional regulations and standards for energy efficiency in buildings

Croatian legal framework in terms of the buildings stock is formulated through several important documents, with the special focus on the Physical Planning Act and Building Act (BA). Building Act transposes the EPBD directive in the national context. Last two modifications and alignments of the BA in 2017 and 2019 prepared the ground for follow up work which reflected in setting up an obligatory technical standard for new buildings (nZEB standard) and buildings that undergo a deep renovation process.

A list of crucial active legal framework (excerpt) in the Republic of Croatia concerning the building stock is listed below and include various acts, regulations, decisions, and ordinances:

- Building Act
- Physical Planning Act
- Energy Efficiency Act
- Electricity Market Act
- Renewable energy and highly efficient cogeneration Act
- Technical regulation on energy economy and heat retention in buildings
- Technical regulation for windows and doors
- Technical regulation on ventilation systems, partial air conditioning and air conditioning of buildings
- Technical regulation on heating and cooling systems in buildings
- Technical regulation on low-voltage electrical installations
- Technical regulation on construction products
- Ordinance on the mandatory contents and format of construction work designs
- Ordinance on energy audits of buildings and energy certification
- Ordinance on maintenance of construction works
- Ordinance on the control of energy certificates and reports on regular inspections of heating systems and cooling or air-conditioning systems in buildings
- Ordinance on persons authorised for energy certification, energy audits of buildings and regular inspections of heating systems and cooling or air-conditioning systems in buildings
- Decision on the adoption of the Long-term Strategy for the Reconstruction of the National Building Stock by 2050
- Decision on the adoption of the Programme of energy renovation of multi-apartment buildings for the period by 2030
- Decision on the adoption of the Programme of energy renovation of public sector buildings up to 2030
- Decision on the adoption of the Programme of energy renovation of buildings with the status of cultural property for the period by 2030



- Decision on the adoption of the Programme to combat energy poverty, including the use of renewable energy sources in residential buildings in assisted areas and in areas of special state concern for the period by 2025
- Decision on the adoption of the Urban Green Infrastructure Development Programme for the period 2021-2030
- Decision on the adoption of the Circular management of space and buildings development programme for the period 2021-2030

2.2.1.1. Buildings energy efficiency framework

Technical regulation on energy economy and heat retention in buildings dictates the standard in global energy performance, correct installation, dimensioning, regulation and control, and all technical systems: space heating/cooling systems, domestic hot water installations, lighting, mechanical ventilation, automation and control systems, local electricity generation systems. It also prescribes all the necessary criteria that must be met for the thermal insulation of all building elements and parts of the building envelope.

All newly constructed buildings must fulfil nZEB requirements that includes:

- annual required thermal energy for heating per unit area of the usable area of the heated part of the building ($Q_{H,nd}$ (kWh/m²a)), is not higher than the permitted values determined in the Technical Regulations
- annual primary energy per unit area of the useful area of the heated part of the building (E_{prim} (kWh/m²a)), which includes the energies listed in Table 8.a. of the Technical Regulation, is not higher than the permissible values established in the Technical Regulation;
- at least 30% of the annual delivered energy is met from renewable energy sources or 60% of the annual delivered energy for the operation of technical systems in the building is met from an efficient centralized heating system, i.e. an efficient centralized heating and cooling system
- compulsory fulfilment of air permeability requirements, before the technical inspection of the building (Blower-Door Test)
- the highest allowed heat transfer coefficients (U) according to Technical Regulation on energy economy and heat retention

Reconstructed and renovated buildings depend on scope and level of renovation must achieve level of energy performance (mandatory criteria regarding building envelope and technical systems).

Increasing energy efficiency, reducing the required energy for heating, cooling, lighting, operation of technical systems, etc., use of renewable energy sources and production of energy from renewable sources at the building location are a key part of the building renovation concept. However, the renovation concept should foresee (in accordance with the results of the analysis of the existing condition of building) measures to improve the fulfilment of the essential requirement of mechanical resistance and stability of buildings, increase safety in the event of fire, ensure healthy indoor climate conditions, measures for the accessibility of people with disabilities and reduced mobility, measures for the installation of elements of green infrastructure and nature-based solutions, and measures for sustainable mobility, i.e. other measures that will improve the fulfilment of other essential requirements for buildings and improvement of needs for safe and comfortable usage of building. Therefore, in case of significant renovation as prescribed by named Technical Regulation it is necessary to perform an analysis of the existing condition of the building. Designer, according to the competence of the profession, should make an analysis of the existing condition of the building and provide a presentation of measures to improve the existing condition



of the entire building with an assessment of the investment in terms of healthy indoor climate conditions, fire protection and risks associated with the effects of earthquakes, and a summary of the analysis is presented in the main project design. The designers are obliged to communicate the results of this analysis and proposed measures to the Investor as part of the communication related to the proposal of renovation measures within the renovation concept. The analysis of the existing condition of the buildings must be carried out in accordance with the Guidelines for the preparation of the analysis of the existing condition of the building with proposed measures and assessment of the investment in the scope - healthy internal climatic conditions, mechanical resistance and stability, safety in case of fire published by the Ministry of Physical Planning, Construction and State Assets.

The energy performance of buildings is determined using data available in the Information system of energy certificates (IEC). Energy ratings are established according to the energy required for heating ($Q_{H,nd}$) by building type and for primary energy (E_{prim}) differently for residential and non-residential buildings and according to typology and function.

2.3. General overview of the framework for buildings sustainability at national and /or regional level

Framework for buildings sustainability on national level starts with Essential requirements for construction work (for buildings) defined in Building Act. Any construction work, depending on its intended purpose, must be designed and built in such a way that, throughout its life cycle, it meets the essential requirements for a construction work as well as any other requirements prescribed by this Building Act and special regulations which have an effect on the fulfilment of the essential requirements for a construction work or in some other way condition the building of construction works or have an effect on construction and other products incorporated into a construction work.

The essential requirements for construction works are as follows:

- Mechanical resistance and stability

A construction work must be designed and built in such a way that the loadings that are liable to act on it during its construction and use will not lead to any of the following:

- > collapse of whole or part of the construction work;
- > major deformations to an inadmissible degree;
- > damage to other parts of the construction work, installations or incorporated equipment as a result of major deformation of the load-bearing construction;
- > damage by an event to an extent disproportionate to the original cause.

- Fire safety

A construction work must be designed and built in such a way that in the event of an outbreak of fire:

- > the load-bearing capacity of the construction can be assumed for a specific period of time;
- > the spreading of fire and smoke within the construction work is limited;
- > the spread of fire to adjoining construction works is limited;
- > the occupants can leave the construction work or be rescued by other means;
- > the safety of rescue teams is taken into consideration.

- Hygiene, health and environment

A construction work must be designed and built in such a way that it will, throughout its life cycle, not be a threat to the hygiene or health and safety of workers, occupants or neighbours, nor have an



exceedingly high impact, over its entire life cycle, on the environmental quality or on the climate during its construction, use and demolition, in particular as a result of any of the following:

- > leakage of toxic gases;
 - > emissions of dangerous substances, volatile organic compounds (VOC), greenhouse gases or dangerous particles into indoor or outdoor air;
 - > emission of dangerous radiation;
release of dangerous substances into ground water, marine waters, surface waters or soil;
 - > release of dangerous substances into drinking water or substances which have an otherwise negative impact on drinking water;
 - > faulty discharge of waste water, emission of flue gases or faulty disposal of solid or liquid waste;
 - > dampness in parts of the construction work or on surfaces within the construction work.
- **Safety and accessibility in use**
A construction work must be designed and built in such a way that it does not present unacceptable risks of accidents or damage in service or in operation such as slipping, falling, collision, burns, electrocution, injury from explosion, and burglaries. In particular, construction works must be designed and built taking into consideration accessibility and use for disabled persons.
 - **Noise protection**
A construction work must be designed and built in such a way that noise perceived by the occupants or people nearby is kept to a level that will not threaten their health and will allow them to sleep, rest and work in satisfactory conditions.
 - **Energy economy and heat retention**
Construction works and their heating, cooling, lighting and ventilation installations must be designed and built in such a way that the amount of energy they require in use shall be low, when account is taken of the occupants and of the climatic conditions of the location of the construction work. Construction works must also be energy-efficient, using as little energy as possible during their construction and dismantling.
 - **Sustainable use of natural resources**
Construction works must be designed, built and demolished in such a way that the use of natural resources is sustainable and in particular ensure the following:
 - > reuse or recyclability of the construction work, its materials and parts after demolition;
 - > durability of the construction work;
 - > use of environmentally compatible raw and secondary materials in the construction works.

2.3.1. Other voluntary assessment methods or certification schemes for sustainable buildings

Other framework for buildings sustainability used voluntarily on national, regional and local level both for public and private buildings include various certification systems such as DGNB, BREEAM or LEED.

The DGNB certification system is a tool for planning and optimizing projects with a holistic approach that does not only consider the ecological aspect of the building, neighborhood or interior, but equally takes into account the social and economic aspect. The system is aligned with European standards and norms, as well as with the European Taxonomy Regulation, which represents a classification framework, i.e. criteria for assessing the sustainability of future economic activities. The Croatian Green Building Council develops a version of the system adapted to the Croatian market and organizes training for future



consultants as an official Academy Partner. The system is in the process of being adapted to the Croatian market and is being implemented in the pilot phase.

2.3.1.1. The Green Deal Design Project Guidelines

REGEA created guidelines for the creation of technical documentation (concept, main, detailed design documentation). The Green Deal Building Design Project Guidelines serve primarily as information for designers but also for all other participants in the process of building construction in order to take into account aspects essential to achieving a sustainable standard of construction and renovation of public sector buildings during the preparation and creation of project-technical documentation.

For the purpose of construction and/or renovation of public sector buildings according to the principles of sustainable construction standards, it is recommended to prepare a conceptual solution and conceptual/main/detailed project in accordance with Green Deal Building Design Project Guidelines that were created in accordance with the European green plan (European Green Deal), one of the strategic priorities of the European Commission, and in that way they represent a kind of super standard when comparing to mandatory national standard. The currently valid version of the guidelines is v3 from October 2022. The guideline is constantly updated and, if necessary, upgraded in order to be harmonized with the regulation, with the system and criteria for financing projects of construction and renovation of buildings with EU funds and with the European framework for sustainable buildings as well as other relevant standards.

The Green Deal Building Design Project Guidelines is designed in the form of a manual and consists of three basic units (A, B and C, i.e. the design alphabet):

- Part A - Why Guidelines and how to use them
 - > Description of Guidelines
- Part B - Guidelines for developing documentation
 - > Basic standards for buildings:
 - Energy and emissions
 - Environment and place
 - Safety and protection
 - Health and comfort
 - Circularity and costs
 - Processes and tools
 - > Building envelope
 - > HVAC systems
 - > Electrotechnical systems
 - > Water and drainage installations
 - > Measurement of energy and water consumption
 - > Automation and management
- Part C - Attachments that include an overview table with criteria for evaluating project compliance with the Guidelines.

Given that the design process is an iterative process during which different design solutions are analyzed, which further need to be integrated into one complete solution, it is necessary to communicate these design solutions with the client during the creation of project documentation. The Green Deal Building



Design Project Guidelines also aim to change the very common practice where complete projects are delivered to the client, where the possibility of revising and changing project solutions is significantly reduced without significantly extending the planned design period. Also, this Guidelines support a systematic approach to the design process where project solutions are analysed and optimized in the process of creating project documentation with the aim of selecting the best quality solutions within the given limitations.

The Green Deal Building Design Project Guidelines imply the creation of a Minimum Output Project Specification (MOPS) that will include all data, information, background and outcomes from the preparatory phase, and in accordance with which the project documentation of the conceptual, main and detailed project will be created. The MOPS will include, among other things, a schedule with the total deadline and intermediate deadlines according to the design phases, with the aim of as high-quality monitoring and control of the design procedures and project documentation as well as the communication of stakeholders in the process. During the design, the compliance of the project with the Guidelines (technical requirements, functional requirements, principles of sustainable construction, lifetime costs, eligibility for EU financing) will be continuously checked.



2.4. Overview and first analysis of the most relevant standards /guidelines /certification schemes for energy efficiency and sustainability in buildings

2.4.1. Energy performance certificates (EPCs) and Green Deal Design Project Guidelines

2.4.1.1. General information

	EPCs	Green Deal Design Project Guidelines
Scope	National (HR) regulation and technical standard	Guideline
Building types assessed	All, distributed in 9 types - multiapartment, family house, office, education, hospital, hotel and restaurant, sports hall, commercial, other non residential	Public and commercial buildings
Type of intervention	New construction, renovations	New construction, renovations
Type of use	Mandatory	Voluntary; mandatory for incentives funded from EU sources
Main target users	Designers, consultants, investors, public policy makers, owners, procurers, researchers, construction companies	Designers, consultants, investors, public policy makers, owners (cities, municipalities, counties...)
Country	Croatia	Croatia
Developer	Republic of Croatia, Ministry of Physical Planning, Construction and State Assets	REGEA - North-West Croatia Regional Energy and Climate Agency
Year of first publishing/launching	1992-current versions from 2013/2015 with several adjustments and upgrades (see OG)	2020 (Current version is v3.0 from 2022)
Number of assessed buildings	All buildings	More than 20 projects had minimum output project specifications written according to guidelines, now are in different phases of development (technical documentation development)
References	https://mpgi.gov.hr/access-to-information/regulations-126/126	Guidelines v3.0 (in Croatian, english translation will be ready in October 2023)
Update frequency	As required, according to national regulation	Annual
Possibility for the PPs to develop/adapt/update the scheme	Possibility to make recommendations to Ministry of Physical Planning, Construction and State Assets	Yes

Table 3- General info on Croatian buildings assessment schemes EPCs and Green Deal Design Project Guidelines



2.4.1.2. Assessment process

	EPCs	Green Deal Design Project Guidelines
Project stage at which the assessment is performed/ referred to	Pre-design stage, design stage, construction stage	Pre-design stage, design stage, construction stage
Assessor	Professional, accredited assessor, public authority	REGEA team, or member of public authority
Additional qualification required for assessors	Licensed engineers for project design documentation, energy auditors license for EPC	Assessors are members of REGEA team
Methodology to assess the building performance	Minimum target definition for each KPI	Scoring, weighting, overview of overall performance regarding set criteria
Validation of the assessment	Assessment certified by an accredited professional, validation/control by public authority (in some cases)	Internal type of validation, there is no certification system
Certification (yes/no) and labelling (yes/no)	yes for EPC/no labelling	no
Certification levels	no	no
Certification body	Licensed energy certicators for EPC	n.a.
Short description of the verification/validation process	Criteria for project design and fulfilment of essential requirements for construction are set in Building Act and Technical Regulation as minimum target definition for each KPI. Designer must fulfil all required criteria. In case of EPC there is an assessment in regard to E_{prim} and Q_{hnd} . Mandatory is to perform energy audit, gather data, perform the calculation and issue EPC and Report on Energy Audit.	Guidelines are used as source and foundation for development of minimum output project specification written for development of technical documentation for renovation and construction of new buildings. During the development of documentation there is continuous monitoring of application of guidelines. After completion overview of overall performance regarding set criteria is done.

Table 4 - Assessment process of the Croatian buildings assessment schemes EPCs and Green Deal Design Project Guidelines



2.4.1.3. Dimensions of sustainability covered

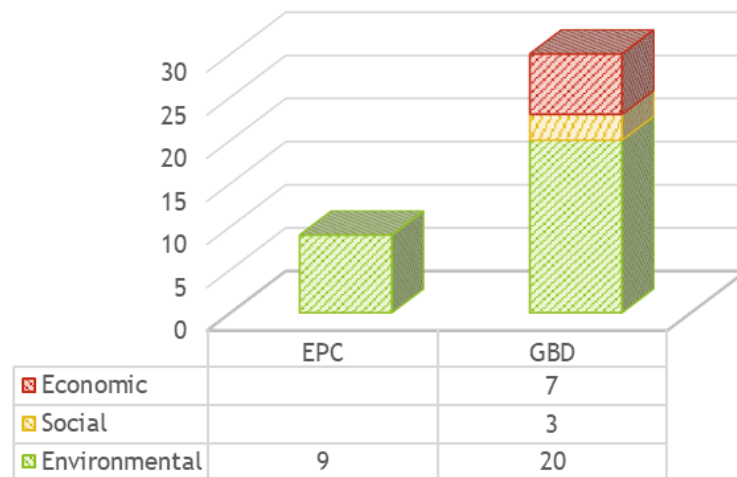
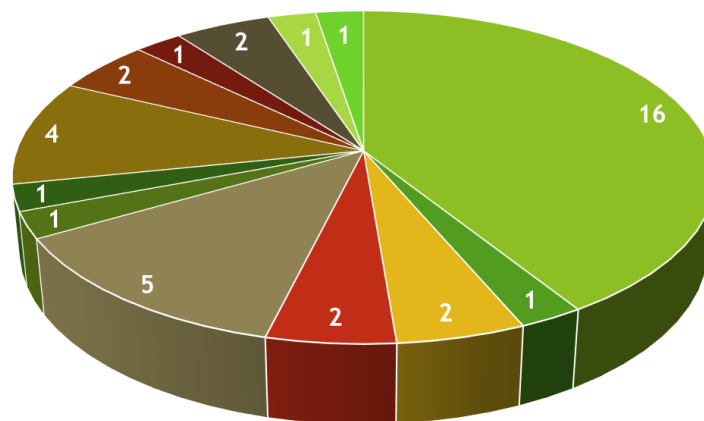


Figure 5 - Dimensions of sustainability covered and number of related indicators of the Croatian building assessment schemes EPCs and Green Deal Design Project Guidelines

2.4.1.4. Thematic areas covered



Energy	LCC
Emissions	Management
Materials	Transport
Waste - no metrics	Site
Water	Safety
IEQ	Adaptability
Adaptation & resilience to climate change	Biodiversity

Figure 6 - Thematic areas covered and number of related indicators of the Croatian buildings assessment scheme Green Deal Design Project Guidelines



3. Germany

3.1. General overview of national energy and climate strategies/plans and policy framework

3.1.1. Climate goals of the German federal government

On the 31.8.2021, the new climate goals of the German federal government were implemented in a law. This was a reaction to a ruling of the federal constitutional court which stated that the previous version of the climate goals was insufficient and unfair for the following generations. Following the new goals, Germany aims to reduce their GHG emissions by 65% until 2030 (reference in 1990), by 88% in 2040 and to become GHG neutral until 2045. This also includes the goal of a climate neutral building sector in 2045.

3.1.2. “Klimaschutz Sofortprogramm” - Immediate climate protection program

In 2022, the federal government launched an immediate programme to reach the defined climate goals. For the building sector, this programme includes more funding for the existing support systems for sustainable buildings (BEG), an adaptation of the GEG and more funding for sustainability in social housing.

3.2. General overview of the framework for energy efficiency in buildings at national and/or regional level

3.2.1. Gebäudeenergiegesetz (GEG) - Law for energy in buildings

The national law regulating the energy and sustainability aspects of buildings in Germany is the “GebäudeEnergieGesetz” (GEG). It is effective since November 2020 and has been updated in January 2023. As the situation is very dynamic in the energy sector and the German government is trying to set the framework for reaching carbon neutrality, the GEG will be updated again with very large changes. This new version is currently discussed very intensely in the government and in the public. It is though not sure if the current draft is the one that will be decided on in autumn. In the following list, it is marked which point is based on the existing law and which one is planned in the draft:

- New buildings must consume less than 55% of the primary energy use of a reference value (law)
- Windows and insulation need to fulfil minimum standards, defined by the thermal transmittance (U-value) (law)
- Heating bridges and air tightness need to be included into the primary energy need (law)
- Every new heating system must run with at least 65% of sustainable sources (draft)
- Old heating systems can still be used and repaired and may be operated on fossil fuels until 31.12.2044 (draft)
- There are many exceptions, extra liberties for existing buildings and deadline extensions if a district heating network is planned (draft)
- The existing funding systems are regularly adapted to the changes in the GEG
- Municipalities need to have a “communal heating plan” until 2028 (cities until 2026) (draft)



- The guideline for sustainable buildings issued by the German building ministry is the basis of the BNB standard. It is mandatory for building owned by the German federal state, some other public institutions have adapted it.

3.2.2. Funding system (BEG)

The national government chose a funding system as a strategy to encourage building owners to more sustainability. The public funding program for sustainability and energy efficiency in buildings (BEG) is meant to help building owners to reach the goals set by the law and encourage them to overachieve the criteria. It is adapted regularly to stay updated with current standards. The exact funding depends on the renovation measure, but the general system is to get a certain percentage of the expenses refunded by the federal state. This generally depends on the measures and not on the financial situation of the building owner.

3.3. General overview of the framework for buildings sustainability at national and /or regional level

3.3.1. Sustainable building quality label (QNB)

The QNB is a sustainability label created by the government, but it is not a certification system. Instead, several certification systems (by the DGNB, BNB, NaWoh, BNK) are eligible for the QNB. This means that a building needs to get one of the certificates and then gets the QNB label if it meets the QNB requirements. The QNB comes in two levels: QNG-Plus and QNG-Premium.



3.4. Overview and first analysis of the most relevant standards/guidelines/certification schemes for energy efficiency and sustainability in buildings

3.4.1. Passivhaus, Bewertungssystem Nachhaltiges Bauen (BNB), DGNB

3.4.1.1. General information

	Passivhaus	BNB	DGNB
Scope	Certification scheme	Certification scheme	Certification scheme
Building types assessed	All buildings	Public buildings with adapted versions for office buildings, educational buildings, laboratories and outdoor facilities	All
Type of intervention	Anything as long as the building fulfils the passive house criteria in the end	New construction, renovation and operation	New construction, renovation, deconstruction, building in use, interiors, construction sites
Type of use	Voluntary	Mandatory for building projects of the German state (>= 2 million€ of investment)	Voluntary. Mandatory to build houses in some parts of Hamburg
Main target users	Any building owner can be seen as target group	Primarily the German state, but also other public building owners	Designers, consultants, investors, public policy makers and procurers, researchers, construction companies
Country	International	Germany	Originates in Germany, but used internationally (30 countries)
Developer	Passive House Institute	German ministry for building	DGNB GmbH
Year of first publishing/launching	1991	2009	2007, renewed in 2015
Number of assessed buildings	over 3,3 mio m ² usable area	n.a.	Over 10000 projects awarded
References	Passivehouse website (in German, English and Chinese)	Documents on the website (Website in English, documents in German)	DGNB website for renovation of buildings, in German and English
Update frequency	As required	As required	As required
Possibility for the PPs to develop/adapt/update the scheme	No possibility	No possibility	No possibility

Table 5- General info on German building certification schemes Passivhaus, BNB and DGNB



3.4.1.2. Assessment process

	Passivhaus	BNB	DGNB
Project stage at which the assessment is performed/ referred to	n.a.	The system should be implemented in the pre-design stage to assure to follow the criteria throughout the building process. The Quality is then checked after finalization	The certificate exists in different versions for the phases of planning, building, operation, renovation, recertification of operation and deconstruction
Assessor	Planners, advisors and craftsman with experience in passive houses after having proved their knowledge in an exam	Sustainability coordinators support the process in the federal construction administration for federal buildings, the conformity assessment body checks for the certification. Other type of builders (public or private) are allowed to use the guidelines and the BNB and to implement it through dedicated certification bodies	DGNB Auditor, Conformity assessment by conformity auditor at DGNB, (see www.dgnb.de for details)
Additional qualification required for assessors	Exam to prove the assessor knowledge and experience in passive houses design	Several day special training	DGNB Registered Professional; DGNB Consultant; DGNB ESG-Manager
Methodology to assess the building performance	n.a.	Following the guidelines that were developed by the federal building ministry	Scoring model (silver, gold, platinum, diamond) with criteria-based minimum requirements
Validation of the assessment	For state-owned projects, a conformity assessment body certifies the finished project.	For state-owned projects, a conformity assessment body certifies the finished project.	Validation via conformity assessment at DGNB
Certification (yes/no) and labelling (yes/no)	Certification and labelling	Certification, but no labelling	Certification and labelling
Certification levels	Three levels: "Certified Passive house" (higher), "energy saving house" (lower) and "EnerPhit - certified modernization" for renovation	Bronze (more than 50% of the score), Silver (more than 65%), Gold (more than 80%)	Silver - Gold - Platin; Bronze only for older buildings; Diamant for design and cultural quality; "climate positive" for buildings with climate neutral operation; "special award environment sign" which is required for new buildings in some parts of Hamburg
Certification body	Passive House Institute or other accredited partners	Federal building ministry of Germany	DGNB



	Passivhaus	BNB	DGNB
Short description of the verification/validation process	n.a.	<ol style="list-style-type: none"> 1. Definition of goals based on the BNB criteria 2. Adaptation and optimization within the planning team 3. Intermediate assessment during the planning phase 4. Documentation of the criteria throughout the building process 5. Assessment through the conformity assessment body 6. Certification 	<ol style="list-style-type: none"> 1. Client hires auditor 2. Registration of the project 3. Auditor accompanies the planning and construction process until completion and takes over target definition and documentation 4. Submission for audit to DGNB 5. Audit by DGNB 6. Award of certificate and plaque

Table 6- Assessment process of the German building certification schemes Passivhaus, BNB and DGNB

3.4.1.3. Dimensions of sustainability covered

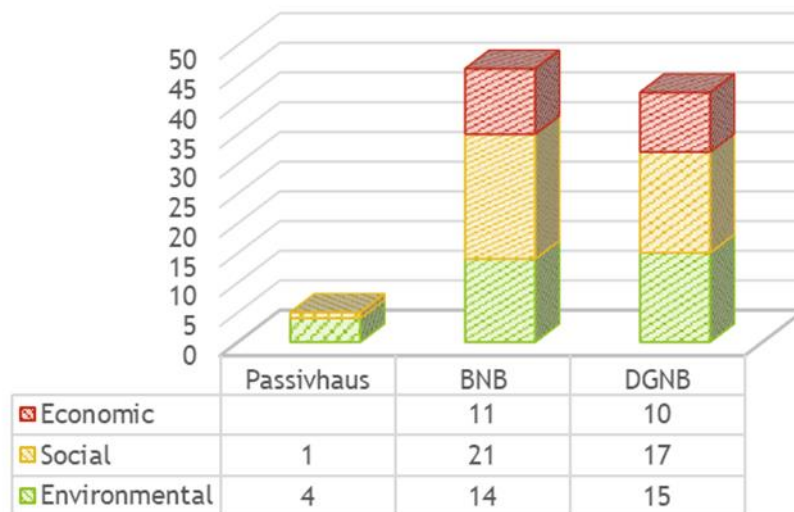
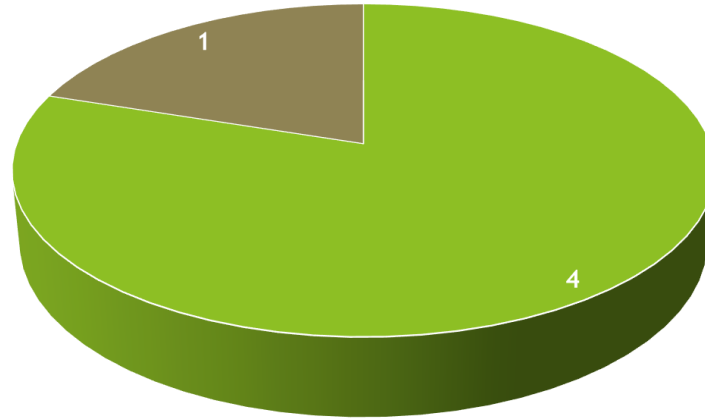


Figure 7 - Dimensions of sustainability covered and number of related indicators of the German building certification schemes Passivhaus, BNB and DGNB

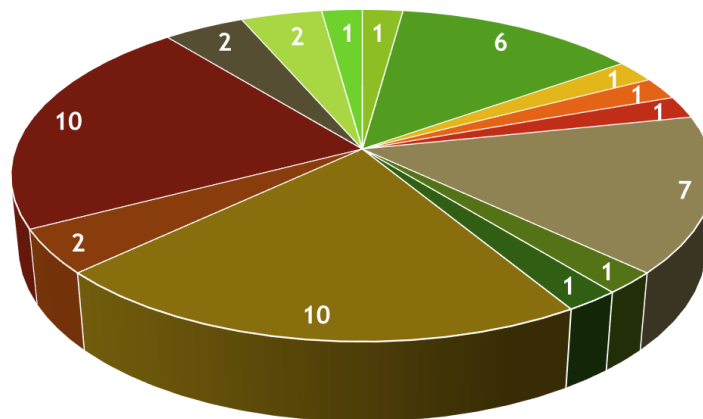


3.4.1.4. Thematic areas covered



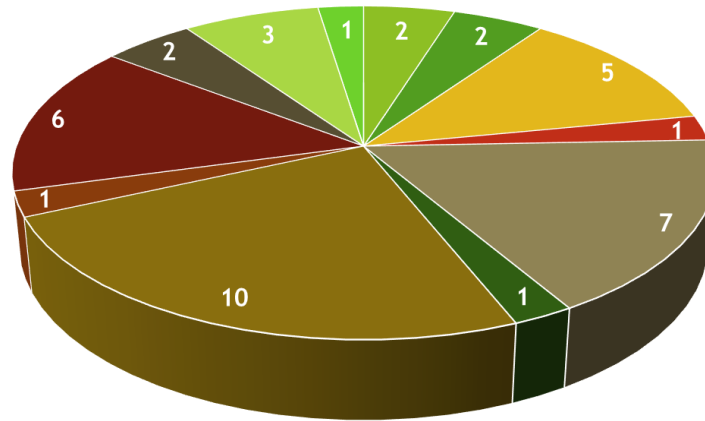
Energy	LCC - no metrics
Emissions - no metrics	Management - no metrics
Materials - no metrics	Transport - no metrics
Waste - no metrics	Site - no metrics
Water - no metrics	Accessibility - no metrics
IEQ	Adaptability - no metrics
Adaptation & resilience to climate change - no metrics	Biodiversity - no metrics

Figure 8 - Thematic areas covered and number of related indicators of the German buildings certification scheme Passivhaus



Energy	LCC
Emissions	Management
Materials	Transport
Waste	Site
Water	Accessibility
IEQ	Adaptability
Adaptation & resilience to climate change	Biodiversity

Figure 9 - Thematic covered and number of related indicators of the German buildings assessment certification scheme BNB



Energy	LCC
Emissions	Management
Materials	Transport
Waste - no metrics	Site
Water	Accessibility
IEQ	Adaptability
Adaptation & resilience to climate change - no metrics	Biodiversity

Figure 10 - Thematic covered and number of related indicators of the German buildings assessment certification scheme DGNB



4. Italy

4.1. General overview of national/regional energy and climate strategies/plans and policy framework

4.1.1. National Energy and Climate Plan (NECP)

The National Energy and Climate Plan (NECP), as submitted in 2020 to the European Commission in 2020, foresees a saving of 0.33 Mtoe/year of final energy for the residential sector and of 0.24 Mtoe/year of final energy for the tertiary sector from 2020 to 2030.

To achieve this objective the NECP aims to launch a major plan to improve the efficiency of the public building stock and reduce their energy consumption, which will provide for the sharing of targets with local and regional authorities. The policy scenario provides for achieving the EED III targets for renovating public buildings (3 % per year) and reducing public administration consumption (1.9 % per year). In the civil sector, action will need to be taken in particular to reduce the energy needs of buildings by means of deep renovation measures and by increasing the uptake of highly performing technical systems such as heat pumps and BACS systems. The needs will then have to be met mainly by renewable sources, so it will be important to promote the integration of thermal and electric renewables into buildings. In order to “further” accelerate the reduction of emissions in the civil sector, policies and measures to promote energy efficiency in the residential sector will need to be strengthened in order to achieve the target by identifying new instruments for the involvement of the private and public sector in the upgrading of the existing national building stock. Targets for the overall annual retrofitting rate have to be updated according to the adoption of the Fit for 55 package: actually they are set at 2% in 2030 and 2.6 % in 2050, the latter around three times the current retrofit rate. The overall retrofitting rate would involve measures being carried out on two-thirds of Italy’s national building stock.

4.1.2. Strategy for Energy Retrofitting of National Building Stock (STREPIN)

The strategy, prepared in accordance with Article 2a of Directive 2010/31/EU on the energy performance of buildings, as amended by Directive 2018/844/EU, sets out an overview of the national building stock and, subsequently, identifies the current and target rates for energy retrofitting of buildings, also highlighting the opportunity to carry out energy retrofitting through an integrated approach that improves cost-effectiveness. The final version has been published in March 2021. It will need to be updated to take account of the new targets set by the Fit for 55 package.

4.1.3. Climate Plan South Tyrol 2040

Overall target of the regional climate plan is climate neutrality by 2040. Regarding the private building sector, the plan aims to set specific minimum efficiency standards for deep renovations combined with incentives that will allow all social categories to implement the planned measures. Oil and gas consumption for heating will be reduced by 60% by 2030 and by 85% by 2037. This will be achieved by reducing the heating needs of buildings (at least -20%) and replacing gas and oil with climate-neutral energy sources. More than 300 public buildings will undergo an energy audit by 2024 and the 27 most energy intensive will be energy-refurbished by 2025. By 2040 all public buildings shall be in line with the new energy performance standards.



4.2. General overview of the framework for energy efficiency in buildings at national and/or regional level

4.2.1. National regulations and standards for energy efficiency in buildings

Italy introduced criteria on the thermal insulation of buildings and the design of heating systems as early as 1976 with Law 373/76, 'Regulations for the containment of energy consumption for thermal uses in buildings'. Next came Law 10/91, which regulated, and in part still does, the design and management of the building/plant system. Starting with Legislative Decree 192/2005, Italy follows the European regulations, translating their contents to adapt them to national needs.

Directive 2002/91/EU on the energy performance of buildings can be considered the beginning of a process that has led, also in Italy, to a greater awareness of how much the building sector must improve its standards and how it can contribute to reducing climate-change emissions. Decree 192/2005, modified by Legislative Decree 311/2006, set the basis for the EPBD implementation in Italy. It was followed by a number of complementary legal acts updating the minimum energy performance requirements for buildings, building components and technical building systems, while extending the calculation to cooling and lighting systems and providing guidelines for energy performance certification (2009) and defining requirements for assessors as well as specifications for the inspection of technical building systems.

Law 90/2013 makes important additions and amendments to Legislative Decree 192/2005, providing the definition of near-zero energy building (NZEB) and establishing new criteria for updating and planning performance standards for buildings (both envelope and technical systems as well as renewable energy sources) with the aim of achieving the objectives set at EU level for near-zero energy buildings. In June 2015, three inter-ministerial decrees (DM 26/06/2015) completed the EPBD transposition, establishing stricter minimum requirements for new buildings and major renovations, as well as rules for taking RES in buildings into account and providing new national guidelines for Energy Performance Certificates (EPCs). The energy performance calculation methodologies are based on the national standard UNI/TS 11300 (series from 1 to 6), which constitutes the national instrument for applying the set of standards developed by CEN to support EPBD implementation. From 2021, all new buildings or buildings subject to a 'first-level major renovation' (refurbishment of at least 50% of the envelope and renovation of the heating and/or cooling plant of the entire building) must meet the technical and performance requirements imposed by Annex 1 of the DM 26/06/2015 for NZEBs. Minimum requirements for the performance of single components and of technical building system are established also for second-level major renovations (refurbishment of at least 25% of the external surfaces of the building with or without renovation of the heating and/or cooling plant) and for minor renovations (refurbishment of less than 25% of the external surfaces of the building and/or modification of the heating and/or cooling plants).

Legislative Decree No. 48/2020 implements the EU Directive 2018/844 on the energy performance of buildings by partly amending Legislative Decree 192/2005. It defines the criteria for the preparation of the long-term renovation strategy of the building stock, introduces important novelties for the Energy Performance Certificates and introduces obligations aimed at the integration of infrastructures for recharging electric vehicles in buildings.

Finally, Legislative Decree 199/2021 implements the EU Directive 2018/2001 (RED II) on the promotion of the use of energy from renewable sources. It increases the coverage of primary energy consumption by renewable sources for new buildings or buildings undergoing major renovations to 60%. For public buildings this obligation increases to 65%. It also defines the obligation to install renewable energy systems on buildings by setting a minimum electrical power of the on-site generation plant according to the floor area of the building.

The actual national standards are compliant with EU Directive 2018/844 (EPBD III) and the EU Directive 2018/2001 (RED II).



4.2.2. Regulations on the Energy Performance of Buildings in the Autonomous Province of Bolzano

With respect to national legislation, South Tyrol benefits from a certain amount of discretionary room and the European directives on energy efficiency 2002/91/EC, 2010/31/EU and 2018/844/EU were implemented in advance through the CasaClima standard. The CasaClima energy efficiency standard for buildings has been developed by the Autonomous Province of Bolzano since 2002, first as a voluntary quality standard and since 2005 as a mandatory standard for all new buildings.

Decree of the President of the Province DPP 34/2004 defined the maximum values of annual heat requirements for heating in new buildings, determined the categories of buildings to which these values apply, and defined the thermal insulation thickness, which is not calculated as building volume. The decree also introduced the CasaClima energy certificate as a requirement for the issuing of the habitability certificate. Designing and calculating the energy performance of buildings must therefore follow the CasaClima guidelines, while the control and issuing of the energy performance certificate is delegated to the CasaClima Agency, which carries out on-site audits on all projects through auditors. The DPP 9/2011 subsequently changed the minimum heating requirement standard for new buildings from class C to class B.

With Provincial Council Decree 939/2012 and 362/2013 and subsequent amendments, minimum requirements are also introduced for buildings that have undergone major renovation and for the replacement and renewal of technical building systems or building elements. In addition to the thermal performance of the envelope, the overall energy performance in terms of primary energy is now evaluated according to the CasaClima calculation methodology, with the definition of corresponding limit values for CO₂ emissions. Minimum requirements for covering total primary energy and hot water needs with renewable energy are introduced. The obligation of issuing an Energy Performance Certificate when selling or renting an existing building is introduced. For new buildings the obligation to reach the standard CasaClima class A, corresponding to the definition of nZEB building, comes into force as of first January 2017.

With Decree of the President of the Province 16/2020, currently in force, the European Directive 2018/844/EU was implemented in South Tyrol. The most important changes and innovations concern, among other things, the infrastructure to be set up in buildings for electric mobility, the installation of automation and control systems to optimise the energy performance of large buildings (heating and/or air-conditioning systems with a rated power above 290 kW), the systems to control the energy efficiency of heating and air-conditioning systems. In addition, the categories of buildings exempt from the obligation to comply with minimum requirements are highlighted, as well as measures to promote the use of energy from renewable sources through the installation of heat pumps.

The CasaClima standard is compliant with EU Directive 2018/844 (EPBD III) while requirements set by EU Directive 2018/2001 (RED II) will be implemented soon.

The CasaClima standard is also applied on the national territory as voluntary certification scheme and is widely recognised as building quality assurance system.

4.2.2.1. Energy Bonus for new and renovated buildings in the Autonomous Province of Bolzano

In addition to the definition of compulsory minimum requirements and with the aim of incentivising investments in the energy efficiency of buildings also on a voluntary basis, the Autonomous Province of Bolzano has introduced since 2008, with Decree of the Provincial Council 2299/2008, a volumetric bonus. This was at first limited to new buildings or demolitions and reconstructions and was set equal to +10% building volume in the case of achieving CasaClima class A and +5% in the case of achieving class B.



As of 2009, with Provincial Council Resolution 1609/2009, this incentive was also extended to the energy requalification of existing buildings. For existing residential buildings that are renovated reaching at least CasaClima class C, the possibility of obtaining additional volume is in fact granted for a maximum of 200 cubic metres above ground level.

The bonus has been modified over time according to the new minimum requirements introduced by law and is currently regulated until 2026 as per Decree of the President of the Province 41/2022.

For new residential buildings or for residential buildings in which more than 50% of the existing volume is demolished, the bonus, now called energy bonus, is only granted in the order of +10% volume if the building achieves the CasaClima Nature sustainability standard. It is also required to cover the electricity demand to the extent of at least 50 W per m² of built area - excluding outbuildings - with renewable energy sources installed on the building or its outbuildings. If this is not possible or not fully possible for technical reasons, or if it is not economically reasonable, then at least 60% of the total primary energy demand must be covered by renewable energy sources or alternatively the building's thermal energy demand - possibly also in combination with other renewable energy sources - must be covered by an electric heat pump or district heating. In any case, as much power as is technically possible and economically reasonable must be installed to cover the electricity needs.

In the case of existing buildings, the energy bonus can correspond to 20% of the existing volume allocated to "dwelling" and in any case it can reach a maximum of 200 m³. The bonus is granted if the building achieves an improvement in the energy performance from a class below to at least CasaClima class B, or if it achieves CasaClima R certification. The electrical energy requirement must also be covered to the extent of at least 30 W per m² of built-up area - excluding outbuildings - with renewable energy sources installed on the building with exceptions possible as for new buildings.

4.3. General overview of the framework for building sustainability at national and /or regional level

4.3.1. National regulations and standards for buildings sustainability

4.3.1.1. The Minimum Environmental Criteria for Construction (CAM Edilizia)

On a national level, the reference framework for building sustainability has been characterised in recent years by the mandatory introduction of Minimum Environmental Criteria for construction in public tenders.

GPP has been introduced in Italy since 2008 with the GPP National Action Plan that provided for the adoption, with subsequent ministerial decrees, of Minimum Environmental Criteria (MEC or CAM in Italian) for each category of products, services and works purchased or entrusted by the Public Administration. The Minimum Environmental Criteria (MEC) are the environmental requirements defined for the various phases of the purchasing process, aimed at identifying the best design solution, product or service from an environmental point of view along the entire life cycle, taking into account market availability.

Italy has made it mandatory for the Public Administration (PA) to apply the principles of Green Public Procurement to the procedures for the purchase of goods, services and works through Art. 34 of Legislative Decree 50/2016 (Public Contracts Code) with the aim of rationalising purchasing and consumption of contracting authorities while increasing environmental quality. These indications have recently been resumed in the new Public Contracts Code, where Article 57 paragraph 2 of Legislative Decree 36/2023, provides for the obligation to apply, for the entire value of the tender amount, the "technical specifications" and "contractual clauses" contained in the minimum environmental criteria (MEC). The same paragraph stipulates that MEC must also be taken into account for the definition of the "contract award criteria" referred to in Article 108, paragraphs 4 and 5 of the Code.



This obligation ensures that the national green public procurement policy is incisive not only in the objective of reducing environmental impacts, but in the objective of promoting more sustainable, "circular" production and consumption models and in spreading "green" employment.

The Ministerial Decree 259/2017 first introduced the "Minimum Environmental Criteria for the entrusting of design services and works for the new construction, renovation and maintenance of public buildings" later revised by the Ministerial Decree 256/2022 "Entrusting of design services and entrusting of works for building interventions" which came into force on 4 December 2022, repealing the previous decree.

The new provisions of the so called "MEC Construction", in particular the contractual clauses and technical specifications, depending on the scope of application and taking into account certain limitations, apply in tenders for the entrusting (joint or separate) of design services and works for building interventions by public administrations.

The "MEC Construction" is divided into three parts, depending on the type of contract:

- Criteria for the award of design services;
- Criteria for the award of works contracts;
- Criteria for the joint award of design and works.

Each macro-group contains the specific mandatory criteria to be applied in the contract, such as contract clauses, selection of designers, technical specifications of the context in which the works will be realised, of the buildings, of the construction products and of the construction site. For each macro-group some rewarding criteria are indicated, i.e. not compulsory, which give the right to additional scores, such as the use of LCA and LCC methodologies, design in BIM, evaluation of the non-financial or ESG risk exposure of economic operators. The adoption of rewarding criteria, in the general context of MEC, makes it possible to favour operators who implement strategies that are increasingly aligned with the EU regulatory framework and to increase the attraction of public and private capital for the works to be realised.

4.3.2. Regional regulations and standards for sustainable buildings

4.3.2.1. The ITACA protocol

Over the years, many Italian regions have introduced environmental sustainability certification systems into their regulations, both voluntary and mandatory, mostly referring to the ITACA protocol.

The ITACA protocol, in its various regional declinations, is a tool for assessing the level of energy and environmental sustainability of buildings, which was created in the early 2000s out of the need for regions to provide themselves with valid tools to support territorial policies for promoting environmental sustainability in the construction sector.

The protocol was created by ITACA (Institute for Innovation and Transparency of Contracts and Environmental Compatibility - National Association of Regions and Autonomous Provinces) with the technical support of iiSBE Italia (International Initiative for a Sustainable Built Environment Italy) and ITC-CNR. The tool is based on the international model SBTool, and characterised by the following principles:

- the identification of criteria, i.e. the environmental themes that make it possible to measure the various environmental performances of the building under examination;
- the definition of reference performance (benchmark) against which the building's performance can be compared in order to assign a score;
- the "weighting" of the criteria determining their greater and lesser importance;
- the final synthetic score that defines the degree of improvement of the performance as a whole with respect to the standard level.



The model allows the assessment of buildings' performance in terms of consumption, energy efficiency, and impact on the environment and human health. Therefore, it promotes the construction of zero-energy and low-water consumption buildings, employing at the same time construction materials with low energy consumption and high comfort. The Protocol is applied mainly to residential buildings, as well as offices and schools.

Thanks to the collaboration between ITACA and UNI (Italian Standardisation Body), in order to evolve the various protocols in use in the Regions to national technical reference standards, the UNI/PdR 13:2015 Reference Practice was created, which has been updated with the UNI/PdR 13:2019 Reference Practice.

The Protocol in its various versions has been adopted over time by various Regions (e.g. Umbria, Marche, Piedmont, Apulia) and municipal administrations in various initiatives aimed at promoting and incentivising sustainable building through: regional laws, building regulations, tenders, urban plans, etc. For example, the protocol has been used in the context of some public housing programmes, as well as in relation to the granting of volumetric and fiscal incentives to private individuals (reduction of urbanisation charges)

4.3.2.2. CasaClima Nature

CasaClima Nature is a voluntary certification scheme for the sustainability of buildings developed by the CasaClima Agency with the aim of completing the CasaClima energy certification criteria with requirements aimed at guaranteeing the construction of buildings that reduce the use of material and water resources, limit their environmental impact and guarantee the wellbeing of occupants.

The Nature protocol was introduced on a voluntary basis in 2010 and included, in addition to the CasaClima energy requirements, the assessment of the building's environmental and water impact requirements. New requirements have been then integrated over time and have been continuously updated as per the current standard.

The evaluation and certification system is based on a limited number of indicators that cover different assessment areas (energy efficiency, water efficiency and reduction of soil consumption, environmental impact of the building, indoor comfort and healthiness) but for each indicator minimum compulsory performance standards are defined. As per CasaClima practice, certification is focused on the verification of requirements not only during the building design phase, but also in the construction phase. Periodic on-site inspections and final checks by means of measurements are therefore an integral part of the certification process.

Parallel to the development of CasaClima Nature, sustainability protocols for non-residential buildings have also been implemented, which introduce further evaluation requirements linked to the specific use (e.g. production process for wine cellars, efficiency standards for swimming pools, wellness areas, kitchens,) and extend the certification also to the building operation phase. The protocols for non-residential buildings also apply to existing buildings to be upgraded.

Currently the protocols are defined as follows:

- ClimaHotel for sustainable accommodation facilities
- CasaClima Welcome for small accommodation facilities
- CasaClima Work&Life for office and company buildings, with a MEC-aligned version for public office buildings
- CasaClima Wine for wine cellars
- CasaClima School for school buildings (MEC aligned version)

With Provincial Council Resolution 964/2014 the Nature standard was introduced among the requirements for obtaining the volumetric bonus in the case of new buildings. In particular, the resolution established



that until 31.12.2016 the Nature standard gave the right to +10% additional volume capacity in the case of buildings in CasaClima B energy efficiency class and +20% for buildings in CasaClima A energy efficiency class. As of 1 January 2017, with the introduction of CasaClima class A as the minimum standard, the bonus was limited to this class only, with the possibility of a volume increase of a maximum of 10%.

Decree of the President of the Province 41/2022 extended this incentive until 2026 by introducing additional requirements regarding the coverage of the building's energy needs with renewable sources and by tightening the minimum requirements to be met for the criterion "Environmental impact of materials", which decreases from 300 to 250 points.

Thanks to the Bonus incentive, every fourth new building in South Tyrol is certified according to the to the CasaClima Nature standard.

4.3.3. Other voluntary assessment methods or certification schemes for sustainable buildings

International sustainability certification schemes have had increasing success in recent years in Italy, especially in the commercial and office sector, with an important role played by international clients. LEED and BREEAM certification, promoted at national level by GBC Italia, represent the two most widespread certification schemes. The actual impact in terms of certified projects (according to the official websites as for Sept.2023) is:

- LEED: 282 certified buildings (rating scheme Building Design and Construction), more than 500 considering all the rating schemes available.
- BREEAM: 57 certified buildings for New construction, 17certified buildings for Refurbishment.



4.4. Overview and analysis of the most relevant standards /guidelines /certification schemes for energy efficiency and sustainability in buildings

4.4.1. Energy Performance Certificates (EPCs) and Minimum Environmental Criteria (MEC)

4.4.1.1. General information

	Energy Performance Certificates (EPCs)	Minimum Environmental Criteria (MEC)
Scope	Certification scheme	Public Procurement Guidelines
Building types assessed	All	Public buildings
Type of intervention	New construction Major/Minor renovation	New construction Major renovation
Type of use	Mandatory	Mandatory
Main target users	Designers, consultants, public institutions, construction companies	Designers, consultants, public institutions, construction companies
Country	Italy	Italy
Developer	Italian state	Ministry of the Environment and Energy Security
Year of first publishing/launching	1991	2017
Number of assessed buildings	All new or renovated buildings	Not available
References	Energy efficiency regulations - ITA	MEC for buildings - ITA MEC for buildings - DEU
Update frequency	As required (last update DLgs 199/2021)	As required (last update: 2022/ minor revision in progress)
Possibility for the PPs to develop/adapt/update the scheme	No	Not directly, CC is part of the stakeholder groups

Table 7 - General info on the Italian national building assessment schemes -EPCs and Minimum Environmental Criteria



4.4.1.2. Assessment process

	Energy Performance Certificates (EPCs)	Minimum Environmental Criteria (MEC)
Project stage at which the assessment is performed	Design stage, construction stage, post-completion stage	Pre- design stage, design stage, construction stage, post-completion stage
Assessor	Accredited professional	Professional
Additional qualification	Depending on the Italian region where the building is located	no
Method to assess the building 's performance	Minimum target	Minimum targets (all mandatory) + rewarding criteria (public contracting authority can decide to apply them or not)
Validation of the assessment	Self-assessment for the design stage; assessment certified by an accredited professional for the construction and post-completion stage	Validation by the public contracting authority
Certification or labelling	Yes - Certification	No
Certification levels	No	No
Certification body	No	No
Short description of the verification/ validation process	The EPC must be drawn up by an accredited technician who must not have been involved in the design and construction phase. He/she may be appointed by the client. The EPC is valid for 10 years. In absence of substantial changes to the thermal envelope and/or the plant system, the validity of the certificate can be extended.	The procedure is the one used by the Italian State for public procurement.

Table 8 - Assessment process of the Italian national certification schemes EPCs and Minimum Environmental Criteria

4.4.1.3. Dimensions of sustainability covered

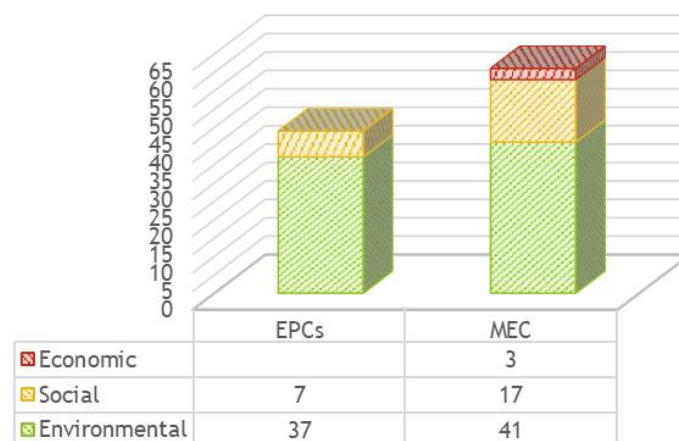
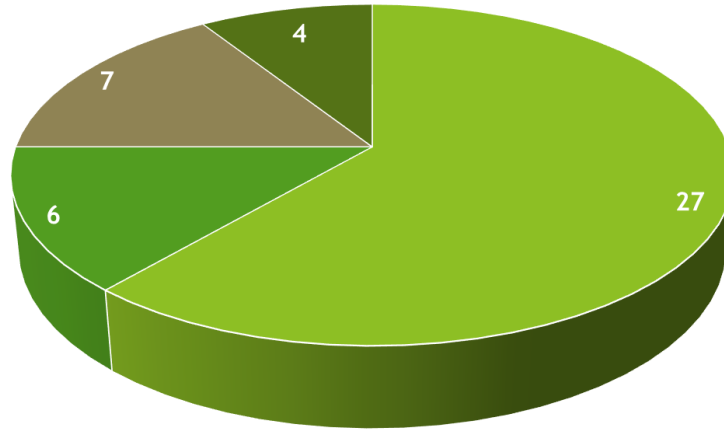


Figure 11 - Dimensions of sustainability covered and number of related indicators of the Italian national building assessment schemes EPCs and Minimum Environmental Criteria

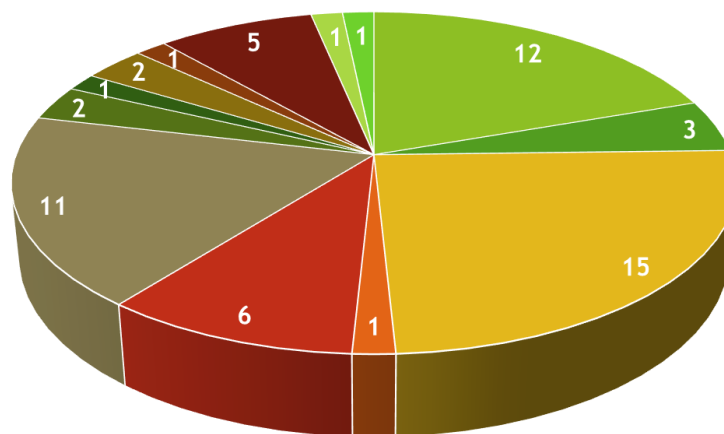


4.4.1.4. Thematic areas covered



Energy	LCC - no metrics
Emissions	Management - no metrics
Materials - no metrics	Transport - no metrics
Waste - no metrics	Site - no metrics
Water - no metrics	Accessibility - no metrics
IEQ	Adaptability - no metrics
Adaptation & resilience to climate change	Biodiversity - no metrics

Figure 12 - Thematic areas covered and number of related indicators of the Italian national building certification scheme EPCs



Energy	LCC
Emissions	Management
Materials	Transport
Waste	Site
Water	Accessibility - no metrics
IEQ	Adaptability
Adaptation & resilience to climate change	Biodiversity

Figure 13 - Thematic areas covered and number of related indicators of the Italian public building assessment scheme Minimum Environmental Criteria (MEC)



4.4.2. CasaClima/KlimaHaus R and CasaClima/KlimaHaus Nature

4.4.2.1. General information

	CasaClima-KlimaHaus R	CasaClima-KlimaHaus Nature
Scope	Certification scheme	Certification scheme
Building types assessed	All buildings type	Residential
Type of intervention	Major renovation	New construction
Type of use	Voluntary, mandatory in South Tyrol to obtain a volume bonus	Mandatory
Main target users	Designers, consultants, public institutions, construction companies	Designers, consultants, public institutions, construction companies
Country	Mainly applied in South Tyrol but also in other Italian regions	Italy
Developer	Energy Agency South Tyrol-CasaClima	Ministry of the Environment and Energy Security
Year of first publishing/launching	2013	2017
Number of assessed buildings	156 (until end of 2022)	Not available
References	Guideline ITA Guideline DEU	Guideline ITA Guideline DEU
Update frequency	As required (last update: 2017)	As required (last update: 2022)
Possibility for the PPs to develop/adapt/update the scheme	Yes	Yes

Table 7 - General info on the regional building certification schemes CasaClima R and CasaClima Nature



4.4.2.2. Assessment process

	CasaClima-KlimaHaus R	CasaClima-KlimaHaus Nature
Project stage at which the assessment is performed	Pre- design stage, design stage, construction stage, post-completion stage	Pre- design stage, design stage, construction stage, post-completion stage
Assessor	Professional	Professional
Additional qualification	no	no
Method to assess the building's performance	Minimum targets for each KPI Exceptions allowed in special cases	Minimum targets for each KPI
Validation of the assessment	Third party validation	Third party validation
Certification or labelling	Yes - Certification; Yes - Labelling	Yes - Certification; Yes - Labelling
Certification levels	No	No
Certification body	Energy Agency South Tyrol- CasaClima	Energy Agency South Tyrol- CasaClima
Short description of the verification/ validation process	3-stage certification process: Pre-certification (assessment of the documentation sent), Certification (check on documents update and construction), Re-Certification. Certification flow starts before the start of works. The energy certificate is valid for 10 years. In absence of substantial changes to the thermal envelope and/or the plant system, the validity of the certificate can be extended.	3-stage certification process: Pre-certification (assessment of the documentation sent), Certification (check on documents update and construction), Re-Certification. Certification flow starts before the start of works. The energy certificate is valid for 10 years. In absence of substantial changes to the thermal envelope and/or the plant system, the validity of the certificate can be extended.

Table 8 - Assessment process of the regional building certification schemes CasaClima R and CasaClima Nature

4.4.2.3. Dimensions of sustainability covered

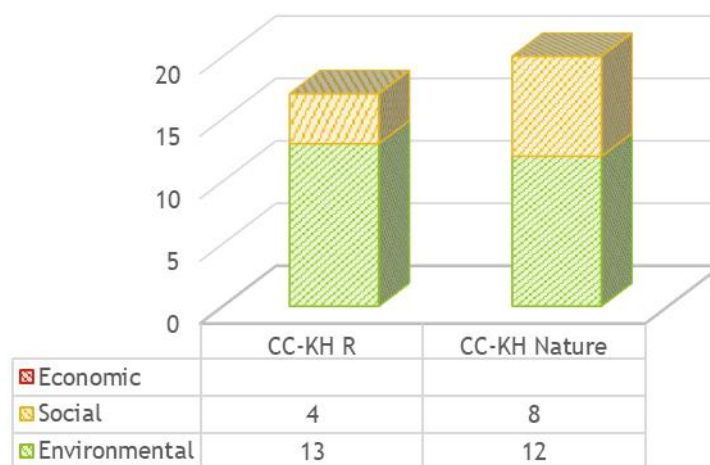
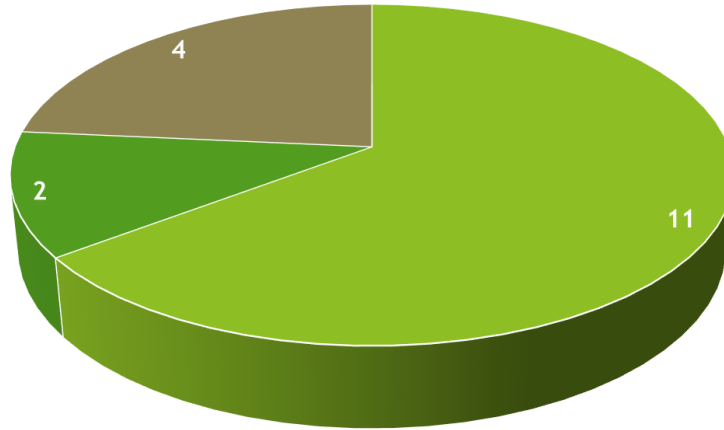


Figure 14 - Dimensions of sustainability covered and number of related indicators of the regional building certification schemes CasaClima R and CasaClima Nature

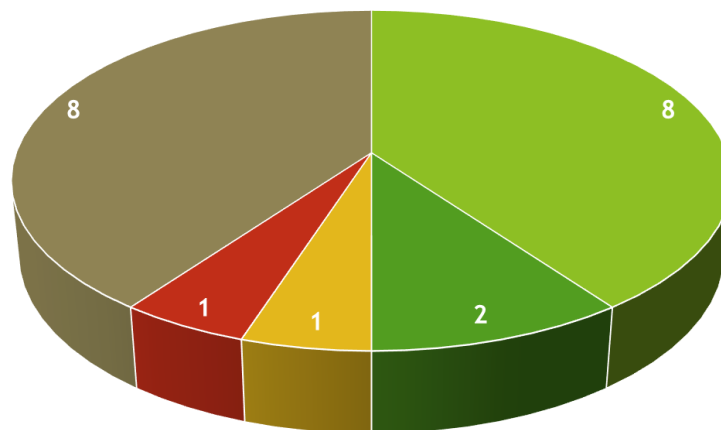


4.4.2.4. Thematic areas covered



Energy	LCC - no metrics
Emissions	Management - no metrics
Materials - no metrics	Transport - no metrics
Waste - no metrics	Site - no metrics
Water - no metrics	Accessibility - no metrics
IEQ	Adaptability - no metrics
Adaptation & resilience to climate change - no metrics	Biodiversity - no metrics

Figure 15 - Thematic areas covered and number of related indicators of the regional building certification scheme CasaClima R



Energy	LCC - no metrics
Emissions	Management - no metrics
Materials	Transport - no metrics
Waste - no metrics	Site - no metrics
Water	Accessibility - no metrics
IEQ	Adaptability - no metrics
Adaptation & resilience to climate change - no metrics	Biodiversity - no metrics

Figure 16 - Thematic areas covered and number of related indicators of the regional building certification scheme CasaClima Nature



5. Poland

5.1. General overview of national energy and climate strategies/plans and policy framework

5.1.1. Long-term strategy for the renovation of buildings (DSRB)

The document of February 9, 2022 defines the necessary actions to achieve high energy efficiency and low-emission buildings in Poland by 2050. The strategy (DSRB) is intended to "cost-effectively transform the national building stock into nearly zero-energy buildings".

For the purposes of developing the strategy, a review of all buildings in Poland, both public and private, was carried out, which shows that there are 14.2 million buildings in Poland, of which almost 40% are single-family residential buildings. A significant part of the buildings is characterized by low energy efficiency and will require thermal modernization in the coming years.

In the years 2020-2030, thermal modernization of 236,000 m² is planned. buildings per year, in the subsequent years 2030-2040 - 271 thousand. buildings, in the years 2040-2050 - 244 thousand. buildings, and in 2021-2050 - 7.5 million thermal modernizations have been planned. According to the strategy, by 2050 it is estimated that approximately 7.5 million thermomodernization investments will be carried out, including 4.7 million deep thermal modernization projects, including phased thermal modernization projects spread over time. The strategy assumes an average annual rate of thermal modernization at the level of approx. 3.8% assuming that by 2050, 65% of buildings will achieve an EP index not higher than 50 kWh/m².*year.

The action plan recommended in the strategy combines the rapid increase in the scale of shallow thermal modernization with the gradual dissemination of deep, more comprehensive thermal modernization in the perspective of 2030. Shallow thermomodernization consists primarily in the replacement of a high-emission heat source, which is, for example, a coal-fired boiler, for an ecological device. Deep thermomodernization involves the need for additional activities, such as building insulation, replacement of windows or installation of an ecological heat source.

It is assumed in the strategy that the share of deep thermal modernization will gradually increase with the simultaneous application of stage thermal modernization of other buildings. Such an approach will support the replacement of high-emission heating sources, which will translate into improved air quality in the coming years and, at the same time, will create the basis for achieving widespread deep thermal modernization of buildings in the coming decades in a manner consistent with the transformation towards a climate-neutral economy.

5.1.2. National Plan for Energy and Climate 2021-2030

National Plan for Energy and Climate 2021-2030 presents the assumptions and goals as well as policies and actions for the implementation of 5 dimensions of the Energy Union, taking into account the principle of "energy efficiency first". The National Energy and Climate Plan was prepared to establish a stable framework that fosters a favourable environment for a sustainable, economically efficient and fair transition towards a low-carbon economy.

The document sets the following 2030 climate and energy goals:

- 7% reduction in greenhouse gas emissions in non-ETS sectors compared to 2005 levels,
- 21-23% share of RES in gross final energy consumption, taking into account:
 - > 14% share of renewable energy in transport,



- > annual increase in the share of renewable energy sources in heating and cooling by 1.1 percentage points percent annually on average,
- > 23% increase in energy efficiency compared to PRIMES2007 forecasts,
- > reduction of the share of coal in electricity production to 56-60%.

5.1.3. Energy Policy for Poland until 2040 (PEP40)

It sets the framework for the energy transformation in Poland. It contains strategic decisions regarding the selection of technologies for building a low-emission energy system. The policy takes into account the scale of challenges related to the adjustment of the national economy to the EU regulatory conditions related to the 2030 climate and energy goals, the European Green Deal, the economic recovery plan after the COVID pandemic and the pursuit of climate neutrality in line with national possibilities, as a contribution to the implementation of the Paris Agreement.

Energy Policy for Poland until 2040 is divided into three pillars (1st pillar Just energy transition, 2nd pillar Zero-emission energy system, 3rd pillar Good air quality) and eight specific objectives:

- Optimal use of own energy resources focusing on transformation of coal regions
- Development of electricity infrastructure focusing on smart grids
- Diversification of supplies - expansion of the network infrastructure of natural gas, crude oil and liquid fuels (Baltic Pipe)
- Development of energy markets - electromobility
- Implementation of nuclear energy
- Development of RES focusing on PV and Offshore wind energy
- Development of heating and cogeneration (DHN)
- Improving energy efficiency

By implementing the specific objectives, a low-emission energy transformation will be carried out with the active role of the end-user and the involvement of the domestic industry, giving an impulse to the economy, while ensuring energy security, in an innovative, socially acceptable manner and with respect for the environment and climate.

Along with the strategy, goals and energy indicators were also indicated, e.g.:

- Until 2030 share of coal in electricity generation will not exceed 56%
- In 2030 primary energy consumption will be reduced by 23%
- By 2040, the heat needs of all households will be covered by DHS or low-emission individual sources
- By 2030, GHG emissions will be reduced by approx. 30% compared to 1990
- In 2033, 1st nuclear power plant with a capacity of app. 1-1.6 GW will be put into operation
- Share of RES in gross final energy consumption will be at least 23% in 2030
 - > 32% in electricity (mainly wind and PV)
 - > 28% in heating.



5.1.4. National Recovery and Resilience Plan

Document was drawn up in the Ministry of Funds and Regional Policy. One of the supported areas is green energy and reduction of energy consumption. Within this component, one of the specific objectives is to improve the energy efficiency of the economy. The following types of investments will be implemented under this objective:

- Investments in heat (cold) sources in district heating systems
- Energy efficiency of residential buildings
- Thermal modernization of schools
- Energy efficiency and RES in enterprises

5.2. General overview of the framework energy efficiency in buildings at national and/or regional level

5.2.1. National regulations and standards for buildings energy efficiency

5.2.1.1. Act of July 7, 1994 Construction Law

The Act regulates the activity covering matters of design, construction, maintenance and demolition of facilities construction and defines the rules of operation of public administration bodies in these fields. The Construction Law indicates the methodology and administrative conditions of the process of implementing construction projects. This law clearly indicates the definitions of a building object, individual types of building objects, as well as the stages of the construction process and the necessary arrangements, administrative decisions and documents for its effective implementation in accordance with applicable law (i.e. without allowing the so-called illegal construction). It includes also requirements for the construction of a building or its part, depending on its expected period of use, i.e. compliance with technical and construction regulations, including:

- load capacity and stability of the structure
- fire safety
- hygiene, health and environment
- safety of use and availability of facilities
- noise protection
- energy savings and thermal insulation
- sustainable use of natural resources

5.2.1.2. Act of April 10, 1997 Energy law

The Act defines the principles of shaping the state's energy policy, the principles and conditions for the supply and use of fuels and energy, including heat, and the activities of energy enterprises, and also defines the competent authorities in matters of fuel and energy management. The purpose of the Act is to create conditions for sustainable development of the country, ensuring energy security, economical and rational use of fuels and energy, development of competition, counteracting the negative effects of natural monopolies, taking into account environmental protection requirements, obligations arising from international agreements and balancing the interests of energy companies and fuel and energy.



5.2.1.3. Regulation of the Minister of Infrastructure of April 12, 2002 on technical conditions to be met by buildings and their location.

This regulation sets out the requirements that must be met during the design, construction, reconstruction and change of use of buildings as well as above ground and underground structures that fulfil all utility functions of buildings. Therefore, it indicates the guidelines and boundary conditions that make the process of designing and constructing buildings effective, so that the resulting building will enable its safe use. The facility constructed in accordance with this regulation will meet the requirements for all built installations and will comply with national standards and other separate regulations in the field of energy efficiency and environmental protection. The regulation contains:

- Guidelines for the design of buildings and their rooms
- Guidelines for hot water installation
- Guidelines for heating installation
- Guidelines for ventilation and air conditioning
- Guidelines for gas installations
- Guidelines for electric installations
- Guidelines for energy saving and thermal insulation

The regulation also refers to the requirements for energy saving and thermal insulation of the building. According to its provisions, the building and its installations for heating, ventilation, air-conditioning, hot water, and in the case of public buildings, collective residence, production, utility and storage buildings - also built-in lighting, should be designed and constructed in a way that ensures compliance with the following minimum requirements:

- maximum value of the indicator “annual demand of non-renewable primary energy EP” [kWh/(m²*year)]
- the envelopes and technical equipment of the building meet at least the requirements of thermal insulation specified in the regulation.

5.2.1.4. Act of November 21, 2008 on supporting thermal modernization and renovations and on the central record of emissivity of buildings.

The Act sets out the rules for financing partial costs of thermo-modernization and renovation projects, as well as renewable energy sources projects from the Thermomodernisation and Repairs Fund. In particular, following instruments are made available:

- Thermomodernization bonus
- Repair bonus
- Compensation bonus
- Co-financing of low-emission projects in the municipalities
- MZG bonus and grant
- RES grant

The Act also regulates the functioning of the central register of emissivity of buildings. The minister competent for construction, spatial planning and development and housing is obligated to keep a central



record of the emissivity of buildings, which collects data and information about buildings and premises in the scope of:

- heat source, including power supply from the heating network, used for the needs of the building or premises,
- source of electricity used for the needs of the building or premises to heat or heat utility water,
- fuel combustion sources,
- the Thermomodernisation bonus or the renovation bonus
- tax relief
- financing or co-financing granted from public funds
- granted benefits from social assistance or other forms of financial support from public funds.

5.2.1.5. Act of April 15, 2011 on energy efficiency

The Act specifies, among others: national target for energy efficiency, tasks of public sector entities in the field of energy efficiency, rules for preparing energy efficiency audits. The Act introduces a national final energy saving target to be achieved by the end of 2030 in the amount of 5,580 toe, which is implemented from January 1, 2021 to December 31, 2030. The target set for 2030 will be implemented through the system of energy efficiency certificates and the so-called alternative measures.

The system of energy efficiency certificates, commonly referred to as white certificates, imposes an annual obligation to save energy on obligated entities, e.g. enterprises selling electricity, district heating, gaseous fuels to end users and fuel entities introducing liquid fuels to the market.

Alternative measures were introduced as a supplementary method to the energy efficiency certificate system to achieve the national final energy savings target for 2030. They were defined in the act as programs and instruments to improve energy efficiency, financed, among others, from the state budget, from the budgets of local government units, the EU budget, from the funds of the Environmental Protection and Water Management Fund.

5.2.1.6. Act of August 29, 2014 on the energy performance of buildings

This Act specifies:

- Rules for drawing up energy performance certificates: the energy performance certificate is drawn up by the person entered to the list of persons authorized to draw up energy performance certificates based on needed qualifications specified in the act.
- Rules for controlling the heating system and air-conditioning system in buildings: the owner or manager of the building shall periodically inspect the buildings during their use in terms of the heating system or the air-conditioning system, checking the technical condition of the heating system and the energy efficiency assessment
- Principles of keeping the central energy performance register buildings.
- The method to develop a national action plan aimed at increasing the number of low-energy buildings.



5.2.1.7. National action plan aimed at increasing number of low-energy buildings (2015)

The national plan includes a definition of a low-energy building reflecting the existing conditions and achievable, economically justified measures to improve the energy performance of buildings. In addition, it presents the activities of the government administration undertaken to promote low-energy buildings, including the design, construction and reconstruction of buildings in a way that ensures their energy efficiency and increase the acquisition of energy from renewable sources in new and existing buildings, and sets a timetable for achieving the goals.

According to the plan, a "building with low energy consumption" should be understood as a building that meets the requirements related to energy saving and thermal insulation contained in national regulations and technical and construction regulations, taking into account that the regulations specify the level of minimum requirements, so it is possible to obtain more favourable parameters in terms of energy efficiency.

5.2.1.8. Act of February 20, 2015 on renewable energy sources

The purpose of this act is the sustainable development of renewable energy in Poland by adapting the methods of financing individual RES technologies and their stabilization over a 15-year period. The Renewable Energy Sources Act contains comprehensive solutions to organize the support system for renewable energy sources, consisting of:

- maintaining the support system for existing RES installations, which will guarantee respect for the rights acquired for all those who were producers of electricity from RES before the entry into force of the Act;
- introduction of new possibilities for existing installations of renewable energy sources, in order to optimize the economic calculation (dedicated auctions);
- implementation of a modern auction system for new and modernized RES installations.

5.2.1.9. Regulation of the Minister of Infrastructure and Development of February 27, 2015 on the methodology for determining the energy performance of a building or part of a building and energy performance certificates

The regulation lays down detailed methodology for determining energy performance, method of preparing the energy performance certificates and model energy performance certificates for a building or part of a building as described already above.

Regarding to the Regulation the energy performance of a building or part of a building is determined using a method based on a standard use of the building or part of the building (calculation method) or a method based on the quantity actually used energy (consumption method).

The methodology for determining the energy performance based on standard use and based on the amount of energy actually consumed is set out in the annexes to the regulation, which includes the exact methodology of how to determine the energy performance of a building or part of a building, including formulas, indicators, coefficient values, efficiencies, etc.:

- determining of indicators of annual demand for non-renewable primary energy, final energy and usable energy;
- determining the annual demand for non-renewable primary energy for technical systems;
- determining the annual demand for final energy supplied to the building or part of the building for technical systems;



- determining the annual demand for usable energy;
- determining the unit amount of CO₂ emissions;
- determining the calculated annual amount of energy carrier or energy consumed;
- determining the share of renewable energy sources in the annual demand for final energy in a building or part of a building.

5.2.1.10. Regulation of the Minister of Development of September 11, 2020

It defines the detailed scope and form of the construction design, which is the basis for issuing a building permit decision. The amended content extends the obligation to take into account, before starting construction, technical, environmental and economic possibilities for the implementation of highly efficient alternative systems using energy from renewable sources, including heat pumps.

5.2.2. Regional regulations and standards for buildings energy efficiency

5.2.2.1. Uchwała antysmogowa “anti-smog resolution”

By Resolution No. 162/17 of October 24, 2017, the Mazovian Voivodeship adopted the so-called an anti-smog resolution introducing restrictions and bans on the operation of installations in which fuels are burned in the Mazovian Voivodeship. This resolution was amended and tightened on April 26, 2022. The anti-smog resolution is a legal regulation to ensure clean air for the inhabitants of Mazovia. The restrictions and prohibitions listed in the resolution apply to all users of devices with a capacity of up to 1 MW in which solid fuels are burned, i.e. owners in particular:

- ovens
- fireplaces
- boilers, including those included in packages of solid fuel boilers, supplementary heaters, temperature controls and solar devices.

For municipalities located in the area where the so-called anti-smog resolution is obligatory, to support the liquidation or replacement of heat sources with low-emission ones and thermal modernization in single-family residential buildings of the least affluent people, the STOP SMOG financial program was launched, in which you can receive up to 70% of the costs of the project for replacing or liquidating high-emission heat sources with low-emission ones, for thermal modernization of single-family residential buildings, including connection to the district heating or gas network.

5.2.3. Compliance of the existing standards with EU legislation in force

Polish energy efficiency policy is in line with EU regulations and its foundations set out in the EU directives and strategies such as:

- European Green Deal
- Energy Efficiency Directive 2023/C125/24 amending Directive 2012/27/EU
- Energy Performance of Buildings Directive (2010/31/EU) amended by the directive 2018/844
- Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources
- Directive 2009/125/EC with regard to ecodesign requirements for solid fuel boilers
- Energy Labelling Directive.



5.3. General overview of the framework for buildings sustainability at national and /or regional level

5.3.1. National regulations and standards for buildings sustainability

Poland shares in EU commitments to tackle climate change and implements activities for sustainable construction, however so far there is not many comprehensive legal regulation supporting buildings sustainability. Many of the strategies and plans listed in point 5.1 also contribute to ensuring building sustainability, including the National Plan for Energy and Climate 2021-2030 and Poland's energy policy until 2040 (PEP40). In addition, following acts are also relevant:

- Regulation of the Minister of Infrastructure of 12 April 2002 on technical conditions to be met by buildings and their location: this regulation sets out the requirements that must be met during the design, construction, reconstruction and change of use of buildings. The facility constructed in accordance with this Regulation will meet the requirements for all built installations and will comply with national standards and other separate regulations in the field of energy efficiency and environmental protection. The guidelines related to the sustainability of the building apply to
 - > Guidelines for land development
 - > Guidelines for the design of buildings and their rooms
 - > Guidelines for sewage and rainwater drainage
 - > Guidelines for internal solid waste disposal facilities
 - > Guidelines for chimney flues
- Act of December 14, 2012 about waste: the Act specifies measures to protect the environment, human life and health by preventing and reducing waste generation and the negative impact of waste generation and management, as well as by reducing the total impact of resource use and improving the efficiency of such use, in order to transition to a circular economy The Act addresses the issues of reducing the generation of waste in processes related to construction and demolition, taking into account the best available techniques.
- Act of April 16, 2004 on construction products: the Act defines the rules for placing on the market or making available on the domestic market of construction products and specifies the competence of the authorities to perform administrative tasks in this matter. According to the Act, a construction product may be placed on the market or made available on the domestic market, if it is suitable for use in the performance of construction works, to the extent corresponding to its functional properties and intended use, which means that its functional properties enable properly designed and constructed construction objects, in particular which it is to be used in a permanent manner, meeting the basic requirements referred to in the Construction Law. The consultative and advisory body of the Chief Inspector of Construction Supervision in matters of construction products is the Construction Products Council
- Act of April 27, 2001 Environmental law: the Act defines the principles of environmental protection and the conditions for using its resources, taking into account the requirements of sustainable development, in particular:
 - > rules to determine conditions for the protection of environmental resources, conditions for releasing substances or energy into the environment, costs of using the environment;
 - > duties of administration bodies;
 - > liability and sanctions



The Act also specifies that in the production of a product (understood as a substance, energy, installation, device and other object or part thereof) placed on the market, without prejudice to its usability and user safety, the following should be limited:

- > consumption of substances and energy;
 - > the use of substances and technical solutions that may have a negative impact on the environment during the life of the product and after its use;
 - > the use of substances and technical solutions that hinder repair of the product, disassembly of the product in order to separate used elements that require special handling under the provisions of the Waste Act, use of parts of the product in another product or their use for other utility purposes after the product has been used up.
- Report on Implementation of Sustainable Development Goals in Poland: the first report Implementation of the Sustainable Development Goals in Poland was adopted by the Council of Ministers on June 5, 2018. It contains a discussion of the stages of implementation of all 17 Sustainable Development Goals in Poland, and also describes the national priorities for sustainable development and the relationship of the 2030 Agenda with the national Strategy for Responsible Development. In the environmental dimension, Poland strives to improve the condition of the environment and sustainable management of resources, ensuring economic development and high quality of life, while guaranteeing development opportunities for future generations. The aim of the state is, in particular, to increase available water resources and achieve high water quality, rational management of natural and geological resources and effective waste management. The actions taken are also intended to improve air quality, protect soils against degradation, as well as reduce the impact of noise and electromagnetic fields, which will positively affect the health of residents [Goals 6, 12 and 15 of sustainable development].

5.3.2. Regional framework for buildings sustainability

5.3.2.1. Innovation Strategy for Mazovia until 2030

The plan includes the objective called “Environment and Energy” with a set of specific goals as:

- Diversification of energy sources and its effective use
 - > Development and pro-ecological modernization of installations for the production of electricity and heat in the region, including increasing the share of energy obtained from renewable sources
 - > Development of energy and gas cross-border connections and analysis of the possibilities and costs of shale gas use and possible construction of a system for its extraction and transmission
 - > Increasing energy efficiency
- Ensuring permanent and sustainable development and preserving the high values of the environment
 - > Conducting monitoring of environmental pollution
 - > Spreading environmental awareness
- Modernization and expansion of local energy networks and improvement of transmission infrastructure
 - > Improving local energy security through the modernization and expansion of local distribution networks
 - > Expansion and modernization of the power transmission system, including adaptation to receive energy from distributed sources
 - > Development and modernization of natural gas and liquid fuels transmission infrastructure
- Counteracting natural threats



- Improvement of water quality, waste recovery / neutralization, restoration of contaminated areas and reduction of pollutant emissions
- Production of energy from renewable sources
 - > Increasing the use of renewable energy sources in rural areas
 - > Improving the security of energy supply to cities through the construction and modernization of local installations for energy production, with particular emphasis on cogeneration technologies and the use of renewable energy sources.

5.3.3. Compliance of the existing standards with EU framework and legislation in force

Polish sustainable policy is in line with EU regulations and its foundations set out in the EU directives and strategies such as:

- Sustainable Development Goals
- European Green Deal
- Regulation (EU) No 305/2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC
- EU-wide standards by the CEN / TC 350 Technical Committee for. Sustainable Construction
- Regulation (EC) No 765/2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing Regulation.

5.3.4. Other voluntary assessment methods or certification schemes for sustainability in buildings

5.3.4.1. Green Building Standard (GBS)

It is the only one Polish certificate recognized by the Ministry of the Environment. This system was developed by Nationwide Sustainable Building Support Association (OSWBZ) and is recognized as a system supporting Well certification. GBS is aimed at commercial buildings both to newly designed facilities, thoroughly modernized established or existing ones. The distinguishing element of this certificate is the ability to perform an analysis of the object showing the effects of the applied elements certification. The evaluation criteria include four sets of this category:

- user comfort and the quality of the indoor environment in which there are the scope thermal comfort, air quality and visual and acoustic comfort;
- energy, including consumption and costs
- amenities in terms of health, infrastructure, comfort and nutrition
- balanced management of the building, including educating of tenants and service.

Assessment of the design solution for the designed internal environment is based on the PN/EN 15251:2012 standard. In all criteria included in the PN/EN 15251:2012 standard, i.e.: thermal comfort, ventilation air stream, ventilation air quality, maintaining humidity, visual comfort, acoustic comfort, the building must meet the requirements of at least category III.

Basic requirements for obtaining a certificate:

- the building meets all the criteria contained in the PN/EN 15251:2012 standard requirements



- the building achieved a minimum of 15% savings expressed in energy consumption costs in relation to the reference building
- an action plan for maintaining high quality has been developed for the building internal environment
- an action plan for energy conservation has been developed for the building
- trainings will be conducted for users and technical staff of the building, during which the ideas of GBS Certification, the Investor's/Owner's obligations and action plans in the field of maintaining high quality of the internal environment and energy conservation will be presented.

The building assessment process is done by the auditor accredited by the National Association for the Support of Sustainable Construction.

5.3.4.2. Breeam

In addition to the GBS certificate, European certificates are mostly used in Poland, primarily Breeam, Leed DGNB, HQE, and Well.

Breeam, the British certification system is used to specify and measure the sustainability performance of buildings, ensuring that projects meet sustainability goals and continue to perform optimally over time. A BREEAM assessment uses recognised measures of performance, which are set against established benchmarks, to evaluate a building's specification, design, construction and use. The measures used represent a broad range of categories and criteria from energy to ecology. Each category focuses on the most influential factors, including reduced carbon emissions, low impact design, adaptation to climate change, ecological value and biodiversity protection. Integrating sustainability measures at the earliest possible stage of a project using the BREEAM framework enables to reduce life cycle costs and increase the asset value, building user experience and health, corporate image and CSR requirements, and risk mitigation. According to the data of the Polish Green Building Council, who shares the database of certified sustainable buildings, there are 1523 buildings with a BREEAM certification in Poland.

5.3.4.3. Leed

Leed is one of the most widely known green certification system, delivering a comprehensive framework for green building design, construction, operations and performance, including:

- The rigorous focus on material selection, human comfort, air quality and human health features of a building rightly prioritizes the most important asset of the building: human beings.
- The specific focus on social equity ensures that buildings are not considered in isolation of their communities but prioritize access and inclusiveness for all.
- To ensure a building is resilient from natural and unnatural disturbances a comprehensive set of design and construction strategies.

LEED is a comprehensive system, factoring in all critical elements that work together to create the best building possible. Of all LEED credits, 35% relate to climate change, 20% directly impact human health, 15% impact water resources, 10% affect biodiversity, 10% relate to the green economy, and 5% impact community and natural resources. The LEED certified buildings in Poland are 257.



5.4. Overview and analysis of the most relevant standards /guidelines /certification schemes for buildings energy efficiency and sustainability

5.4.1. Energy Performance Certificates and Green Building Standard (GBS)

5.4.1.1. General information

	EPCs	Green Building Standard (GBS)
Scope	Certification scheme	Certification scheme
Building types assessed	All	Commercial buildings. Other buildings can obtain it after prior notification to the organizer and obtaining its consent
Type of intervention	New construction, major renovations, buildings that are being sold or rented	Every type
Type of use	Mandatory	Voluntary
Main target users	All mentioned above	Designers, investors, end users
Country	Poland	Poland
Developer	Ministry of Development and Technology	National Association for the Support of Sustainable Construction
Year of first publishing/launching	2014	2016
Number of assessed buildings	n.a.	12 buildings
References	https://www.gov.pl/web/rozwoj-technologie/Swiadectwa-charakterystyki-energetycznej	http://greenbuildingstandard.eu/en/
Update frequency	According to national regulation	Regularly
Possibility for the PPs to develop/adapt/update the scheme	No	No

Table 9 - General info on the Polish certification scheme EPCs and Green Building Standard (GBS)



5.4.1.2. Assessment process

	Energy Performance Certificate (EPCs)	Green Building Standard (GBS)
Project stage at which the assessment is performed	Operation stage, post-completion stage	Design stage, post-completion stage, operational stage
Assessor	Accredited assessor	Accredited assessor
Additional qualification	n.a.	Specific training and admission to GBS auditors made by a professional commission
Method to assess the building's performance	Requirements for indicator of annual demand for non-renewable primary energy	Scoring
Validation of the assessment	No	No
Certification or labelling	Certification - yes; labelling - yes	Certification-yes; labelling - yes
Certification levels	Slider - a visual presentation of the energy performance of the building	No certification levels, overall final score in relation to the required one.
Certification body	Ministry of Development and Technology	National Association for the Support of Sustainable Construction
Short description of the verification/ validation process	n.a.	The filling in of an Application Form is required. This provides information about energy consumption and IEQ, action plan for maintaining a high IEQ and low energy consumptions, training declarations for users; other facilities for users. A Commission appointed by the organizer deals with the processing of applications submitted for GBS Certification. The Commission reserves the right to verify information sent in application documents and to launch the Explanatory Procedure in the event of doubts as to the data contained in application documents.

Table 10 - Assessment process of the Polish certification scheme EPCs and Green Building Standard (GBS)



5.4.1.3. Dimensions of sustainability covered

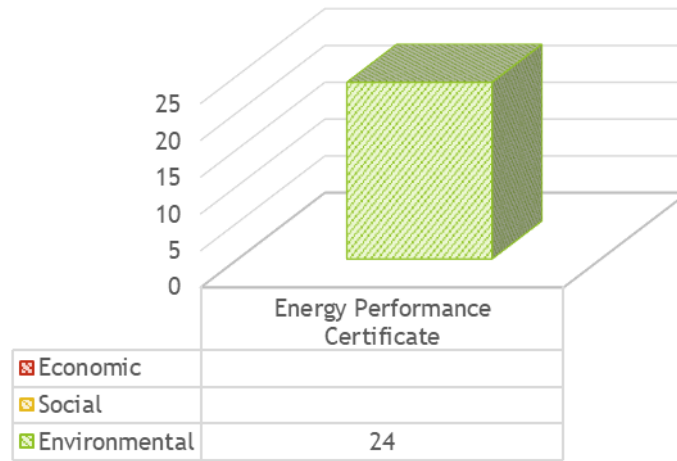
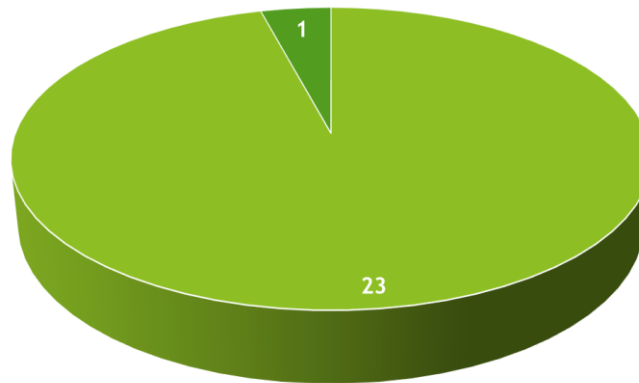


Figure 17 - Dimensions of sustainability covered and number of related indicators for the Polish certification scheme EPCs

5.4.1.4. Thematic areas covered



Energy	LCC - no metrics
Emissions	Management - no metrics
Materials- no metrics	Transport - no metrics
Waste - no metrics	Site - no metrics
Water - no metrics	Accessibility - no metrics
IEQ - no metrics	Adaptability - no metrics
Adaptation & resilience to climate change - no metrics	Biodiversity - no metrics

Figure 18 - Thematic areas covered and related number of indicators of the Polish certification scheme EPCs



6. Slovenia

6.1. General overview of national energy and climate strategies/plans and policy framework

6.1.1. Long term energy renovation strategy until 2050

The long-term strategy for the energy renovation of buildings until 2050 is regulated in Article 9 of the Act on the Efficient Use of Energy, where the government, on the proposal of the Ministry of Infrastructure, adopts the Long-term strategy for the renovation of the national fund of existing public and private residential and non-residential buildings into a highly energy-efficient and decarbonized building fund until in 2050.

The long-term strategy for the energy renovation of buildings until 2050 (DSEPS 2050) defines and upgrades the existing ones and adds new measures that will achieve the goals in the field of buildings, which are defined in the Comprehensive National Energy and Climate Plan of the Republic of Slovenia (NEPN). The strategy contains indicative goals for the year 2050 and intermediate goals for the years 2030 and 2040. In terms of content, it addresses the vision, framework, goals, indicators, review of the building stock by different sectors (residential, non-residential, public), obstacles and opportunities for the renovation of public buildings, cost effective approaches to the renovation of public buildings, policies and measures, and financing the implementation of measures.

Renovation of buildings is a long-term task, which will gradually cover the entire building stock in the coming years, and at the same time has a great impact on the quality of the internal environment. More than 75% of today's buildings are expected to still be in use by 2050. Larger investments in the renovation of individual buildings can be expected in the event of new findings regarding the inadequacy of building resistance in connection with endangering human lives, in the event of possible damage, such as the result of material aging or accidents (earthquake, flood, landslides, etc.), and under the conditions of a normal scenario, approx. only every 30 years (e.g. change of ownership, change of purpose, obsolescence and wear and tear).

The vision defined by DSEPS 2050 is to significantly improve energy efficiency and reduce greenhouse gas emissions by increasing the use of renewable energy sources (RES) in buildings. Approaching net zero emissions in the building sector by 2050 will be achieved by maintaining a high level of energy renovations of buildings and a targeted method of heating using RES technologies and a centralized heating system with RES. Renovations and new constructions will be encouraged with the achievement of almost zero emissions during the lifetime, while other aspects of the renovation will also need to be taken into account (e.g. earthquake and fire safety, aspects of the quality of the indoor environment). This will significantly reduce emissions of other harmful substances into the air. The goal of the strategy is also for Slovenia to become recognizable in the field of sustainable construction and renovation of buildings. DSEPS 2050 sets out a timetable with measures and nationally determined indicators to measure progress, namely to achieve the long-term goal of reducing greenhouse gas emissions in the European Union by 80-95 percent by 2050 compared to 1990. By implementing these measures, it will be ensured highly energy-efficient and decarbonized national building fund.

6.1.2. National energy and climate action plan

The Comprehensive National Energy and Climate Plan (NEPN) is a guide and one of Slovenia's key steps towards a climate-neutral Slovenia and the European Union (EU) by 2050. With it, Slovenia will set energy and climate goals as well as policies and measures to achieve these goals. until 2030 and with a view to 2040. The fulfilment of the NEPN goals is supported by a comprehensive environmental impact assessment (EIA), which is part of the formal process of preparing the NEPN. In addition to the assessment of



environmental impacts, the CPVO also enables the broad involvement of stakeholders (ministries and organizations, non-governmental organizations, sectors, interested individuals) and the definition of the appropriate path for Slovenia to achieve its goals. The CPVO process continues, and through the public disclosure and definition of the content of the NEPN proposal and the environmental report, there will also be room for additional considerations.

NEPN is the most ambitious in improving energy and material efficiency in all sectors and consequently reducing the use of energy and other natural resources, which is also the first and key measure on the way to a climate-neutral society. This also has a significant impact on other areas (decarbonisation, energy security, internal energy market and research and innovation). Slovenia's goal is to improve energy efficiency by 35% compared to the base year of 2007. Fulfilling the NEPN leads us to reduce dependence on fossil fuels and increase reuse. With NEPN, we also support sustainable solutions in transport (public sustainable transport), in buildings (heating and cooling, comprehensive renovation) and in industry (ongoing to ensure competitiveness). Today, traffic in Slovenia contributes more than 50% of emissions (outside the EU emissions trading system).

6.2. General overview of the framework for energy efficiency in buildings at national and/or regional level

6.2.1. Rules on energy efficient use in buildings

According to the European Energy Performance of Buildings Directive (EPBD), EU member states must ensure that all new buildings are constructed as nearly zero-energy buildings (nZEB) by the end of 2020, and public buildings by the end of 2018. In addition, they must member states to promote the renovation of existing buildings in the direction of increasing their energy efficiency.

In Slovenia, on June 5, 2022, new legislation was adopted in the field of efficient use of energy in buildings, which replaces the previous rulebook from 2010. It is the Rulebook on efficient use of energy in buildings (PURES-3), which sets minimum requirements for the energy efficiency of new and existing buildings and their technical systems, and for the Technical Construction Guideline TSG-1-004:2022 Efficient use of energy in buildings (TSG-1-004:2022), which defines in more detail the methodology for calculating the required heat for heating, cooling and ventilation, necessary electricity for lighting and operation of technical systems, as well as primary energy and CO₂ emissions for the entire building.

Technical guideline TSG-1-004:2022 was prepared on the basis of the European standards of the EN ISO 52000 series, which were adopted in 2017 and represent a common framework for assessing the energy efficiency of buildings at the EU level. The guideline consists of four parts:

- Part 1: General Provisions
- Part 2: Methodology for calculating the required heat for heating, cooling and ventilation
- Part 3: Methodology for calculating the necessary electrical energy for lighting and the operation of technical systems
- Part 4: Methodology for calculating primary energy and CO₂ emissions for the whole building

Some of the main innovations and features of TSG-1-004:2022 are:

- Introducing the concept of a near-zero-energy building (sNES), which is defined as a building with very high energy efficiency, whose near-zero or very low amount of energy required is largely covered by energy from renewable sources, including renewable energy produced on site alone or nearby.
- Introduction of new indicators for evaluating the energy efficiency of buildings, which comply with European standards. These indicators are: required energy for heating, cooling, ventilation and



lighting (EPHND), required electrical energy for the operation of technical systems (EEL), primary energy (EP) and CO₂ emissions (ECO₂). These indicators are calculated for the entire building on an annual basis and are expressed in kWh/m²a or kgCO₂/m²a. In addition, the indicator of the use of renewable energy sources (ROVE) is also used, which is expressed as a percentage and means the share of energy from renewable sources in the total energy required for the operation of the building.

- The introduction of new minimum requirements for the energy efficiency of buildings, which depend on the type of building, purpose, location and age. The minimum requirements relate to the required energy for heating, cooling and ventilation as well as to primary energy and CO₂ emissions for the entire building. The minimum requirements are set to ensure the achievement of the goal of almost zero-energy buildings by 2020 or 2018 for public buildings. The minimum requirements will gradually become more stringent as technology and the market progress.
- Introduction of new methodologies for calculating the required energy for heating, cooling, ventilation and lighting, as well as the required electrical energy for the operation of technical systems. The methodologies are based on a balanced approach between the thermal properties of the building envelope, the efficiency of technical systems and the influence of internal and external factors on the heat balance in the building. The methodologies also take into account the different climate zones in Slovenia and the possibility of using passive strategies to reduce heating and cooling needs, such as solar gain, shading, night ventilation, etc.
- Introduction of a new methodology for calculating primary energy and CO₂ emissions for the entire building. The methodology is based on the use of primary energy conversion coefficients and CO₂ emissions for different energy sources, which are determined at the national level. The conversion coefficients take into account the average efficiency of energy production, transmission and distribution and the average structure of energy supply in Slovenia. The methodology also makes it possible to take into account the production of energy from renewable sources on-site or nearby and to deduct it from the total energy required for the operation of the building.

Technical guideline TSG-1-004:2022 represents an important step in the transition to sustainable building construction in Slovenia. The guideline introduces new standards, indicators and methodologies for assessing the energy efficiency of buildings and sets the minimum requirements for achieving the goal of almost zero-energy buildings by 2020 and 2018 for public buildings. The guideline is intended for all stakeholders involved in the process of planning, construction and renovation of buildings, such as investors, designers, contractors, supervisors, managers and users. The guideline is also the basis for issuing energy certificates for buildings and for determining the amount of financial incentives for energy renovation of buildings.

The use of technical guideline TSG-1-004:2022 will contribute to the reduction of energy consumption and CO₂ emissions in the building sector and to the increase of the use of energy from renewable sources. With this, Slovenia will follow European and national goals in the field of climate change and energy policy and improve the quality of living and functioning in buildings.



6.3. General overview of the framework for building sustainability at national and /or regional level

6.3.1. National standards for sustainable buildings

6.3.1.1. The European framework Level(s)

Level(s)⁹ is the European framework of core indicators of sustainable construction for commercial and residential buildings, takes into account the achievement of six (6) macro goals and provides a set of individual indicators for the assessment of environmental effects in the life cycle of the building, which is also the basic purpose, while also enabling the assessment of other important properties of buildings, such as healthy and comfortable living, lifetime costs and management of possible future risks to the building's operation. The indicators are based on tools and standards and cover energy, materials, water, health and comfort, climate change, lifetime costs and the value of the building. The beta version of the Level(s) framework was available for free use and testing from Fall 2017 to September 2019. The Common European Framework of Key Indicators is presented transparently in the JRC publication¹⁰ and represents:

- six (6) macro goals (defined in the areas of: energy, use of materials and waste, water, indoor air quality), which contribute to the set European and domestic political directions in the field of sustainable construction;
- a set of nine (9) core indicators and a common metric for measuring the characteristics of buildings that contribute to the achievement of each macro goal. The system is designed to encourage the use of LCA (Life Cycle Assessment) and LCC (Life Cycle Costing) analyses;
- life-cycle-based tools: a set of four (4) scenario tools and one data collection tool, together with a simplified LCA analysis, supporting a comprehensive analysis of the building's characteristics, considering the entire life cycle;
- assessment of values and risks, which can be used to evaluate a possible positive effect on the valuation of the real estate and demonstrate the reliability of the assessment of effects in the context of the evaluation using the Level(s) framework.

As a framework, Level(s) can be connected to (existing) assessment schemes (market methods of sustainable construction certification, which in addition to the core indicators from Level(s) can also cover a range of other criteria) or be used independently as an affordable solution (it is designed for non-residential buildings and will later, after gaining experience, also be available for residential). However, it should be understood that Level(s) is primarily a framework for assessing sustainable buildings, which for use on e.g. the national level requires the prior establishment of databases and tools (such as the German DGNB system has, for example), important at the national level, and, even more importantly, the appropriate adaptation of building regulations (to remove organizational obstacles regarding easy access to data for analysis) and the training of users methods valuations. Conscious investors also include criteria for sustainable construction in their projects, and we already have the first Slovenian project groups that joined the testing of the Level(s) method of the common EU framework for key sustainability indicators of commercial and residential buildings. Slovenia, on the other hand, monitors the development of the European method and meaningfully connects it with the development of national criteria for sustainable construction.

⁹ https://environment.ec.europa.eu/topics/circular-economy/levels_en

¹⁰ Dodd, N., et al., 2017. Level(s) - A common EU framework of core sustainability indicators for office and residential buildings - Part3



6.3.1.2. Slovenian indicators of sustainable construction (SLO kTG) based on Level(s) framework

The Slovenian indicators of sustainable construction (SLO kTG) represent a national adaptation of the European framework Level(s) for the evaluation of sustainable construction. Their development takes place within the framework of the multi-year project LIFE IP CARE4CLIMATE2 (2019-2026), where, under the coordination of the Ministry of Environment, Climate and Energy (MOPE), 15 partners work in various areas important for reducing greenhouse gas emissions.

In order to unify the scattered approaches, the European Commission prepared a unified framework for the evaluation of sustainable construction called Level(s). This is becoming a central instrument for supporting the implementation of European policy in the field of the circular economy in construction, construction with the entire life cycle of the building in mind and decarbonization of buildings. The use of Level(s) is voluntary for now, but extremely useful and recommended for builders and at the system level.

In the construction of sustainable buildings, until recently we encountered the possibility of market sustainable certification of buildings according to international voluntary schemes (e.g. LEED, BREEAM, DGNB) and, on the other hand, with incentive programs for the implementation of state policies for more environmentally friendly construction and with prescribed requirements for the construction of certain types of buildings within the framework of green public procurement (ZeJN).

The described ways of ensuring environmentally and human-friendly and economical construction of buildings with their entire life cycle in mind and checking the success of these activities on a concrete building are complex tasks that require time and additional investment in knowledge, equipment and work. On the other hand, the user expects the criteria used for sustainable construction to be transparent and uniform, which has been a problem until now.

With TG indicators, we can also quantitatively express how successful the planned and implemented project is for the completed building, based on well-known and constantly monitored properties. We are already used to the building's energy efficiency statement, which provides proof of the fulfillment of one of the essential requirements for the building, but it is only one of the 16 indicators of sustainable construction that we monitor as part of the SLO kTG sustainable construction metric by Level(s).

In the years 2023-2024, under the auspices of the LIFE IP CARE4CLIMATE project, pilot use of the beta version of SLO kTG is planned in the phase of conceptual and detailed planning of buildings and during their construction or renovation.

The beta version of SLO kTG is available on the online platform (www.kazalnikitrajnostnegradnje.si). It is intended for pilot use both in the conceptual planning phase and during detailed planning, when the PZI documentation is being created, all the way to the completion of construction. Particularly interesting is the use of SLO kTG in green public procurement of design and construction and in other forms of procurement, in project tasks, criteria for financing and above all for demonstrating the sustainable properties of the completed building. The TG indicators will help the entire project group - the investor and designers in setting sustainable goals, choosing sustainable decisions and monitoring achieved sustainable indicators, and they will represent a clear guide for suppliers and contractors regarding the required sustainable quality of the materials used, procedures and the building as a whole.

The Ministry will support three (3) to five (5) pilot projects for the application of sustainable construction criteria in newly designed or completely renovated buildings. When can we check the sustainability of the building The pilot project mainly refers to the use of SLO kTG during conceptual and detailed planning of the building (level 1 and 2), to the setting of sustainability goals, to the sustainable orientation of the conceptual solution and during detailed planning, to the use of software tools (BIM, energy modelling, simulation of the properties of the internal environment, digital twin), which enable an effective approach to the calculation of sustainable construction indicators, to making project decisions based on the results of LCA and LCC analyses, to the introduction of advanced technological solutions to increase the circularity



of materials and to close material loops, to documenting foundations for the ultimate expression of sustainable properties.

Feedback from pilot projects of SLO kTG will be extremely useful before the planned introduction of SLO kTG in green public procurement as well as in other spheres of building construction in Slovenia.

6.4. Overview and first analysis of the most relevant standards/guidelines /certification schemes for energy efficiency and sustainability in buildings

6.4.1. Level(s)/ Slovenian indicators of sustainable construction (SLO kTG)

6.4.1.1. General information

	Level(s)/SLO kTG
Scope	Certification scheme
Building types assessed	Residential; non-residential buildings
Type of intervention	New construction; Major renovation
Type of use	Voluntary
Main target users	Designers, consultants, public institutions, construction companies
Country	Slovenia
Developer	European Commission
Year of first publishing/launching	2023
Number of assessed buildings	0; currently there's an ongoing demo certification of an office buildings
References	Technical guidelines in Slovenian language, freely available upon registration
Update frequency	Annually at the moment
Possibility for the PPs to develop/adapt/update the scheme	Yes

Table 11 - General info on the Slovenian certification scheme Level(s)/SLO kTG



6.4.1.2. Assessment process

	Level(s)/SLO kTG
Project stage at which the assessment is performed/ referred to	Pre- design stage; design stage; construction stage; post-completion stage
Assessor	Professional
Additional qualification required for assessors	No
Methodology to assess the building performance	Scoring
Validation of the assessment	Third party validation
Certification (yes/no) and labelling (yes/no)	Yes - Certification
Certification levels	No
Certification body	Ministry of Environment, Climate and Energy (MOPE)
Short description of the verification/validation process	n.a.

Table 12 - Assessment process of the Slovenian certification scheme Level(s)/SLO kTG

6.4.1.3. Dimensions of sustainability covered

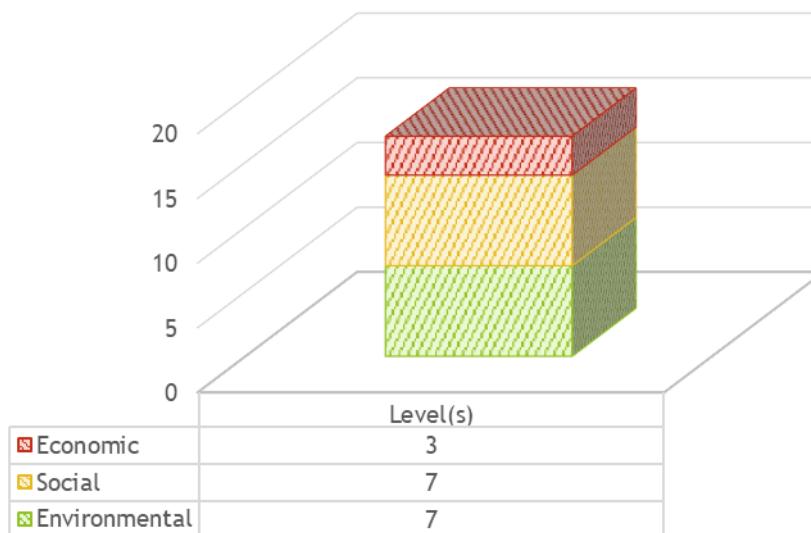
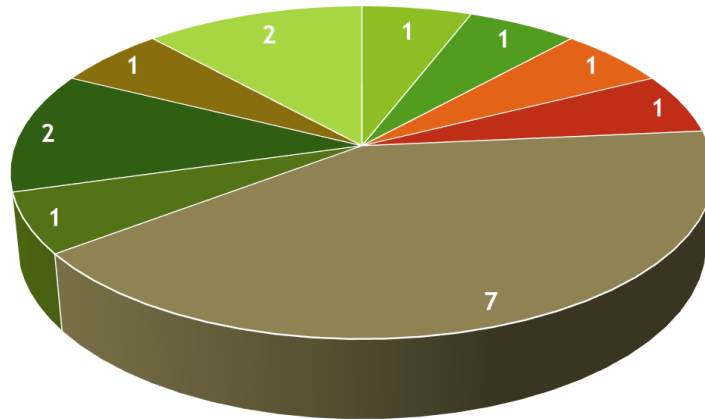


Figure 19 - Dimensions of sustainability covered and number of related indicators for the Slovenian certification scheme Level(s)/SLO kTG



6.4.1.4. Thematic areas covered

















 Energy	 LCC
 Emissions	 Management
 <i>Materials - no metrics</i>	 <i>Transport - no metrics</i>
 Waste	 <i>Site - no metrics</i>
 Water	 <i>Accessibility - no metrics</i>
 IEQ	 Adaptability
 Adaptation & resilience to climate change	 <i>Biodiversity - no metrics</i>

Figure 20 - Thematic areas covered and related number of indicators of the Slovenian certification scheme Level(s)/SLO kTG



D. Conclusion

The decarbonisation of the building stock is crucial to achieving the climate neutrality goal set by the EU by 2050 and within even more ambitious time horizons for some of the partner countries and regions (by 2040 for Austria and South Tyrol, by 2045 for Germany). Therefore, at both national and regional level, strategies and plans for the construction of high-efficiency buildings and the energy renovation of existing ones have been developed in recent years and numerous initiatives have been put in place to support energy transition in the building sector.

The analysis carried out on the framework for energy efficiency and sustainability in buildings in Central Europe partner countries shows that all of them have introduced national or regional regulations on energy performance of buildings that are substantially in line with current European energy directives. Alongside compulsory standards, which in most cases cover the requirements for the energy performance both of new buildings and of the existing ones undergoing a more or less significant renovation, in all countries there are voluntary instruments in place to support the construction of buildings with energy performances that go beyond the minimum legal requirements, and which are also increasingly focusing on the overall sustainability performance of buildings.

These instruments, whether guidelines or certification schemes, are often adopted to verify the quality of interventions in case of public incentive programmes for private investors (this is the case, for instance, of klimaaktiv in Austria or CasaClima Nature in Italy). Some others are sustainability standards that must be compulsorily applied in the case of public interventions or interventions using public funds, including EU funds (Minimum Environmental Criteria in Italy, Green Building Design Project guidelines in Croatia, BNB in Germany). Other times these schemes are mostly adopted on a voluntary basis by private or public investors, to ensure the quality of their investments, or by professionals as a support for the sustainable building design.

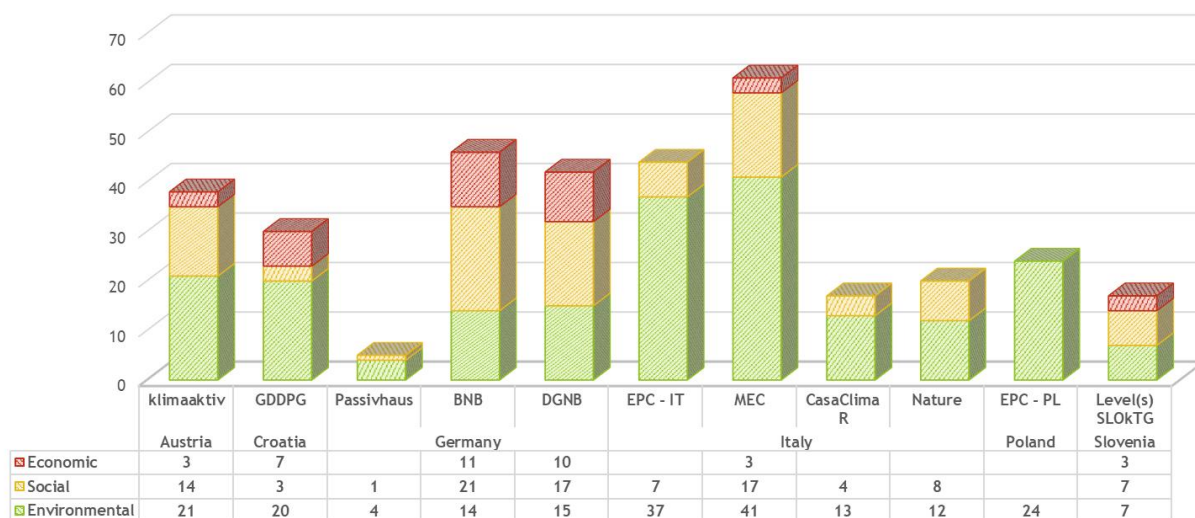


Figure 21 - Dimensions of sustainability covered and number of related indicators for the most relevant national or regional building assessment schemes



The first analysis conducted on the national and regional building standards and schemes selected by the project partners, and preparatory to the comparative analysis which will be developed in the upcoming project period, shows that the selected instruments can be divided into two main groups with regard to the dimensions of sustainability covered (see Figure 21).

The first group, consisting of the national Italian and Polish EPC standards and the Passivhaus, the CasaClima R and CasaClima Nature certification schemes, focuses mainly on the environmental dimension of sustainability with, however, some criteria that also embrace the social dimension. All the other schemes present a more holistic approach and foresee the use of assessment criteria/indicators that cover all three dimensions of sustainability, with a prevalence of the environmental dimension, followed by the social and economic ones.

The analysis of the thematic areas covered by the criteria/indicators used in the different selected schemes allows to identify very different approaches. The strictly energy certification schemes limit the evaluation to performance in the field “Energy” and in some cases in the field “Emissions” and “IEQ” (EPCs, CasaClima R, Passivhaus). The CasaClima Nature certification scheme additionally introduces indicators in the fields “Materials” and “Water”. The thematic areas evaluated are significantly broadened in the SLOk TG, klimaaktiv, Green Deal Design Project Guidelines, Minimum Environmental Criteria, DGNB and BNB schemes, all characterised by a greater number of indicators in use. However, the distribution of the criteria/indicators in the different thematic areas remains very uneven across the different schemes (see Figure 22-23).

The information collected on the national/ regional frameworks for energy efficiency and sustainability in buildings and the first analysis of the relevant schemes, standards, guidelines for the efficient and sustainable construction or renovation of buildings in the different Central Europe partner countries provide the basis for the comparative analysis that will be reported in D.2.1.2. This will be aimed at identifying the contribution of the analysed building standards and assessment/certification schemes to the development of the MESTRI-CE Sustainable Building Methodology as well as at assessing the possibility of upgrading and aligning these schemes with Level(s) and other European initiatives and standards.

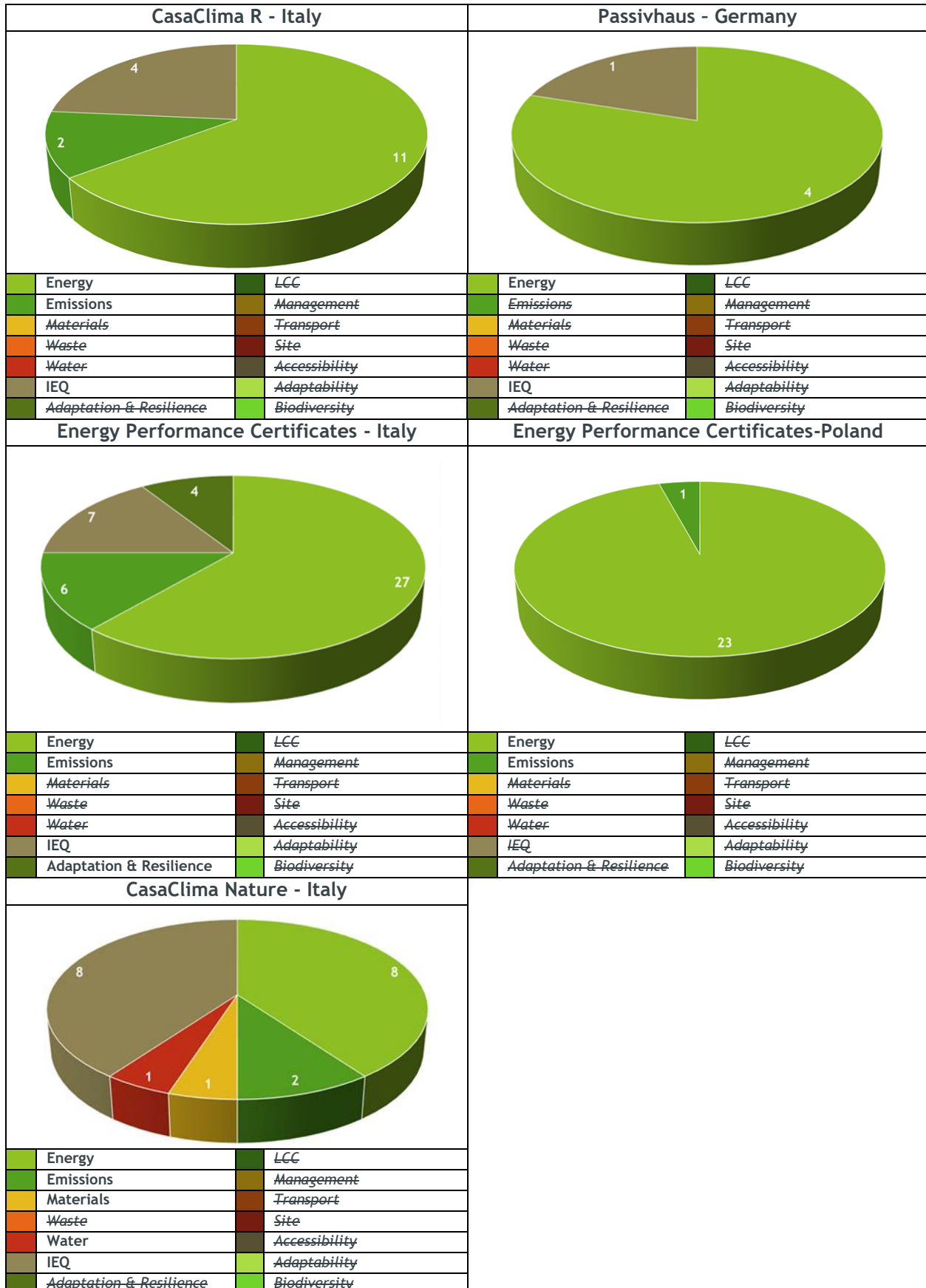


Figure 22 - Thematic areas covered and related number of indicators of the selected building assessment schemes

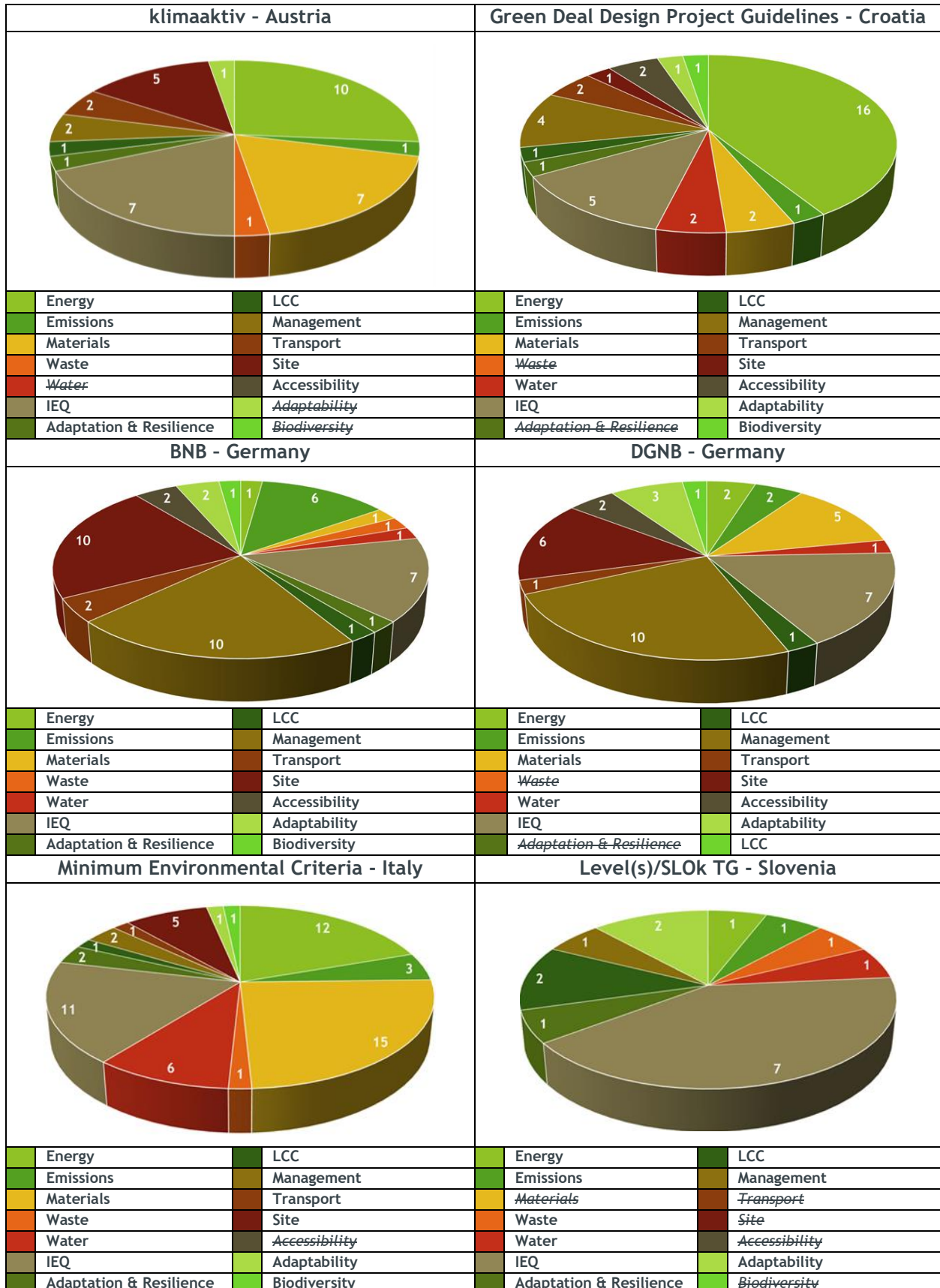


Figure 23 - Thematic areas covered and related number of indicators of the selected building assessment schemes



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